

# Collision Repair Technology

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**Program CIP:** 47.0603

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## Published by

Office of Vocational and Technical Education  
Mississippi Department of Education  
Jackson, MS 39205

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Vocational and Technical Education  
Mississippi State University  
Mississippi State, MS 39762

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The Research and Curriculum Unit (RCU), located in Starkville, MS, as part of Mississippi State University, was established to foster educational enhancements and innovations. In keeping with the land grant mission of Mississippi State University, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.



# Table of Contents

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Acknowledgements .....	3
Preface .....	5
Executive Summary .....	7
Research Synopsis.....	13
Blueprint .....	17
Collision Repair .....	19
Unit 1: Fundamentals of Collision Repair .....	19
Unit 2: Fundamentals of Collision Repair (Mechanical and Electrical Components).....	44
Unit 3: Fundamentals of Collision Repair (Basic Non – Structural Analysis and Damage Repair) .....	65
Unit4: Fundamentals of Collision Repair (Basic Structural Analysis and Damage Repair).....	80
Unit 5: Intermediate Painting and Refinishing.....	96
Unit 6: Safety (Review), Employability Skills, and Business Skills .....	114
Unit 7: Advanced Non – Structural Analysis and Damage Repair .....	130
Unit 8: Advanced Structural Analysis and Damage Repair .....	143
Unit 9: Advanced Painting and Refinishing.....	159
Student Competency Profile.....	172
Appendix A: 21st Century Skills Standards .....	174
Appendix B: MS Academic Standards .....	175
Appendix C: ACT College Readiness Standards.....	178
Appendix D: National Industry Standards.....	189
Appendix E: National Educational Technology Standards for Students .....	190

# Acknowledgments

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The Collision Repair Technology curriculum was presented to the Mississippi Board of Education on January 16, 2009. The following persons were serving on the state board at the time:

Dr. Hank M. Bounds, Executive Secretary  
Mr. Claude Hartley, Chair  
Mr. William Harold Jones, Vice Chair  
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Dr. O. Wayne Gann  
Ms. Rebecca Harris  
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Ms. Sondra Parker Caillavet  
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Dr. David Sistrunk

Mike Mulvihill, Interim Associate State Superintendent of Education for the Office of Vocational Education and Workforce Development, at the Mississippi Department of Education assembled an oversight committee to provide input throughout the development of the *Collision Repair Technology Curriculum Framework and Supporting Materials*. Members of this task force were as follows:

Dean Batton, Simpson County Vocational Center  
Annie Covington, Coffeerville Public Schools  
Linda Davis, Millsaps Vocational Center  
Dave Ellison, Hinds Community College  
Jimmy Flynt, Empire Trucks  
Scott Kolle, Research and Curriculum Unit  
Rick McDonald, Mississippi Gulf Coast Community College  
Ted Mangum, Jones County Vocational Center  
Michael Myrick, Canton Career Center  
Tommy Nance, Fowler Buick  
Ray Orr, Itawamba Community College  
Danny Owen, Tupelo Public Schools  
Ben Pratt, Northeast Mississippi Community College  
Rick Saucier, Hancock County Vo-Tech Center  
Chad Smith, Smith Brothers Collision Repair  
Dale Smith, Thomson Machinery  
Cravin Turnage, Holly Springs Public Schools  
Earl White, Mississippi Department of Education

Also, a special thanks is extended to the teachers who contributed teaching and assessment materials that are included in the framework and supporting materials. Members who contributed were as follows:

Wade Jackson, Oakley Training School, Raymond, MS  
Sheddric Lewis, Amite County School District, Liberty, MS  
James Terrell, Oakley Training School, Raymond, MS

Appreciation is expressed to the following staff members at the Mississippi Department of Education who provided guidance and insight throughout the development process:

Sam Davis, Program Coordinator and Division Director, Office of Vocational Education and Workforce Development, Mississippi Department of Education, Jackson, MS  
Bill McGrew, Division Director of Instructional Programs and Student Organizations, Office of Vocational Education and Workforce Development, Mississippi Department of Education  
Chris Wall, Bureau Director of Instructional Programs and Student Organizations, Office of Vocational Education and Workforce Development, Mississippi Department of Education

Finally, standards in the *Collision Repair Technology Curriculum Framework and Supporting Materials* are based on the following:

### **Industry Standards**

NATEF was founded in 1983 as an independent, non-profit organization with a single mission: To evaluate technician training programs against standards developed by the automotive industry and recommend qualifying programs for certification (accreditation) by ASE, the National Institute for Automotive Service Excellence. For more information, visit <http://www.natef.org/>. Reprinted with permission.

I-CAR was formed in 1979 as a not-for-profit collision training organization. Its focus is on activities and resources that assist the collision repair industry achieve a high level of training for its technicians, and content is based on National Automotive Technicians Education Foundation (NATEF) standards. I-CAR technical training programs are developed and delivered to technicians in the collision industry. For more information, visit <http://www.i-car.com/>.

### **Applied Academic Credit Benchmarks**

Mississippi Department of Education 2007 Mississippi Mathematics Framework Revised

### **21st Century Skills and Information and Communication Technologies Literacy Standards**

In defining 21st century learning, the Partnership for 21st Century Skills has embraced five content and skill areas that represent the essential knowledge for the 21st century: Global awareness; civic engagement; financial, economic, and business literacy; learning skills that encompass problem-solving, critical-thinking, and self-directional skills; and Information and Communication Technology (ICT) literacy.

### **National Educational Technology Standards for Students**

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### **ACT College Readiness Standards**



The College Readiness Standards are sets of statements intended to help students understand what is expected of them in preparation for the ACT. These standards are integrated into teaching and assessment strategies throughout the curriculum framework.

## Preface

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Secondary vocational–technical education programs in Mississippi are faced with many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing true learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, Mississippi Code of 1972, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, ch. 487, §14; Laws, 1991, ch. 423, §1; Laws, 1992, ch. 519, §4 eff. from and after July 1, 1992; Carl D. Perkins Vocational Education Act IV, 2007; and No Child Left Behind Act of 2001).

# Using This Document

## Unit Number and Title

### Suggested Time on Task

An estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75–80% of the time in the course.

### Competencies and Suggested Objectives

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

### Suggested Teaching Strategies

This section of each unit indicates research-based strategies that can be used to enable students to master each competency. Emphasis has been placed on strategies that reflect active learning methodologies. Teachers should feel free to modify or enhance these suggestions based on needs of their students and resources available in order to provide optimum learning experiences for their students.

### Suggested Assessment Strategies

This section indicates research-based strategies that can be used to measure student mastery. Examples of suggested strategies could include rubrics, class participation, reflection, and journaling. Again, teachers should feel free to modify or enhance these suggested assessment strategies based on local needs and resources.

### Integrated Academic Topics, 21st Century Skills and Information and Communication Technology Literacy Standards, ACT College Readiness Standards, and Technology Standards for Students

This section identifies related academic topics as required in the Subject Area Testing Program (SATP) in Algebra I, Biology I, English II, and U.S. History from 1877, which are integrated into the content of the unit. Research-based teaching strategies also incorporate ACT College Readiness standards. This section also identifies the 21st Century Skills and Information and Communication Technology Literacy skills. In addition, national technology standards for students associated with the competencies and suggested objectives for the unit are also identified.

### References

A list of suggested references is provided for each unit. The list includes some of the primary instructional resources that may be used to teach the competencies and suggested objectives. Again, these resources are suggested, and the list may be modified or enhanced based on needs and abilities of students and on available resources.



## Executive Summary

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### Program Description

Collision Repair is a pathway for students in the Transportation career cluster. The following description is from the current Standard Course of Study for Career–Technical Education, Mississippi Department of Education. Collision Repair is a hands-on program that will prepare students for employment or continuing education in the collision repair industry. The content is based on industry content. The content consists of fundamentals; mechanical/electrical components; nonstructural analysis and damage repair; structural analysis and damage repair; and painting and refinishing.

The program is aligned with the NATEF 2006 Collision Repair and Refinishing standards, which were retrieved May 1, 2006, from <http://www.natef.org>.

### Industry Certification

The Collision Repair pathway was written to incorporate the **National Automotive Technicians Education Foundation (NATEF)** and the **Inter-Industry Conference on Auto Collision Repair (I-CAR)** learning objectives, content, and hours. Any student who successfully completes this program will be eligible to apply to obtain the ASE exams. ASE requires 2 years of employment before certificates are issued. Students receive 1 year of credit for completion of the secondary program. Students who take certifications before the 2-year requirement is met will be granted certifications after they complete 1 year of collision repair employment. NATEF and I-CAR are national certifications recognized throughout the automotive service industry. Each district should implement a maximum student number due to the size of each lab. Programs seeking certification (NATEF) may receive certification in Painting and Refinishing. Programs can seek certification in other areas if they so desire.

### Assessment

Students will be assessed using the Collision Repair MS-CPAS2 test. The MS-CPAS2 blueprint can be found at <http://info.rcu.msstate.edu/services/curriculum.asp>. If there are questions regarding assessment of this program, please contact the transportation instructional design specialists at the Research and Curriculum Unit at 662.325.2510.

### Student Prerequisites

In order for students to be able to experience success in the Collision Repair Technology program, the following student prerequisites are in place:

1. C or higher in English (the previous year)
2. C or higher in Math (last course taken or the instructor can specify the math)
3. Instructor Approval and TABE Reading Score (eighth grade or higher)

or

1. TABE Reading Score (eighth grade or higher)
2. Instructor Approval

or

1. Instructor Approval

## Proposed Applied Academic Credit

Applied Mathematics content from the curriculum was aligned to the 2007 Mississippi Mathematics Framework Revised Academic Benchmarks. It is proposed that upon the completion of this program, students will earn one Applied Mathematics Credit that can be used for graduation requirements.

The applied academic credit has ***not*** been approved by the Mississippi Commission on School Accreditation or by the State Board of Education. If there are questions regarding applied academic credit, please contact the Coordinator of Workforce Education at the Research and Curriculum Unit at 662.325.2510.

## Licensure Requirements

A 967 educator license is required to teach the Collision Repair pathway. The requirements for the 967 licensure endorsement are listed below:

1. Applicant must have earned a 2-year college degree (associate degree) or higher from an accredited institution of higher education.
2. Applicant must have 2 years of documented collision repair service experience.
3. Applicant must enroll immediately in the Vocational Instructor Preparation (VIP) or the Redesign Education Program (REP).
4. Applicant must complete the individualized Professional Development Plan (PDP) requirements of the VIP or REP prior to the expiration date of the 3-year vocational license.
5. Applicant must hold ASE certificates in Painting and Refinishing or I-CAR Paint and Refinishing certification.
6. Applicant must successfully complete an approved computer literacy certification exam.
7. Applicant must successfully complete a certification for an online learning workshop, module, or course that is approved by the Mississippi Department of Education.
8. Applicant must successfully complete a Collision Repair certification workshop, module, or course that is approved by the Mississippi Department of Education.

## Professional Learning

*The professional learning itinerary for the middle school or individual pathways can be found at <http://redesign.rcu.msstate.edu>. If you have specific questions about the content of each training session provided, please contact the Research and Curriculum Unit at 662.325.2510, and ask for the Professional Learning Specialist.*

## Course Outlines

This curriculum framework allows multiple options for local school districts to implement based on the local needs of industry and students. The first option groups units into four one-Carnegie-unit courses. The second option groups units into a 2-year, four-Carnegie-unit program. An in-depth discussion of each option is listed in the following material.



## Option 1

This Collision Repair Pathway option emphasizes industry-based content with time being allocated between lecture and lab activities. The content is aligned with National Institute for Automotive Service Excellence (ASE) standards to ensure that programs can be recommended for certification by National Automotive Technicians Educational Foundation (NATEF) and the Inter-Industry Conference on Auto Collision Repair (I-CAR) learning objectives and content.

Collision Repair Pathway (four Carnegie units total) is a program that will prepare students for the collision repair industry. The content is divided into four one-credit courses. These courses are to be taken sequentially. Safety is an integral part of every course and activity. A student must complete all four courses to be a completer and to receive the one math credit.

- Safety will be reinforced and tested at the beginning of each year and throughout the content.
- Students are not to enroll into multiple courses at the same time.
- Courses cannot be taken out of the above order unless the instructor approves. Foundation knowledge in each course must be mastered to move to the next unit.
- Students must complete collision courses with a score of 80/C or higher in classwork to advance to the next level.

### **Course Description: Fundamentals of Collision Repair (Course Code: 997102)**

Fundamentals of Collision Repair contains information on safety, tool identification/use, employee information, collision estimating, paint mixing/matching, service specification and service information, measurement, personal/ business finance, introduction to steering and suspension systems, concepts of electronic/electrical systems, concepts of brake systems, introduction to heating/cooling systems, concepts of cooling systems, introduction to restraint systems, inspecting and analyzing body components, repairs to outer body panels, and introductory welding, information on frame inspection and repair, unibody inspection and repair, and introductory welding/cutting applications.

### **Course Description: Intermediate Painting and Refinishing (Course Code: 997103)**

The Intermediate Painting and Refinishing course contains information and skills relating to painting and refinishing operations and surface preparations.

### **Course Description: Advanced Fundamentals of Collision Repair (Course Code: 997104)**

Advanced Fundamentals of Collision Repair contains information on safety, tool identification/use, employee information, collision estimating, paint mixing/matching, service specification and service information, measurement, personal and business skills, metal finishing and body filling, movable glass/hardware, advanced welding, unibody measurement and repair, fixed glass procedures, and advanced welding/cutting applications.

### **Course Description: Advanced Painting and Refinishing (Course Code: 997105)**

The Advanced Painting and Refinishing course contains information and skills relating to mixing and matching paint; paint defects, causes, and cures; and final detail practices.

**Fundamentals of Collision Repair (One Carnegie Unit) - Course Code: 997102**

Unit	Title	Hours
1	Fundamentals of Collision Repair	65
2	Fundamentals of Collision Repair (Basic Mechanical and Electrical Components)	25
3	Fundamentals of Collision Repair (Basic Non-Structural Analysis and Damage Repair)	25
4	Fundamentals of Collision Repair (Basic Structural Analysis and Damage Repair)	25
		140

**Intermediate Painting and Refinishing (One Carnegie Unit) - Course Code: 997103**

Unit	Title	Hours
5	Intermediate Painting and Refinishing	140
		140

**Advanced Fundamentals of Collision Repair (One Carnegie Unit) - Course Code: 997104**

Unit	Title	Hours
6	Safety (Review), Employability Skills, and Business Skills	80
7	Advanced Non-Structural Analysis and Damage Repair	30
8	Advanced Structural Analysis and Damage Repair	30
		140

**Advanced Painting and Refinishing (One Carnegie Unit) – Course Code: 997105**

Unit	Title	Hours
9	Advanced Painting and Refinishing	140
		140

**Option 2**

This Collision Repair Pathway option also emphasizes industry-based content with time being allocated between lecture and lab activities. The content is aligned with National Institute for Automotive Service Excellence (ASE) standards to ensure that programs can be recommended for certification by National Automotive Technicians Educational Foundation (NATEF) and the Inter-Industry Conference on Auto Collision Repair (I-CAR) learning objectives and content.

The content is divided into two courses. Safety is an integral part of every course and activity. A student must complete both courses to be a completer and to receive the one math credit.

**Course Description: Collision Repair I (Course Code: 997100)** Fundamentals of Collision Repair contains information on safety, tool identification/use, employee information, collision estimating, paint mixing/matching, service specification and service information, measurement, and personal/ business finance, introduction to steering and suspension systems, concepts of electronic/electrical systems, concepts of brake systems, introduction to heating /cooling systems, concepts to cooling systems, introduction to restraint systems, inspecting and analyzing body components, repairs to outer body panels, and introductory welding, frame inspection and repair, unibody inspection and repair, and introductory welding/cutting applications.

**Course Description: Collision Repair Technology II (Course Code: 997101)** Advanced Fundamentals of Collision Repair contains information on safety, tool identification/use, employee information, collision estimating, paint mixing/matching, service specification and service information, measurement, personal and business skills, metal finishing and body filling, movable glass/hardware, advanced welding, frame inspection and repair, unibody measurement and repair, fixed glass procedures, and advanced welding/cutting applications.

**Collision Repair I (Two Carnegie Units) - Course Code: 997100**

Unit	Title	Hours
1	Fundamentals of Collision Repair	65
2	Fundamentals of Collision Repair (Basic Mechanical and Electrical Components)	25
3	Fundamentals of Collision Repair (Basic Non-Structural Analysis and Damage Repair)	25
4	Fundamentals of Collision Repair (Basic Structural Analysis and Damage Repair)	25
5	Intermediate Painting and Refinishing	140
		280

**Collision Repair II (Two Carnegie Units) - Course Code: 997101**

Unit	Title	Hours
6	Safety (Review), Employability Skills, and Business Skills	80
7	Advanced Non-Structural Analysis and Damage Repair	30
8	Advanced Structural Analysis and Damage Repair	30
9	Advanced Painting and Refinishing	140
		280

- Scheduling and operating more than one course in the same classroom/laboratory with the same teacher is not allowed.
- Students must complete the first year with a score of 80/C or higher in classwork to advance to the next level.

# Research Synopsis

## **Collision Repair Technology Research**

As Americans continue their love affair with the automobile, collisions are apt to happen. Automobile damage can be as minor as a pebble hitting the windshield or as major as damage that involves straightening frames, replacing air bags, and repainting the entire vehicle. When collisions happen, the vehicle owner will most likely have the damage repaired. Who will make those repairs? Collision repair technicians are certified personnel with the latest training, knowledge, and skill to perform the task (I-CAR, 2008). Although one does not have to be certified to be employed in the collision repair industry, some insurance companies recognize industry certifications. I-CAR (2008) concluded that certifications benefit all parties involved from the customer to the repair business to the insurance company. The customer benefits from knowing that his or her automobile is being repaired by technicians who have the latest training available (ASE, 2008). The repair business benefits from having technicians with the latest training, which means higher quality repairs with fewer complaints (I-CAR, 2008).

Results of the surveys indicate that collision repair technicians can be certified or trained by two main groups: The National Institute for Automotive Service Excellence (ASE) and The Inter-Industry Conference on Auto Collision Repair (I-CAR). Both ASE certification and I-CAR training are based on National Automotive Technicians Education Foundation (NATEF) standards.

## **Industry Certifications**

### **National Institute for Automotive Service Excellence (ASE)**

ASE was created in 1972 in response to customers wanting to be able to identify competent or incompetent technicians. The organization is independent and non profit. The exam questions are written by experts that represent a cross section of the automotive service industry nationally. These professions include technicians, manufacturers and aftermarket training representatives, customer service professionals, and automotive educators. ASE test content parallels actual collision work situations, and content is based on National Automotive Technicians Education Foundation (NATEF) standards. Question developers spend a considerable amount of time developing each question. Certification requires an individual to pass an exam and have 2 years of relevant hands-on experience. These certifications serve as the technician's proof of competence and effectiveness. As of 2008, there are approximately 420,000 ASE-certified professionals around the United States. These occupations are collision repair/refinish technicians (34,540), master collision repair/refinish technicians (7,262), and collision damage estimators (10,650) (ASE, 2008).

### **The Inter-Industry Conference on Auto Collision Repair (I-CAR)**

I-CAR was formed in 1979 as a not-for-profit collision training organization. Its focus is on activities and resources that assist the collision repair industry achieve a high level of training for its technicians, and content is based on National Automotive Technicians Education Foundation (NATEF) standards. I-CAR technical training programs are developed and delivered to technicians in the collision industry. I-CAR programs are instructor led. These instructors are trained by I-CAR. Instructor training consists of the participant being tested on his or her technical knowledge and ability to present the content and answer questions in a training atmosphere. I-CAR training is conducted in a hands-on atmosphere that mirrors real-world situations. Students receive a CD-ROM that includes instructional videos, interactive exercises, and a textbook. I-CAR training is centered on performance-based training methods. These methods allow for actual collision repair skills to be verified. Training courses are provided on all aspects of the collision industry.

## Employment

Based on the employment projections from the Department of Labor, the need for these types of jobs will continue. The four areas of the industry are painters, body repairers, glass installers and repairers, and auto insurance appraisers.

## Projections Data

Occupational Title	Employment 2006	Projected Employment 2016	Change 2006–2016	
			Number	Percent
Painters, transportation equipment	54,000	59,000	4,600	8
Painting, coating, and decorating workers	31,000	32,000	1,100	4
Automotive body and related repairers	183,000	204,000	21,000	12
Automotive glass installers and repairers	24,000	28,000	4,400	19
Insurance appraisers, auto damage	13,000	15,000	1,700	13

*NOTE: Data in this table are rounded. See the discussion of the employment projections table in the introductory chapter on Occupational Information Included in the Handbook.*

Source: U. S. Department of Labor, Bureau of Labor Statistics. (2008). *Occupational Outlook Handbook, 2008–2009 edition*. Retrieved May 7, 2008, from <http://www.bls.gov/soc/home.htm>

### Painters (all areas)

It seems like almost everything available for purchase is painted. These items are covered by a variety of coatings: Paint, plastic, clear coating, nutrients, and so forth. Painters and coating workers are the ones who make this happen. In vehicular repair, prior to applying any coating, the technician must prepare the surface. Sanding is the process that is used to smooth, rough up (some surfaces have to be roughed up so paint will adhere), or correct imperfections in the surface. Paint and other coatings can be applied by hand application, dip/vat method, or automated spray guns. For a technician to be skilled in all areas of painting usually requires 1 to 2 years of on-the-job training. New technicians gain valuable experience performing jobs such as trim removal, cleaning/polishing, general sanding, and masking. As they gain experience, they advance to higher technical skills under the supervision of the senior technician.

### Body Repairers

For the collision repair technician to gain skill and knowledge, formal educational training is followed by on-the-job instruction. Technicians need good reading ability, basic mathematics ability, and basic computer skills. Collision repair technicians have a wide variety of tasks: Straighten frames, remove and fill dents and creases, and replace parts that are damaged beyond repair. New technicians assist senior collision repairer technicians in simple tasks until they have mastered the skills for more advanced tasks. For the new technician, it takes 3 to 4 years of hands-on training to become skilled in all areas of the collision repair industry.

### Glass Installers and Repairers

Automotive glass installers' and repairers' work environment is different from the other areas of collision repair. Technicians can operate from a fixed location, or they can be mobile. The area of expertise is removing broken, cracked, or pitted windshields or side glass. Introduction to content can be on the job or in an educational setting. Most of the time, the skills and knowledge can be acquired and mastered within a few days to weeks.

## Auto Insurance Appraisers

Auto appraisers' duties are to inspect damaged vehicles and estimate the cost of repairs. Collision repair knowledge, skills, and experience are a plus for an appraiser. The appraiser must be knowledgeable in repair techniques to advise and give an unbiased estimate.

### Salary

Based on the salary data from the Department of Labor, these positions in the collision industry provide an annual mean wage of \$29,000 to \$49,220. Technicians must realize that pay is commensurate with training, skill, knowledge, experience, and certifications. New technicians in most cases will work as an apprentice for a senior technician. The time period can last from 6 months to a few years depending on aptitude and willingness to learn. Starting pay for beginning technicians can range from \$7 to \$9 per hour. As technicians grow in skill, experience, and knowledge, their salary increases.

Occupational Title	Employment	Annual Mean Wage
Automotive body and related repairers	1,080	\$32,000
Automotive glass installers and repairers	170	\$29,000
Insurance appraisers, auto damage	130	\$49,220

### Curriculum Content

Results from the survey indicate that there are four employment areas in the Mississippi collision industry: Glass installer and repairer, body repairer, painter/refinisher, and auto appraiser. Most of the respondents from the survey indicated that they had never viewed a secondary curriculum but would be willing to when the curriculum is finished. They also indicated that they did not know what was taught in the secondary programs. They did emphasize that students need hands-on experience with the basic tasks that are required to be a technician. "Hands-on" does not mean perform the task one time. Repetition is the key to perfect the skill level and knowledge. Specific job skills requested are problem solving, cooperative learning, and organization. Specific academic skills identified are math, writing/reading, and basic computer skills. Specific collision repair topics mentioned are as follows:

- **Air Bags** – Students need to know how to safely disarm an air bag. They also need to know how to work around an air bag.
- **Adhesives, Bonding, and Fillers** – Students need working knowledge of adhesives, bonding, and fillers. They should be able to actually use adhesives, bonding, and fillers to repair certain damage. Knowledge of the different types of plastics and how to repair each was emphasized.
- **Frames** – Students need to know how to identify basic frame damage and then discuss repair techniques or procedures. The actual repair may need to be left to the community college.
- **Glass (stationary/moveable)** – These tasks are not performed in most of the shops, and most shops subcontract this work to an independent mobile glass service. Although most shops do not perform these tasks, it is an area for which secondary career programs could introduce skill and knowledge.
- **Mechanical and Electrical** – Less hands-on time for these tasks is needed. Students need to be able to identify parts of the vehicle related to mechanical and electrical content. Larger repair shops have separate technicians who perform these tasks. In smaller shops, technicians may perform all aspects of the repair.
- **Paint and Refinishing** – Students need to focus on the skills of preparation of a vehicle to prime and paint. These tasks must be done on different areas of a vehicle.
- **Welding** – MIG welding is required, and plasma should be introduced. Students should learn how to identify the types of metals and apply basic repair procedures. Students also need to explore working with alloys, aluminum, and magnesium.
- **Estimating** – Students need to be able to inspect damage, evaluate the most cost-efficient repair, and estimate a total cost. Written communication is a must for this task to be completed.

- **General Knowledge** – The student must be able to read and understand technical manuals, diagrams, and schematics. A good understanding of the collision industry and mechanical ability is a must for the student to be successful.

Certifications and training were not indicated as being requirements for acquiring a job. Training and certification may be encouraged or required depending on the particular business environment. All respondents indicated that new employees serve as an apprentice to a senior technician. During this time, the senior technician assigns simple tasks that need to be completed. As skill level, experience, and knowledge increase, more complex tasks are assigned.

Collision repair skills and knowledge take time to perfect. The NATEF standards provide the tasks, which, if taught, should provide employers with an employee that has skills and knowledge that will enable him or her to be successful. The tasks need to be performed over and over again to be mastered and understood. For technicians to be successful, they must continue training throughout their careers. For students to be successful in the workplace, emphasis needs to be placed on a hands-on understanding of the material.



# Blueprint

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You will find the blueprint that corresponds to this document at:  
<http://redesign.rcu.msstate.edu/curriculum/>

## Professional Organizations

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Association for Supervision and Curriculum Development (ASCD)  
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# Collision Repair

## Unit 1: Fundamentals of Collision Repair

**Competency 1:** Introduce, describe, and distinguish local program and vocational/career technical center policies and procedures. (DOK 1) CRN1 CRS2 CRS3 CRP4

### Suggested Enduring Understandings

1. Safety is an integral part of daily life.
2. Rules and regulations are essential to a safe work environment.

### Suggested Essential Questions

1. What would happen if there were no rules and regulations?
2. How would people function without rules and regulations?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Describe local program and vocational/career technical center policies and procedures including dress code, attendance, academic requirements, discipline, and the school technology acceptable use policy and transportation regulations. (DOK 1)</p>	<p>a. Divide students into two groups. Assign one of the following scenarios to each group. Have groups present a role-play for their assigned scenarios.</p> <ul style="list-style-type: none"> <li>• Imagine a school or business without rules. What would a normal day be like? What would a normal class be like? How productive would your day be?</li> <li>• Imagine a school or business that has created a rule and a procedure for everything. What would a normal day be like? What would a normal class be like? How productive would your day be? <small>CS1 CS2 CS4, T1 T2 T3 T4, E1 E2 E3 M1 R1 R2 W1</small></li> </ul> <p>Review all of the local program policies, including dress code, attendance, academic requirements, discipline, and the technology acceptable use policy using the presentation station. Post all of these documents on the classroom bulletin board.</p>	<p>a. After the role-play, students will ask questions and discuss the answers. Evaluate the role-play using the <b>Role-Play or Skit Rubric for Shop/Lab Safety Activity.</b></p>
<p>b. Compare and contrast local program policies, procedures, and expectations to industry policies, procedures, and expectations. (DOK 2)</p>	<p>b. Ask students, “What skills or behavioral characteristics does this school/classroom expect from you? What skills or behavioral characteristics do employers and/or industries expect from you? How are they different? How are they the same?”</p> <p>Have students visit or interview collision industry members to learn about industry policies, procedures, and expectations. Have students visit <a href="http://www.teachology.com/web_tools/graphic_org/venn_diagrams/">http://www.teachology.com/web_tools/graphic_org/venn_diagrams/</a> and create a Venn diagram that compares and contrasts local program policies, procedures, and expectations to industry</p>	<p>b. Give an electronic test on local school rules and regulations using the Blackboard class Web site. Have students complete a form verifying that they have received instructions on local school rules and policies. Parents should also sign to acknowledge rules and policies. This should be</p>

policies, procedures, and expectations. CS1 CS2 CS4 CS5, T1 T2 T4, E1 E2 E3 E4 E5 E6 R1 R2 R3 S1 W1 W2 W3

kept in a student folder.

**Competency 2:** Introduce, describe, and express employment opportunities and responsibilities of the collision repair industry. (DOK 1) CRN1 CRS2 CRS3 CRP4

**Suggested Enduring Understandings**

1. Employers offer a wide variety of benefits.
2. Employers are looking for specific skills in employees.

**Suggested Essential Questions**

1. What do you already know about collision repair?
2. What would the nation and world be like without collision service technicians?
3. What are the businesses in this area that provide collision repair services?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Introduce concepts associated with the collision repair industry; describe employment opportunities including potential earnings, employee benefits, job availability, place of employment, working conditions, and educational requirements. (DOK 1) <small>SMT1</small>	a. As a group activity, have students interview three industry members from the collision repair sector or professionals related to the course and determine employment opportunities including potential earnings, employee benefits, job availability, place of employment, working conditions, and educational requirements. Divide the students into groups, and have them develop a multimedia presentation regarding the interview information and present their findings to the class. Allow students to discuss their findings and expectations for the course. Have students record findings in their electronic journals using a Blog or a word processing program. Have students use the writing process to summarize their information. <small>CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4, E1 E2 E3 E4 R1 R2 R3 S1 S2 W1 W2</small>	a. Evaluate the journal activity using the <b>Journal Rubric</b> .
b. Describe basic employee responsibilities and how to communicate effectively in on-the-job situations. Identify and apply the practices that affect employer and employee decision making as it relates to identifying and applying appropriate algebraic formulas to personal finance situations, linear programming to business decisions, and algebraic formulas to personal and business	b. Have students use the Internet and other classroom resources to research employment opportunities, educational opportunities, and working conditions in the collision repair industry. Have students role-play a given situation. Have students choose to be a technician, a manager, a customer, or a parts specialist. Have students interact with each other in a variety of situations related to the workplace (i.e., practices that affect employer and employee decision making as it relates to identifying and applying appropriate algebraic formulas to personal finance situations, linear programming to business decisions, and algebraic formulas to personal and business investments). After each skit, the class will discuss the situations, the pros and cons of each, and how each will relate to a successful business. <small>CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4</small>	b. Evaluate the skit using the <b>Role-Play or Skit Rubric for Employment Skills</b> .

investments. (DOK 2)  
SMT2

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| c. Discuss the history of the collision repair industry to include materials, terminology, and techniques. (DOK 2) | c. Allow students to use the Internet to search for four to five articles regarding the history of the collision repair industry. After a classroom discussion, have students record facts in their electronic journals. <small>CS1, T1 T2 T3 T4, E1 E2 E3 M8 R1 R2 R5 S1 W1 W2</small> | c. Evaluate the electronic journal activity using the <b>Journal Rubric</b> . |
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| d. Research and report the computerized systems used for estimating collision repairs, measuring damage, and mixing or matching paint. (DOK 3) <small>PRA1, PRA4</small> | d. Allow students to use trade journals or catalogs to research computerized systems used for estimating collision repairs, measuring damage, and mixing or matching paint. Have students contact the vendor to obtain information regarding the product. Have students present the information to the class. <small>CS1 CS2, T1 T2 T3, E1 E2 E3 E4 E5 E6 M1 M2 M3 M7 M8 R4 R5 S1 S2 W1 W2 W5</small> | d. Evaluate the presentation using the <b>Presentation Assessment Rubric</b> . |
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**Competency 3:** Investigate and replicate leadership skills and personal development. (DOK 1) CRN1 CRS2 CRS3 CRP4

**Suggested Enduring Understandings**

- Leadership and team-building skills are needed to be successful in a career.
- Student involvement in SkillsUSA develops and enhances the skills employers are looking for.

**Suggested Essential Questions**

- What leadership and team-building skills are necessary for success in any career?
- What activities does SkillsUSA provide that can prepare you for the world of work?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Demonstrate effective team-building and leadership skills. (DOK 1)	<p>a. Use the SkillsUSA team-building CD to describe the purposes of the SkillsUSA organization and the activities and programs that support these purposes. Have students use the Internet to research the SkillsUSA Web site for more in-depth information. Have each student reflect on how the SkillsUSA organization will benefit him or her. Students' reflections will be shared through classroom discussion. <small>CS1 CS2 CS3, T1 T2 T3 T4 T5 T6, E1 E2 R1 R2 S1 S2 W1 W2 W5</small></p> <p>Divide students into teams. Assign team leaders and rotate throughout the year. As tasks are assigned, the team works together to complete the tasks. These tasks should be classroom or shop activities. Have students brainstorm different activities that they will be able to work together as a team to complete. These are listed on the poster board and will be checked as activities are completed. <small>CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1</small></p>	<p>a. Monitor the class for participation.</p> <p>Evaluate throughout the year using the <b>Team-Building and Participation Rubric</b>. Evaluate team-building activities using the <b>Teamwork Rubric</b>.</p>

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| <p>b. Model appropriate work ethics. (DOK 1)</p> | <p>b. Evaluate students on their practice of work ethics and values periodically through the activities and assignments made in the remainder of the course.<br/> <small>CS1 CS4 CS5, T1 T2 T3 T4, E1 E2 E3 E4 E5 E6 R1 R2 R3 S1 W1 W2</small></p> | <p>b. Evaluate student work ethics and values periodically using the <b>Work Ethics and Values Rubric</b>.</p> |
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**Competency 4: Model general safety rules for working in a shop/lab and an industry setting. (DOK 3)** CRN1 CR52 CR53 CRP4

<b>Suggested Enduring Understandings</b>	<b>Suggested Essential Questions</b>
<ol style="list-style-type: none"> <li>1. Safe use and proper choice of tools is important to completing a job.</li> <li>2. Fires can happen at any time, and you must know what to do.</li> <li>3. There is a wide variety of tools and equipment in the collision industry. Each has a purpose and must be used properly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Why are there safety rules and regulations?</li> <li>2. How do fires happen?</li> <li>3. What happens when you choose the improper tool for the job or use a tool in an incorrect manner?</li> </ol>

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Explain the importance of following all safety rules and policies (report all on-the-job injuries and accidents), evacuation policy, substance abuse policy, and procedures when working near pressurized or high temperature, and explain electrical hazards and the action to take when an electrical shock occurs when performing collision operations (personal protective equipment, procedures for lifting heavy objects, and MSDS sheets). (DOK 3)</p>	<p>a. Show students videos demonstrating examples of accidents in the workplace (<a href="http://www.unitedstreaming.com">http://www.unitedstreaming.com</a>). Pre-assess knowledge of safety by having each student write a summary of the safety violations present in the videos.</p> <p>Present the following terms to students:</p> <ul style="list-style-type: none"> <li>• Evacuation policy</li> <li>• Substance abuse policy</li> <li>• Procedures when working near pressurized or high temperatures</li> <li>• Electrical hazards</li> <li>• Electrical shock</li> <li>• Personal protective equipment</li> <li>• Procedures for lifting heavy objects</li> <li>• MSDS sheets</li> </ul> <p>Divide students into groups based on learning styles, and assign each group a guideline for</p>	<p>a. Evaluate the role-play activity using the <b>Role-Play or Skit Rubric for Shop/Lab Safety Activity</b>. Required written tests will follow each section of guidelines for safety rules and procedures. When applicable, use the assessment tools found in the Blackboard Learning System. Monitor student participation, and grade the safety exam. The student must achieve 100% accuracy. Print and place in the student's file.</p>

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personal and laboratory safety (i.e., chemicals, fire, equipment, animals, and electrical) or general laboratory conduct. Have each group role-play, create a multimedia presentation or a rap song, or write a story to discuss the proper and improper procedures related to the guideline.

Evaluate the MSDS activity using the **Interpret MSDS Rubric**.

Divide students into groups. Each group will receive an MSDS sheet. Have students research the assigned item and answer the questions on the **Interpret MSDS Rubric**.  
CS1 CS4 CS5,T4 T5 T6, E1 E2 E3 M1 M2 M7  
R1 R2 R3 S1 W1 W4 W5

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b. Explain the process by which fires start, fire prevention of various flammable liquids, the classes of fire and the types of extinguishers. (DOK 3)

b. Invite the local fire department to lead a fire safety lesson. Have students use fire extinguishers properly. Have students locate all fire extinguishers in the school. Have students determine and select the proper fire extinguisher for different types of fires.  
CS4 CS5, T3 T4 T6, E1 E2 E3 M1 M2 M7 R1 R2 R5 S1 W1 W2 W4

b. Evaluate the guest speaker's presentation using the **Guest Speaker Evaluation Form**.

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c. Identify and demonstrate the safe and proper use of common hand tools. (DOK 2)

c. Use classroom materials to discuss and demonstrate the proper use of common hand tools including wrenches, screwdrivers, pliers, hammers, chisels, body hammers, slide hammers, pull rods, suction cups, and dollies; hand-operated power tools including paint sprayer, pneumatic grinders, sanders, drills, dent removal system, files, surform (cheese grater), Bondo spreader (squeegee), and sanding blocks, pop rivet gun, door handle removal tools, windshield knife, interior and exterior trim removal tools; and portable and stationary power equipment including hydraulic body jacks, spray booth, frame alignment and straightening equipment, floor jacks, hoists, hydraulic automobile lifts, drill press, lifting equipment, and cleaning equipment.

c. Administer a written exam to test students' knowledge of the proper use of common hand tools.

Use the six-step process for teaching new terms to students:

- Provide a description, explanation, and example of the term.
  - Ask students to restate the description, explanation, or example in their own words.
  - Ask students to construct a picture, symbol, or graphic representing the term.
  - Engage students periodically in activities that help them add to their knowledge.
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- Periodically ask students to discuss the terms with each other.
- Involve students periodically in games that allow them to play with the new terms.

Have each student choose a tool or piece of equipment. Have students research the item and give a presentation. CS2 T3 T4 E1 E2 E3 E4 E5 M7 R1 R2 R3 R4 R5 S1 W1 W2 W3

**Competency 5: Interpret and apply service specifications and information. (DOK 3)** CRN1 CRS2 CRS3 CRP4

**Suggested Enduring Understandings**

1. To perform proper repairs to a vehicle, a technician must be able locate and interpret information.
2. Specifications and vehicle information are required to restore a vehicle to OEM specifications.

**Suggested Essential Questions**

1. Why it is important to have the correct information on a vehicle before repairs begin?
2. Why is it important to be able to locate information on vehicles?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Locate and interpret service specifications and information, using both print and computerized service information references vehicle and major component identification numbers (VIN, certification, and calibration labels). (DOK 1)	a. Review the text, Internet, manuals, and handouts for locating and applying information. Have each student locate specific information using text, Internet, manuals, and handouts for an assigned vehicle at school. Have students record information in their electronic journals. Students will present findings to class. <small>CS1 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M7 R1 R2 R3 R4 R5 S1 W1 W2</small>	a. Evaluate using the <b>Presentation Assessment Rubric.</b>
b. Interpret and apply information to a specific job on a specific vehicle. (DOK 3)	b. Using a job sheet for specifications, have students record the required information from their own vehicle or from a neighbor's. The <b>Job Sheet/Performance Rubric</b> will be given to each student and reviewed for understanding. <small>CS1, T1 T2 E1 E2 E5 E6 M1 M7 M8 R1 R2 R3 R4 R5 S1 W1 W2 W5</small>	b. Evaluate using the <b>Job Sheet/Performance Rubric.</b>

**Competency 6: Demonstrate measurement practices used in the automotive service. (DOK 2)** CRN1 CRS2 CRS3 CRP4

**Suggested Enduring Understandings**

1. Measurement tools and equipment are used to check for misalignment.
2. Accurately measuring a vehicle can determine the extent of damage.
3. Using fasteners, glues, and restoring threads to

**Suggested Essential Questions**

1. Why should an item be measured?
2. Is visual inspection enough? Should we measure?
3. How do you choose fasteners, glues, or restoring threads?



specifications can prevent injury or accidents.

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Measure the length of an object using a rule to the nearest 1/16 in. and 1 mm. (DOK 1) <sup>PRA1, PRA4</sup>	<p>a. Give students the following scenario: The distance from your nose to the outside of your fingertips is about 1 m. Estimate the distance between you and three objects in the room. Have each member in the class make a data table and record his or her estimates. Have each student verify his or her estimation and compare it with the real measurement. Lead a class discussion using the following prompts:</p> <ul style="list-style-type: none"><li>• Were the estimates reasonably close?</li><li>• Did one person consistently make accurate estimates?</li></ul> <p>Explain the importance of proper measurement practices, display tools that are used for measurement, and demonstrate how to operate the instruments. Demonstrate how to measure a given item using a variety of measuring instruments. Have students work in groups to measure given items and record the answers on a job sheet. <sup>CS1 CS2 CS3 CS5, T1 E1 E2 M7 R1 R2 S1 W1 W2 W3</sup></p>	a. Evaluate measurement activities using the <b>Measurement Rubric</b> . Assess students as they measure given items and record the measurements on a job sheet.
b. Identify the different types of bolts (grade, diameter, length, and thread pitch), nuts, and washers, and describe their appropriate uses. (DOK 1) <sup>PRA1, PRA4</sup>	<p>b. Using a variety of bolts, nuts, and washers, have students match the appropriate pieces into a complete unit. Then have students categorize each unit by grade, diameter, length, and thread pitch. Have students discuss the activity. <sup>CS4, T1 T2, E1 E2 M1 M7 R1 R2 R3 R4 R5 S1 W1 W2 W5</sup></p>	b. Evaluate the bolt, nut, and washer activity using peer review.
c. Identify different glues and sealants used in automotive service, and describe their appropriate uses. (DOK 2)	<p>c. Divide students into groups; each group will choose a glue or sealant. Have students use text, manuals, and the Internet to research the automotive use of the product, potential hazards (environmental), and the cost. Have students demonstrate how the product is applied in the appropriate amount and conditions. Have students record information about the glues and sealants in their electronic journals. <sup>T3, E1 E2 E3 E4 M1 M7 R1 R2 S1 W1 W2 W3</sup></p>	c. Evaluate the journal information by allowing the students to exchange journals and review the information. The instructor can evaluate the journal using the <b>Journal Rubric</b> .

**Competency 7: Manage personal and business finances to include aspects of employer–employee decision making and consumer credit. (DOK 2)** CRN1 CRS2 CRS3 CRP4

**Suggested Enduring Understandings**

1. Budgets are a great management tool.
2. Filing income tax forms should be done by the dates (yearly or quarterly) required.
3. Business decisions should be made before the business begins operation.
4. Renting or buying a house or business is one of the most expensive decisions you will make.
5. Health and life insurance are benefits individuals need and some employers offer.
6. Before opening a credit card account, an individual needs to completely understand the way credit card accounts operate.

**Suggested Essential Questions**

1. Why should you have a personal and business budget?
2. What happens if you do not file income tax returns?
3. What are the advantages and disadvantages of renting or buying a house or business?
4. Should individuals have health insurance and/or life insurance?
5. Should credit card balances be paid off every month?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Design, analyze, and develop business finance concepts and skills. (DOK 3) <small>SMT1</small></p>	<p>a. Guest speakers: Invite guest speakers to discuss budgets, ownership, insurance, and credit cards. Divide students into groups. Have each group choose one of the topics to research (budgets, ownership, insurance, and credit cards). Have students present the material on their topics to the class. Have students divide into teams and debate the topics. <small>CS1 CS2 CS3 CS4 CS5, T1 T3, E1 E2 E3 E4 E5 E6 M1 M7 R1 R2 R3 R4 R5 S1 W1 W2 W5</small></p> <p>Ensure that student research and projects include the following:</p> <ul style="list-style-type: none"> <li>• Develop household and business budgets.</li> <li>• Use and apply basic accounting procedures to maintain and balance a checkbook.</li> <li>• Identify the terminology and apply the process of filing personal income tax returns.</li> <li>• Identify and explain the components and processes involved in the purchase, operation, and maintenance of a personal vehicle.</li> <li>• Determine the advantages and disadvantages of housing alternatives.</li> <li>• Use information and data to make sound decisions regarding personal savings.</li> <li>• Identify life and health insurance terminology, and apply it to real-world situations.</li> <li>• Compute and compare various forms of earnings, and calculate gross pay, deductions, and net pay.</li> </ul>	<p>a. Evaluate the guest speaker using the <b>Guest Speaker Evaluation Form</b>. Evaluate the journal activity using the <b>Presentation Assessment Rubric</b>. Evaluate the debate using the <b>Debate Rubric</b>.</p>

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- Compare and contrast the finances of credit cards.
  - Identify and explain the components and processes involved in the stock market, and apply them to real-world applications.
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# Standards

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## Industry Standards

- CRN1 Non-Structural Analysis and Damage Repair
- CRS2 Structural Analysis and Damage Repair
- CRS3 Mechanical and Electrical Components
- CRP4 Painting and Refinishing

## Applied Academic Credit Standards

### *Pre-Algebra*

- PRA1 Apply concepts and perform basic operations using real numbers in real-world contexts.
- PRA2 Apply properties to simplify algebraic expressions, solve linear equations and inequalities, and apply principles of graphing.
- PRA3 Identify and apply geometric principles to polygons, angles, and two- and three-dimensional figures.
- PRA4 Understand measurable attributes of objects and apply various formulas in problem-solving situations.
- PRA5 Interpret, organize, and make predictions about a variety of data using concepts of probability.

### *Survey of Mathematical Topics*

- SMT1 Compute, analyze, and develop a variety of skills necessary to manage personal and business finance to include aspects of employer–employee decision making and consumer credit.
- SMT2 Identify and apply the practices that affect employer and employee decision making.
- SMT3 Demonstrate an understanding of the impact of consumer credit.
- SMT4 Collect and apply information for planning a trip.

## 21st Century Learning Standards

- CS1 Flexibility and Adaptability
- CS2 Initiative and Self-Direction
- CS3 Social and Cross-Cultural Skills
- CS4 Productivity and Accountability
- CS5 Leadership and Responsibility

## National Education Technology Standards for Students

- T1 Creativity and Innovation
- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T4 Critical Thinking, Problem Solving, and Decision Making
- T5 Digital Citizenship
- T6 Technology Operations and Concepts

## ACT College Readiness Standards

- E1 Topic Development in Terms of Purpose and Focus
- E2 Organization, Unity, and Coherence
- E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
- E4 Sentence Structure and Formation
- E5 Conventions of Usage
- E6 Conventions of Punctuation
- M1 Basic Operations and Applications
- M2 Probability, Statistics, and Data Analysis
- M3 Numbers: Concepts and Properties

M4	Expressions, Equations, and Inequalities
M5	Graphical Representations
M6	Properties of Plane Figures
M7	Measurement
M8	Functions
R1	Main Ideas and Author's Approach
R2	Supporting Details
R3	Sequential, Comparative, and Cause–Effect Relationships
R4	Meaning of Words
R5	Generalizations and Conclusions
S1	Interpretation of Data
S2	Scientific Investigation
S3	Evaluation of Models, Inferences, and Experimental Results
W1	Expressing Judgments
W2	Focusing on the Topic
W3	Developing a Position
W4	Organizing Ideas
W5	Using Language

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## Texts

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- Duffy, J. (2001). *I-CAR professional automotive collision repair*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-1398-4. (Instructor's text, student workbook, and interactive DVD available)
- Duffy, J., & Scharff, R. (2004). *Auto body repair technology*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-6272-0. (Instructor's text, student workbook, and interactive DVD available)

## Videos

- Films Media Group. (2005). *Auto body repair basics*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)
- Films Media Group. (2005). *Auto construction*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

## Web Sites

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- I-Car. (n.d.). Retrieved September 12, 2008, from <http://www.i-car.com/>
- National Institute for Automotive Service Excellence. (n.d.). Retrieved September 12, 2008, from <http://www.asecert.org/>

## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Debate Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Information</b>	All information was accurate and clear.	Most information was accurate and clear.	Most information was accurate but not completely thorough or clear.	Information was inaccurate or needed clarification.	
<b>Rebuttal</b>	All counterarguments were accurate, relevant, and strong.	Most counterarguments were accurate, relevant, and strong.	All counterarguments were accurate and relevant, but some were weak.	Counterarguments were not accurate or relevant.	
<b>Organization</b>	All arguments were logical and clearly followed a premise.	Most arguments were logical and clearly followed a premise.	Arguments were logical but did not always follow a premise.	Arguments were not logical and/or did not follow a premise.	
<b>Understanding of the Topic</b>	The individual/team clearly understood the topic fully and presented in a convincing manner.	The individual/team clearly understood the topic fully and presented with ease.	The individual/team understood the main points of the topic and presented those well.	The individual/team did not exhibit an adequate understanding of the topic.	
<b>Total Score</b>					





Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Work Ethics and Values Rubric

Behavior/Skill	Excellent 4	Good 3	Needs Improvement 2	Unacceptable 1	Score
Punctuality (arrives on time)					
Preparation (completes pre-assignments and brings necessary materials)					
Respects other students/workers					
Listens to supervisor and follows directions					
Accepts responsibility for actions					
Demonstrates positive personality traits (kindness, trustworthiness, and honesty)					
Demonstrates productivity (patient, thorough, and hard working)					
Demonstrates a concern for others					
Remains on task and allows others to remain on task					
Takes initiative as appropriate					



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Measurement Rubric

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Object to Be Measured \_\_\_\_\_

Measuring Instrument \_\_\_\_\_

Record measurements below (length, depth, width, internal, external, etc.):

Rate the ability of the student to perform measurement tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Safety procedures	
Uses proper measuring instrument	
Understands how to measure	
Records proper measurements	

**Comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Teamwork Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Score</b>
<b>Sharing</b>	Shared ideas with others	Occasionally shared ideas with others	Seldom shared ideas with others	
<b>Listening</b>	Always listened to peers	Occasionally listened to peers	Ignored ideas of peers	
<b>Respecting</b>	Interacted with, encouraged, and supported ideas of others	Occasionally encouraged and supported others	Seldom encouraged and supported others	
<b>Participating</b>	Shared task equally with group members	Did most of the task	Did very little of the task	
<b>Total Score</b>				

Comments:



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Role-Play or Skit Rubric for Employment Skills

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Accuracy</b>	All collision repair/business information was accurate.	Almost all collision repair/business information was accurate.	Most collision repair/business information was accurate.	Very little collision repair/business information was accurate.	
<b>Role</b>	Excellent character development; student contributed in a significant manner.	Good character development; student contributed in a cooperative manner.	Fair character development; student might have contributed.	Little or no character development; student did not contribute much at all.	
<b>Knowledge Gained</b>	Can clearly explain several ways in which his or her character "saw" things differently than other characters and can explain why	Can clearly explain several ways in which his or her character "saw" things differently than other characters	Can clearly explain one way in which his or her character "saw" things differently than other characters	Cannot explain any way in which his or her character "saw" things differently than other characters	
<b>Content</b>	Collision repair/business content used was appropriate to the workplace, and student can explain why.	Collision repair/business content used was appropriate to the workplace.	Collision repair/business content used was slightly appropriate to the workplace.	Collision repair/business content used was not appropriate to the workplace.	
<b>Total Score</b>					



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Role-Play or Skit Rubric for Shop/Lab Safety Activity

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Accuracy</b>	All safety information was accurate.	Almost all safety information was accurate.	Most safety information was accurate.	Very little safety information was accurate.	
<b>Role</b>	Excellent character development; student contributed in a significant manner.	Good character development; student contributed in a cooperative manner.	Fair character development; student might have contributed.	Little or no character development; student did not contribute much at all.	
<b>Knowledge Gained</b>	Used more than 4 safety examples and showed considerable creativity and can clarify details	Used 3 to 4 safety examples and showed considerable creativity	Used 2 to 3 safety examples	Used 1 safety example	
<b>Content</b>	Collision safety content used was appropriate to the workplace, and student can explain why.	Collision safety content used was appropriate to the workplace.	Collision safety content used was slightly appropriate to the workplace.	Collision safety content used was not appropriate to the workplace.	
<b>Required Elements</b>	Included more information than required	Included all required information	Included most required information	Included less information than required	
<b>Total Score</b>					

Comments:



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Presentation Assessment Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Content</b>	Used more than 4 trade journals or catalogs, contacted more than 1 vendor and obtained quote and information, and can clearly explain findings	Used 3 to 4 trade journals or catalogs, contacted 1 vendor and obtained quote and information, and can clearly explain findings	Used 2 to 3 trade journals or catalogs and contacted the vendor and obtained quote and information	Used 1 trade journals or catalogs and contacted the vendor	
<b>Clarity</b>	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
<b>Presentation</b>	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
<b>Visual Aids</b>	Attractive, accurate, and grammatically correct	Adequate, mostly accurate, and few grammatical errors	Poorly planned, somewhat accurate, and some grammatical errors	Weak, inaccurate, and many grammatical errors	
<b>Length</b>	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
<b>Eye Contact</b>	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
<b>Total Score</b>					

Comments:



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Journal Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Writing Quality</b>	There are a strong writing style and ability to express concepts learned. Excellent spelling, grammar, syntax, spelling, etc.	There are a good writing style and ability to express concepts learned. Very good grammar, syntax, spelling, etc.	There is a writing style that conveys meaning adequately. Some minor grammatical, syntax, and spelling errors	There is difficulty in expressing concepts. There is limited syntax. There are noticeable grammatical and spelling mistakes.	
<b>Content</b>	Clear and complete description of the activity is recorded. All major points are documented.	Very good description of the activity is recorded. Most major points are documented.	Good description of the activity is recorded. Some major points have been omitted.	Limited description of the activity is recorded. Very few major points are documented.	
<b>Insight and Understanding</b>	Definite insights into the implications of the activity are recorded. Awareness of the complexity of issues and situations is present.	Some insight into the issue or situation is recorded. Some sense of complexity is present.	Insight is present from a more simplistic standpoint.	Only limited insight into the issue or situation is recorded.	
<b>Application</b>	Content of the activity is connected to the student's personal life and goals.	Content of the activity is connected to the field of automotive service.	Content of the activity is related to life in general.	Only limited connections	
<b>Total Score</b>					

**Comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Job Sheet/Performance Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Safety</b>	Student follows all safety regulations without prompting.	Student follows all safety regulations but may require limited reminders or prompting.	Student follows all or nearly all safety regulations but requires significant reminders.	Student does not follow most safety regulations.	
<b>Guidelines</b>	Student properly diagnoses problem according to manufacturer guidelines and specifications within manufacturer-specified time limits.	Student properly diagnoses problem according to manufacturer guidelines and specifications but may take additional time.	Student properly diagnoses problem according to manufacturer guidelines and specifications with limited assistance.	Student's work is not performed to manufacturer guidelines and specifications.	
<b>Diagnosis</b>	Student quickly and accurately diagnoses problems and accurately determines causes of malfunction based on information obtained from resources.	Student accurately diagnoses problems and accurately determines causes of malfunction based on information obtained from resources.	Student diagnoses problem with limited assistance. With limited assistance, student determines causes of malfunction based on information obtained from resources.	Student is unable to diagnose problem.	
<b>Customer Information</b>	Job Sheet includes all customer information, lists all requested repairs, and contains correct calculations with no items missing.	Job Sheet includes customer information, lists requested repairs, and contains correct calculations but may include up to two errors or omissions.	Job Sheet includes customer information, lists requested repairs, and contains correct calculations but may include up to three errors or omissions.	Job Sheet includes customer information, lists requested repairs, and contains correct calculations but may include up to four errors or omissions.	
<b>Written Information</b>	Written report is accurate and complete and demonstrates thorough understanding of systems, how they operate, safety procedures, and importance of manufacturer recommendations.	Written report is accurate and complete and demonstrates solid understanding of systems, how they operate, safety procedures, and importance of manufacturer recommendations.	Written report is mostly accurate and complete and demonstrates understanding of types of systems, how they operate, safety procedures, and importance of manufacturer recommendations.	Written report is inaccurate and/or incomplete or indicates limited to no understanding of types of systems, how they operate, safety procedures, and importance of manufacturer recommendations.	
<b>Total Score</b>					





Name: \_\_\_\_\_  
Date: \_\_\_\_\_  
Period: \_\_\_\_\_

## Guest Speaker Evaluation Form

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Name of Speaker: \_\_\_\_\_

1. List five main ideas expressed in the presentation.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

2. Write a brief summary relating the topics of the presentation to your life.

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Team-Building and Participation Rubric

	Excellent 4	Good 3	Needs Improvement 2	Unacceptable 1	Score
Actively participates in team discussions and activities					
Encourages other team members to participate in discussions and activities					
Works with other members to keep the activity on schedule and task					
Shares ideas and thoughts					
Offers constructive recommendations					
Credits others for their contributions and ideas					
Empathizes with other members					
Requests input from others to reach an agreement					
Expresses ideas and thoughts					
Actively listens to other team members					
<b>Total Score</b>					

**Comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Interpret MSDS Rubric

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Your instructor will furnish you with the name of a chemical that is commonly used in agricultural and natural resources occupations. You are to conduct a search of the Internet to locate a material safety data sheet (MSDS) for this material and use it to answer the following questions.

1. What is the Web address of the Internet site that you found this information on?
2. If you accidentally drank some of this material, what is the first aid procedure you would do first?
3. What special precautions should be taken in storing this material?
4. What is the flash point of this material?
5. If you spilled a small amount of this product, how would you clean it up?
6. What immediate effects would likely happen if you spilled some of this material on your skin?

## Unit 2: Fundamentals of Collision Repair (Basic Mechanical and Electrical Components)

**Competency 1:** Identify, evaluate, and practice suspension and steering components and systems. (DOK 2)<sup>CRN1 CRS2</sup>  
CRS3 CRP4

### Suggested Enduring Understandings

1. Work order information must be accurate for the estimate/repair to be performed properly.
2. Suspension and steering components must be inspected after a collision.
3. Tire condition is reflected in performance and safety of the vehicle.

### Suggested Essential Questions

1. What type of information is needed to complete a work order?
2. Why does a collision repair technician need to inspect suspension and steering components after a collision?
3. Why is tire condition important to performance and safety?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, and causes and corrections; measure vehicle ride height and check for front wheel setback; determine needed repairs. (DOK 1) PRA1, PRA4</p>	<p>a. Take the class on a field trip to two front-end-alignment facilities. Have students record the customer–technician relationship; observe diagnosis, equipment usage, and correction of the problem. Have students exchange findings and critique and compare content of the two trips. Have students present findings to the class. CS1 CS2 CS4 CS5, T1 T2 T3 T4, E1 E2 E3 M1 M7 W1 W4 W5</p>	<p>a. Evaluate the field trip using the <b>Field Trip Participation Checklist</b>. Evaluate presentation using the <b>Presentation Assessment Rubric</b>.</p>
<p>b. Identify and inspect (where applicable) steering linkage geometry (attitude/parallelism), Pitman arm, relay (center link/intermediate) rod, idler arm and mountings, tie rod sleeves, clamps, tie rod ends, steering linkage damper, shock absorbers, upper/lower control arms, upper/lower control arm bushings, shafts and rebound bumpers, and upper and lower ball joints. (DOK 1)</p>	<p>b. Have students participate in a scavenger hunt. Give students a list of components, and have them search and identify the list in a given amount of time. Have students explain the purpose of each component and where it is located on a vehicle. CS1 CS5, T1 T3, E1 E2 E3 E4 E5 E6 M1 M7</p>	<p>b. Evaluate the scavenger hunt by using the <b>Scavenger Hunt Questionnaire</b>. Knowledge areas in which students appear lost or weak will be reviewed. Have students redo the exercise if they are weak in knowledge in those areas.</p>

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|---|---|---|
| <p>c. Analyze and diagnose wheel and tire repairs according to manufacturer's specifications. (DOK 2)<br/><small>PRA1, PRA2, PRA4</small></p> | <p>c. Using a vehicle on a lift with incorrect and correct tire problems, discuss tire problems and have the students observe and record the procedures to correct the problems. Explain and demonstrate each task. Have students perform the task(s).<br/><small>CS1 CS2, T1 T2, E1 E2 M1 M7 W1 W2 W3</small></p> <p>Students will observe the instructor demonstrating the given task(s) listed below:</p> <ul style="list-style-type: none"> <li>• Diagnose tire wear, and determine needed repairs.</li> <li>• Inspect tires, and identify direction of rotation and check location.</li> <li>• Check and adjust air pressure, wheel/tire vibration, shimmy, and tramp (wheel hop) problems; determine needed repairs.</li> <li>• Reinstall wheels, and torque lug nuts according to manufacturer's specifications.</li> </ul> <p>Have each student perform the task(s).<br/><small>CS1, T1 T2, E1 E2 M1 M7R1</small></p> | <p>c. Evaluate each task/job sheet using the <b>Job Sheet/Performance Rubric</b>.</p> <p>Evaluate the task(s) using the <b>Activity Performance Rubric</b>.</p> |
|---|---|---|

**Competency 2:** Practice concepts and procedures related to electrical/electronic systems. (DOK 2) CRN1 CRS2 CRS3 CRP4

**Suggested Enduring Understandings**

1. Technicians must be able to properly troubleshoot electrical/electronic systems to repair them properly.
2. Technicians must have knowledge about voltage, current, and amperage to analyze systems.

**Suggested Essential Questions**

1. What items on a vehicle require electrical current to operate or function?
2. What is the difference between voltage, current, and amperage?
3. Before making repairs on an electrical electronic system, what steps should be completed?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Diagnose electrical/electronic components. (DOK 3) <small>PRA1</small></p>	<p>a. Using a wiring schematic, have the small groups of students interpret and troubleshoot the assigned system. Students should diagnose and determine the needed action and research appropriate electronic service information. Have students record findings to the given components(s) listed below:</p> <ul style="list-style-type: none"> <li>• Inspect, test, and replace/repair (if needed)</li> <li>• Fusible links</li> <li>• Circuit breakers</li> <li>• Fuses and switches</li> <li>• Relays</li> <li>• Bulbs</li> <li>• Sockets</li> <li>• Connectors</li> <li>• Wires of all interior and exterior light circuits</li> </ul> <p><i>Note: Use proper self-grounding procedures for handling electrical components.</i></p>	<p>a. Evaluate using the <b>Job Sheet/Performance Rubric</b>.</p>

Sample Problem: A 9-V battery supplies power to a cordless curling iron with a resistance of 18  $\Omega$ . How much current is flowing through the curling iron? <sup>CS2,</sup>  
T1 T2 T3, E1 E2 M1 M7 S1

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|--|--|--|
| <p>b. Diagnose and perform procedures related to the battery. (DOK 1)<br/> <small>PRA1</small></p> | <p>b. Identify and interpret the specific task concerns. The student will utilize a variety of resources to write a report to identify and interpret task concerns. Students will use the following task(s):</p> <ul style="list-style-type: none"> <li>• Replace battery.</li> <li>• Replace battery cables.</li> <li>• Connectors/clamps</li> <li>• Perform a battery state-of-charge test.</li> <li>• Determine needed service.</li> <li>• Perform a slow/fast battery charge in accordance with manufacturer’s recommendations.</li> <li>• Dispose of batteries and battery acid according to local, state, and federal requirements. <sup>CS1 CS2 CS3 CS4</sup><br/> <small>CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1</small></li> </ul> <p><small>R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5</small></p> | <p>b. Evaluate using the <b>Written Report Rubric.</b></p> |
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| <p>c. Inspect and repair various electrical/electronic components. (DOK 1)</p> | <p>c. Explain and demonstrate each task. Have students perform the task and complete the appropriate job sheet. Review the students’ progress at the end of each competency, and re-teach as appropriate to ensure mastery. <sup>CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5</sup><br/> <small>E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5</small></p> | <p>c. Evaluate using the <b>Job Sheet/ Performance Rubric.</b></p> |
|--|---|--|

Students will observe the instructor demonstrating the given task(s). Each student will inspect the following:

- Identify and inspect horn(s).
- Windshield wiper/washer system
- Power side windows and power tailgate window
- Power seat motors
- Linkages
- Cables
- Electric door and hatch/trunk lock
- Keyless lock/unlock devices and alarm systems
- Power antenna circuits <sup>CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6,</sup>  
E1 E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1  
W2 W3 W4 W5

**Competency 3:** Diagnose and apply practices related to brakes and braking systems. (DOK 3) CRN1 CR52 CR53 CRP4

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|---|---|
| <p><b>Suggested Enduring Understandings</b></p> <p>1. Proper brake function and maintenance are</p> | <p><b>Suggested Essential Questions</b></p> <p>1. What happens if brake systems are not</p> |
|---|---|

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|--|---|
| important for the vehicle to function and perform properly.  | maintained properly?  |
| 2. Diagnosis of a problem pertaining to the brake system may require the technician to test other systems. | 2. Why would other systems be affected by brake wear or damage?           |
| 3. Brake system wear may affect other components of the vehicle.   | 3. If a damaged brake system is not repaired, whose responsibility is it? |

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Diagnose various brake components and the replacement/repair procedures. (DOK 4) PRA1, PRA4</p>	<p>a. Review the video at <a href="http://www.discount-trailer-parts.com/do-it-yourself-brakes.html">http://www.discount-trailer-parts.com/do-it-yourself-brakes.html</a>; lead a discussion dealing with brake system maintenance. Discuss safety when working with brakes, and identify the other components of the system and their function and operation.</p> <p>Students will identify and inspect components listed below:</p> <ul style="list-style-type: none"> <li>• Brake lines and fittings for leaks, dents, kinks, rust, cracks, or wear</li> <li>• Loose fittings and supports</li> <li>• Brake lines (double flare and ISO types), hoses, fittings, and supports,</li> <li>• Flexible brake hoses for leaks, kinks, cracks, bulging, or wear CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5</li> </ul>	<p>a. Evaluate the discussion for content, clarity, and understanding.</p>
<p>b. Identify and discuss factors related to brake fluid. (DOK 3)</p>	<p>b. Review MSDS sheets, brake fluid containers, and governmental regulations. Have students present information to the class related to the following topics: Handling, storing, and usage of appropriate brake fluids (dispose of in accordance with federal, state, and local regulations); and bleeding (manual, pressure, vacuum, or surge) a hydraulic brake system in accordance with manufacturer’s procedures. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5</p>	<p>b. Evaluate the presentation using the <b>Presentation Assessment Rubric</b>.</p>
<p>c. Identify and discuss factors related to brake shoes. (DOK 2) PRA4</p>	<p>c. Have students compare and contrast the maintenance and repair process of a brake system. Have students develop and illustrate a timeline that shows the proper steps in the inspection, maintenance, and repair process. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5</p> <p>Students will observe the instructor demonstrating the given task(s) listed below:</p> <ul style="list-style-type: none"> <li>• Identify, inspect, and discuss brake shoes: Adjustment, removal, and reinstallation of brake</li> </ul>	<p>c. Evaluate the timeline using text, manuals, or the Internet for accuracy. Have students correct any inaccuracies and present them to the class. Evaluate the timeline using the <b>Timeline Rubric</b>.</p>

drums or drum/hub assemblies.

- Wheel bearings: Reinstall wheel and torque lug nuts according to manufacturer’s specifications.

Each student will perform the task(s). CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5

Evaluate the presentation using the **Presentation Assessment Rubric**. Evaluate using the **Job Sheet/ Performance Rubric**.

**Competency 4: Discuss and apply practices related to heating and air conditioning. (DOK 1)** CRN1 CRS2 CRS3 CRP4

**Suggested Enduring Understandings:**

1. Heating and air-conditioning components must be maintained and serviced by a certified technician.
2. In a frontal collision, these components may not appear to be damaged, but they must be inspected to ensure they are operational.

**Suggested Essential Questions**

1. What components might be damaged in a frontal collision?
2. When repairing a heater and/or air conditioner, what are some of the environmental concerns?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
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<p>a. Identify and comply with environmental concerns relating to refrigerants and coolants. (DOK 1)</p>	<p>a. Have students research environmental concerns. Students will create a Photostory (with audio) and present to the class. Have students record information in their journals. <small>CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5</small></p>	<p>a. Evaluate the presentation using the <b>Presentation Assessment Rubric</b>. Evaluate the journal using the <b>Journal Rubric</b>.</p>
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<p>b. Locate and identify A/C system service ports; discuss the procedure of evacuation of the A/C system including checking for leaks and recharging the A/C system with refrigerant; and perform a leak test. (DOK 1)</p>	<p>b. Have students complete a scavenger hunt. Give students a list of components, and have them search for and identify items on the list in a given amount of time. Have students explain the purpose of each component and where it is located on a vehicle. <small>CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5</small></p> <p>Students will observe the instructor demonstrating the given task(s). Each student will perform the task(s). <small>CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5</small></p>	<p>b. Evaluate the scavenger hunt by using the <b>Scavenger Hunt Questionnaire</b>. Knowledge areas in which students appear lost or weak will be reviewed. Have students redo the exercise if they are weak in those knowledge areas.</p>
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**Competency 5: Identify and discuss cooling systems. (DOK 1)** CRN1 CRS2 CRS3 CRP4

**Suggested Enduring Understandings**

1. Cooling systems must be repaired to ensure proper engine temperature and performance.
2. The repair must be to pre-accident condition.

**Suggested Essential Questions**

1. What parts of the cooling system are normally damaged in a collision?
2. If the cooling system is not repaired properly, what conditions or problems could arise?



Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify and inspect engine cooling and heater system hoses, belts, radiator, pressure cap, coolant recovery system, and water pump. (DOK 1)	a. Have students use manuals, textbooks, and Web sites to match parts/components and systems to the various automobile systems. <small>T1 T2 T3 T6, E1 E2 E3 E4 E6 M1 M2 M7 M8 W1</small>	a. Evaluate the match-up worksheet using the <b>Match-Up Worksheet</b> .
b. Discuss the procedure to recover, refill, and bleed a system with proper coolant and check the level of protection; leak test system and dispose of materials in accordance with EPA specifications. (DOK 2)	b. Have students analyze different freezing points of antifreeze. Using the graph of freezing points of the antifreeze, have students determine how much antifreeze/water to add to the system to obtain the proper mixture. Have students record steps and explanations of operation and information in their journals. <small>CS1, T1 T2 T3, E1 E2 E3 E4 E5 E6 M1 M7</small>	b. Evaluate the journal activity using the <b>Journal Rubric</b> .

**Competency 6:** Diagnose and repair active restraint systems procedures and practices. (DOK 2) CRN1 CRS2 CRS3 CRP4

**Suggested Enduring Understandings**

1. Restraint systems work together to protect the occupants.
2. The procedures to disarm an air bag must be adhered to.

**Suggested Essential Questions**

1. What is the difference between passive and active restraint systems?
2. What are the components of an active restraint system?
3. How do passive and active restraint systems work together?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Analyze and replace (if needed) components related to seat belts. (DOK 2)	<p>a. Have students complete the case study activity. Have students research the Web site <a href="http://www.carcomplaints.com">www.carcomplaints.com</a> for restraint system complaints for three different vehicle year models. Compare the problems for the three vehicles and possible solutions. Have students record information in their journals. <small>CS1 CS2, T1 T2 T3 E1 E2 M7</small></p> <p>Have students observe the instructor demonstrating the given task(s) listed below:</p> <ul style="list-style-type: none"> <li>• Inspect and replace (if needed) seat belt and shoulder harness assembly and components in accordance with manufacturer’s specifications/procedures.</li> <li>• Inspect restraint system mounting areas for damage; repair in accordance with manufacturer’s specifications/procedures.</li> <li>• Verify proper operation of seat belt in accordance with manufacturer’s specifications/procedures.</li> </ul>	<p>a. Evaluate the journal activity using the <b>Journal Rubric</b>.</p> <p>Evaluate the task(s) using the <b>Activity Performance Rubric</b>.</p>

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Each student will perform the task(s). CS1 CS2, T1 T2 M1 M7

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# Standards

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## Industry Standards

- CRN1 Non-Structural Analysis and Damage Repair
- CRS2 Structural Analysis and Damage Repair
- CRS3 Mechanical and Electrical Components
- CRP4 Painting and Refinishing

## Applied Academic Credit Standards

### *Pre-Algebra*

- PRA1 Apply concepts and perform basic operations using real numbers in real-world contexts.
- PRA2 Apply properties to simplify algebraic expressions, solve linear equations and inequalities, and apply principles of graphing.
- PRA3 Identify and apply geometric principles to polygons, angles, and two- and three-dimensional figures.
- PRA4 Understand measurable attributes of objects and apply various formulas in problem-solving situations.
- PRA5 Interpret, organize, and make predictions about a variety of data using concepts of probability.

### *Survey of Mathematical Topics*

- SMT1 Compute, analyze, and develop a variety of skills necessary to manage personal and business finance to include aspects of employer–employee decision making and consumer credit.
- SMT2 Identify and apply the practices that affect employer and employee decision making.
- SMT3 Demonstrate an understanding of the impact of consumer credit.
- SMT4 Collect and apply information for planning a trip.

## 21st Century Learning Standards

- CS1 Flexibility and Adaptability
- CS2 Initiative and Self-Direction
- CS3 Social and Cross-Cultural Skills
- CS4 Productivity and Accountability
- CS5 Leadership and Responsibility

## National Education Technology Standards for Students

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- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T4 Critical Thinking, Problem Solving, and Decision Making
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- T6 Technology Operations and Concepts

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- E1 Topic Development in Terms of Purpose and Focus
- E2 Organization, Unity, and Coherence
- E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
- E4 Sentence Structure and Formation
- E5 Conventions of Usage
- E6 Conventions of Punctuation
- M1 Basic Operations and Applications
- M2 Probability, Statistics, and Data Analysis
- M3 Numbers: Concepts and Properties

- M4 Expressions, Equations, and Inequalities
- M5 Graphical Representations
- M6 Properties of Plane Figures
- M7 Measurement
- M8 Functions
- R1 Main Ideas and Author’s Approach
- R2 Supporting Details
- R3 Sequential, Comparative, and Cause–Effect Relationships
- R4 Meaning of Words
- R5 Generalizations and Conclusions
- S1 Interpretation of Data
- S2 Scientific Investigation
- S3 Evaluation of Models, Inferences, and Experimental Results
- W1 Expressing Judgments
- W2 Focusing on the Topic
- W3 Developing a Position
- W4 Organizing Ideas
- W5 Using Language

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## Videos

- Films Media Group. (2005). *Auto body repair* [12-part series]. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)
- Films Media Group. (2005). *Auto body repair basics*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)
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*How stuff works*. (n.d.). Retrieved September 12, 2008, from <http://www.howstuffworks.com/>

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## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Match-Up Worksheet

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Place the letter from the description into the answer column that matches the appropriate item.

Answer	ITEM	DESCRIPTION
	Hoses	A. Push(es) water and coolant through the cooling system
	Belts	B. Hold(s) coolant and keeps the engine at a certain temperature.
	Pressure cap	C. Regulate(s) pressure for the radiator
	Water pump	D. Hold(s) excess coolant from the radiator
	Coolant recovery system	E. Connect(s) the radiator to the water pump
	Radiator	F. Drive(s) the water pump from the crankshaft





Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Activity Performance Rubric

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Task to Be Performed \_\_\_\_\_

	Possible Points	Points Awarded
<b>Safety</b> Personal safety (glasses, clothing, etc.) Safe use of tool Safely performs the task	25	
<b>Performance of the Task</b> Follows the task instructions Performs the task efficiently Performs the task satisfactorily	50	
<b>Lab Maintenance</b> Area cleanup (clean and tidy) Area organization (before, during, and after the task)	25	
<b>Total</b>	100	

**Comments for Deductions:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Scavenger Hunt Questionnaire

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**Respond to the following:**

1. What is the name of the component?
2. What is the purpose of the component?
3. Where is the component located on a vehicle?
4. Where can the component be purchased?
5. What is the cost of the component?
6. When should the component be repaired or replaced?
7. What is the cost of labor to replace or repair the component?



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Field Trip Checklist

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- \_\_\_\_\_ 1. The student arrived at the designated meeting place on time with all materials and supplies required for the field trip.
- \_\_\_\_\_ 2. The student observed all safety rules and policies while traveling to and participating in the field trip.
- \_\_\_\_\_ 3. The student demonstrated interest in the content of the field trip by paying attention to the exhibits and speakers, asking pertinent questions, and taking notes.
- \_\_\_\_\_ 4. The student exhibited a positive attitude toward the events and activities of the field trip.
- \_\_\_\_\_ 5. The student remained on task throughout the field trip.
- \_\_\_\_\_ 6. The student exhibited cooperative workplace skills with other students throughout the field trip.



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Timeline Rubric

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Scoring Criteria					
<i>The student</i>	<b>Excellent 4</b>	<b>Good 3</b>	<b>Needs Improvement 2</b>	<b>Unacceptable 1</b>	<b>Score</b>
Correctly identified three steps in the brake inspection process.					
Correctly designed a brake maintenance timeline including replace dates and inspection dates.					
Correctly identified the major steps in the repair process.					
<b>Total Score</b>					



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Job Sheet/Performance Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
	Student follows all safety regulations without prompting.	Student follows all safety regulations but may require limited reminders or prompting.	Student follows all or nearly all safety regulations but requires significant reminders.	Student does not follow most safety regulations.	
	Student properly diagnoses problem according to manufacturer guidelines and specifications within manufacturer-specified time limits.	Student properly diagnoses problem according to manufacturer guidelines and specifications but may take additional time.	Student properly diagnoses problem according to manufacturer guidelines and specifications with limited assistance.	Student's work is not performed to manufacturer guidelines and specifications.	
	Student quickly and accurately diagnoses problems and accurately determines causes of malfunction based on information obtained from resources.	Student accurately diagnoses problems and accurately determines causes of malfunction based on information obtained from resources.	Student diagnoses problem with limited assistance. With limited assistance, student determines causes of malfunction based on information obtained from resources.	Student is unable to diagnose problem.	
	Job Sheet includes all customer information, lists all requested repairs, and contains correct calculations with no items missing.	Job Sheet includes customer information, lists requested repairs, and contains correct calculations but may include up to two errors or omissions.	Job Sheet includes customer information, lists requested repairs, and contains correct calculations but may include up to three errors or omissions.	Job Sheet includes customer information, lists requested repairs, and contains correct calculations but may include up to four errors or omissions.	
	Written report is accurate and complete and demonstrates thorough understanding of systems, how they operate, safety procedures, and importance of manufacturer recommendations.	Written report is accurate and complete and demonstrates solid understanding of systems, how they operate, safety procedures, and importance of manufacturer recommendations.	Written report is mostly accurate and complete and demonstrates understanding of types of systems, how they operate, safety procedures, and importance of manufacturer recommendations.	Written report is inaccurate and/or incomplete or indicates limited to no understanding of types of systems, how they operate, safety procedures, and importance of manufacturer recommendations.	
<b>Total Score</b>					



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Journal Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Writing Quality</b>	There are a strong writing style and ability to express concepts learned. Excellent spelling, grammar, syntax, spelling, etc.	There are a good writing style and ability to express concepts learned. Very good grammar, syntax, spelling, etc.	There is a writing style that conveys meaning adequately. Some minor grammatical, syntax, and spelling errors	There is difficulty in expressing concepts. There is limited syntax. There are noticeable grammatical and spelling mistakes.	
<b>Content</b>	Clear and complete description of the activity is recorded. All major points are documented.	Very good description of the activity is recorded. Most major points are documented.	Good description of the activity is recorded. Some major points have been omitted.	Limited description of the activity is recorded. Very few major points are documented.	
<b>Insight and Understanding</b>	Definite insights into the implications of the activity are recorded. Awareness of the complexity of issues and situations is present.	Some insight into the issue or situation is recorded. Some sense of complexity is present.	Insight is present from a more simplistic standpoint.	Only limited insight into the issue or situation is recorded.	
<b>Application</b>	Content of the activity is connected to the student's personal life and goals.	Content of the activity is connected to the field of automotive service.	Content of the activity is related to life in general.	Only limited connections	
<b>Total Score</b>					

Comments:



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Presentation Assessment Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Content</b>	Used more than 4 trade journals or catalogs, contacted the more than 1 vendor and obtained quote and information, and can clearly explain findings	Used 3 to 4 trade journals or catalogs, contacted 1 vendor and obtained quote and information, and can clearly explain findings	Used 2 to 3 trade journals or catalogs, contacted the vendor and obtained quote and information	Used 1 trade journals or catalogs, contacted the vendor	
<b>Clarity</b>	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
<b>Presentation</b>	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
<b>Visual Aids</b>	Attractive, accurate, and grammatically correct	Adequate, mostly accurate, and few grammatical errors	Poorly planned, somewhat accurate, and some grammatical errors	Weak, inaccurate, and many grammatical errors	
<b>Length</b>	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
<b>Eye Contact</b>	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
<b>Total Score</b>					

Comments:



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Written Report Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Content</b>	Clear thesis and focus that remain apparent	Thesis and focus that remain apparent	Addresses subject matter with minimal support	Does not focus on topic	
<b>Grammar</b>	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
<b>Organization</b>	Ideas flow smoothly and logically with clarity and coherence.	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	
<b>Total Score</b>					

Comments:



## Unit 3: Fundamentals of Collision Repair (Basic Non-Structural Analysis and Damage Repair)

**Competency 1:** Inspect, analyze, perform, and evaluate procedures and skills pertaining to non-structural analysis and damage repair. (DOK 3) CRN1 CRS2 CRS3 CRP4

### Suggested Enduring Understandings

1. To perform repairs that are satisfactory, the technician must be able to return the metal to its original form.
2. The preparation of body components is one of the most important areas to develop and comprehend.
3. Skills pertaining to structural and damage repair take years to perfect. Patience is a must.
4. Metal finishing and body filling techniques are fundamental skills needed to complete any collision repair.
5. Good welding skills are critical to a technician’s success.

### Suggested Essential Questions

1. Why must a technician be proficient in all areas of collision repair?
2. When preparing body components, which method of repair is appropriate?
3. What type of damage is most common to outer body panels?
4. What determines which metal finishing and body filling techniques the technician will use to repair the damage?
5. Before welding or cutting on a vehicle, what must the technician know?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Identify, inspect, determine necessary action, and perform that procedure when preparing body components. (DOK 3)</p>	<p>a. Provide the students with several damage reports. Have students discuss the work order, repair procedures to the vehicle, and approximately how long it will take to complete the job. Have students present the findings to the class. Explain and demonstrate each task. Have students perform the task and complete the appropriate job sheet. <small>CS1 CS2, T1 T2 T3, E1 M1 M7 W1 W2</small></p> <p>Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill.</p> <ul style="list-style-type: none"> <li>• Review a damage report and analyze damage to determine appropriate methods for overall repair; develop and document a repair plan.</li> <li>• Inspect, remove, store, and replace exterior trim and moldings.</li> <li>• Inspect, remove, store, and replace interior trim and components.</li> <li>• Inspect, remove, store, and replace non-structural body panels and components that may interfere with or be damaged during repair.</li> <li>• Inspect, remove, store, and replace all vehicle mechanical and electrical components that may interfere with or be damaged during</li> </ul>	<p>a. The <b>Activity Performance Rubric</b> or <b>Job Sheet/Performance Rubric</b> may be used to evaluate this activity.</p> <p>Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill.</p>

	<p>repair.</p> <ul style="list-style-type: none"> <li>• Protect panels, glass, and parts adjacent to the repair area.</li> <li>• Soap and water wash the entire vehicle; use appropriate cleaner to remove contaminants from those areas to be repaired.</li> <li>• Apply safety procedures associated with vehicle components and systems according to manufacturer's specifications/procedures.</li> </ul>	
<p>b. Inspect, analyze, and perform repairs as they relate to outer body panels: Repairs, replacement, and adjustments. (DOK 4) <sup>PRA1</sup></p>	<p>b. Display a repair that is related to the teaching objective. Ask students to analyze and research the repair and use manuals, the Internet, and so forth to research parts, labor, and repair information. Ask students to share their findings using the Blackboard discussion board. Groups will then comment on findings of other groups.</p> <p><small>CS1 CS2, T1 T2 T3 T4 T6, E1 M1 M7 W1</small></p> <p>Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill.</p> <ul style="list-style-type: none"> <li>• Determine the extent of direct and indirect damage and direction of impact; develop and document a repair plan.</li> <li>• Inspect, remove, and replace bolted, bonded, and welded steel panel or panel assemblies.</li> <li>• Inspect, remove, replace, and align the hood, hood hinges, and hood latch.</li> <li>• Inspect, remove, replace, and align the deck lid, lid hinges, and lid latch.</li> <li>• Inspect, remove, replace, and align the doors, tailgates, hatches, lift gates, latches, hinges, and related hardware.</li> <li>• Inspect, remove, replace, and align the bumper bars, covers, reinforcement, guards, isolators, and mounting hardware.</li> <li>• Inspect, remove, replace, and align the front fenders, headers, and other panels.</li> <li>• Straighten and rough-out contours of damaged panels to a suitable condition for body filling or metal finishing using power tools, hand tools, and weld-on pull attachments.</li> <li>• Weld damaged or torn steel body panels; repair broken welds.</li> </ul>	<p>b. Monitor Blackboard comments, and assess students' knowledge through a summative assessment using a computer response system and/or Blackboard.</p> <p>Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill.</p>
<p>c. Determine and perform skills and evaluate procedures as they relate to metal finishing and</p>	<p>c. Students will be provided with pictures of various types of damage to vehicles. The students will analyze the damage and record repair procedures and estimates as they relate</p>	<p>c. Evaluate each task/job sheet using the <b>Job Sheet/Performance</b></p>

<p>body filling. (DOK 2) <sup>PRA1,</sup> PRA4</p>	<p>to metal finishing and body filling. They should record findings on the appropriate job sheet. <sup>T1 T2</sup> <sup>T3 T4 T6, E1 M1 M7 W1</sup></p> <p>Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill.</p> <ul style="list-style-type: none"> <li>• Remove paint from the damaged area of a body panel.</li> <li>• Locate and reduce surface irregularities on a damaged body panel.</li> <li>• Demonstrate hammer and dolly techniques.</li> <li>• Heat shrink stretched panel areas to the proper contour according to manufacturer’s specifications.</li> <li>• Cold shrink stretched panel areas to the proper contour.</li> <li>• Mix body filler.</li> <li>• Apply body filler; shape during curing.</li> <li>• Rough sand cured body filler to contour; finish sand.</li> </ul>	<p><b>Rubric.</b></p> <p>Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill.</p>
<p>d. Identify and determine correct procedure and perform the skill as it relates to metal welding and cutting procedures for non-structural applications. (DOK 3)</p>	<p>d. Display several types of material to be welded. Students can inspect and identify the material to be welded, determine the correct welding procedure, and perform the welding skill as it relates to metal welding and cutting procedures for non-structural applications. When the students have completed the welding procedure, they will discuss the operation with their classmates. Students will offer pros and cons of the procedure and record findings in an electronic journal. <sup>CS1 CS2, T1 T2 M1 M7 W1 W2</sup></p> <p>Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill. <sup>CS1 CS2, T1 T2 M1 M7</sup></p> <ul style="list-style-type: none"> <li>• Identify weldable and non-weldable materials used in collision repair.</li> <li>• Weld and cut high-strength steel and other steels using manufacturer’s specifications/procedures.</li> <li>• Determine the correct welder type, electrode, wire type, diameter, and gas to be used in a specific welding situation.</li> <li>• Set up and adjust the GMAW (MIG) welder to “tune” for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the material being welded.</li> <li>• Store, handle, and install high-pressure gas</li> </ul>	<p>d. Evaluate using the <b>Journal Rubric.</b></p> <p>Evaluate using the <b>Body Filler Rubric, Damage Panel Rubric, and the Welding (Non-Structural) Panel Rubric.</b></p> <p>Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill.</p>

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cylinders.

- Determine work clamp (ground) location and attach.
  - Use the proper angle of the gun to the joint and direction of gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions.
  - Protect adjacent panels, glass, vehicle interior, and so forth from welding and cutting operations.
  - Protect computers and other electronic control modules during welding procedures according to manufacturer's specifications.
  - Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, and clamp as required.
  - Determine the joint type (butt weld with backing, lap, etc.) for the weld being made according to manufacturer's or industry specifications.
  - Determine the type of weld (continuous, butt weld with backing, plug, etc.) for each specific welding operation according to manufacturer's or industry specifications.
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# Standards

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## Industry Standards

- CRN1 Non-Structural Analysis and Damage Repair
- CRS2 Structural Analysis and Damage Repair
- CRS3 Mechanical and Electrical Components
- CRP4 Painting and Refinishing

## Applied Academic Credit Standards

### *Pre-Algebra*

- PRA1 Apply concepts and perform basic operations using real numbers in real-world contexts.
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- PRA3 Identify and apply geometric principles to polygons, angles, and two- and three-dimensional figures.
- PRA4 Understand measurable attributes of objects and apply various formulas in problem-solving situations.
- PRA5 Interpret, organize, and make predictions about a variety of data using concepts of probability.

### *Survey of Mathematical Topics*

- SMT1 Compute, analyze, and develop a variety of skills necessary to manage personal and business finance to include aspects of employer–employee decision making and consumer credit.
- SMT2 Identify and apply the practices that affect employer and employee decision making.
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- T6 Technology Operations and Concepts

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- E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
- E4 Sentence Structure and Formation
- E5 Conventions of Usage
- E6 Conventions of Punctuation
- M1 Basic Operations and Applications
- M2 Probability, Statistics, and Data Analysis
- M3 Numbers: Concepts and Properties
- M4 Expressions, Equations, and Inequalities
- M5 Graphical Representations

- M6 Properties of Plane Figures
- M7 Measurement
- M8 Functions
- R1 Main Ideas and Author's Approach
- R2 Supporting Details
- R3 Sequential, Comparative, and Cause–Effect Relationships
- R4 Meaning of Words
- R5 Generalizations and Conclusions
- S1 Interpretation of Data
- S2 Scientific Investigation
- S3 Evaluation of Models, Inferences, and Experimental Results
- W1 Expressing Judgments
- W2 Focusing on the Topic
- W3 Developing a Position
- W4 Organizing Ideas
- W5 Using Language

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## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Journal Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Writing Quality</b>	There are a strong writing style and ability to express concepts learned. Excellent spelling, grammar, syntax, spelling, etc.	There are a good writing style and ability to express concepts learned. Very good grammar, syntax, spelling, etc.	There is a writing style that conveys meaning adequately. Some minor grammatical, syntax, and spelling errors	There is difficulty in expressing concepts. There is limited syntax. There are noticeable grammatical and spelling mistakes.	
<b>Content</b>	Clear and complete description of the activity is recorded. All major points are documented.	Very good description of the activity is recorded. Most major points are documented.	Good description of the activity is recorded. Some major points have been omitted.	Limited description of the activity is recorded. Very few major points are documented.	
<b>Insight and Understanding</b>	Definite insights into the implications of the activity are recorded. Awareness of the complexity of issues and situations is present.	Some insight into the issue or situation is recorded. Some sense of complexity is present.	Insight is present from a more simplistic standpoint.	Only limited insight into the issue or situation is recorded.	
<b>Application</b>	Content of the activity is connected to the student's personal life and goals.	Content of the activity is connected to the field of automotive service.	Content of the activity is related to life in general.	Only limited connections	
<b>Total Score</b>					

Comments:



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Activity Performance Rubric

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Task to Be Performed \_\_\_\_\_

	Possible Points	Points Awarded
<b>Safety</b> Personal safety (glasses, clothing, etc.) Safe use of tool Safely performs the task	25	
<b>Performance of the Task</b> Follows the task instructions Performs the task efficiently Performs the task satisfactorily	50	
<b>Lab Maintenance</b> Area cleanup (clean and tidy) Area organization (before, during, and after the task)	25	
<b>Total</b>	100	

**Comments for Deductions:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Job Sheet/Performance Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
	Student follows all safety regulations without prompting.	Student follows all safety regulations but may require limited reminders or prompting.	Student follows all or nearly all safety regulations but requires significant reminders.	Student does not follow most safety regulations.	
	Student properly diagnoses problem according to manufacturer guidelines and specifications within manufacturer-specified time limits.	Student properly diagnoses problem according to manufacturer guidelines and specifications but may take additional time.	Student properly diagnoses problem according to manufacturer guidelines and specifications with limited assistance.	Student's work is not performed to manufacturer guidelines and specifications.	
	Student quickly and accurately diagnoses problems and accurately determines causes of malfunction based on information obtained from resources.	Student accurately diagnoses problems and accurately determines causes of malfunction based on information obtained from resources.	Student diagnoses problem with limited assistance. With limited assistance, student determines causes of malfunction based on information obtained from resources.	Student is unable to diagnose problem.	
	Job Sheet includes all customer information, lists all requested repairs, and contains correct calculations with no items missing.	Job Sheet includes customer information, lists requested repairs, and contains correct calculations but may include up to two errors or omissions.	Job Sheet includes customer information, lists requested repairs, and contains correct calculations but may include up to three errors or omissions.	Job Sheet includes customer information, lists requested repairs, and contains correct calculations but may include up to four errors or omissions.	
	Written report is accurate and complete and demonstrates thorough understanding of systems, how they operate, safety procedures, and importance of manufacturer recommendations.	Written report is accurate and complete and demonstrates solid understanding of systems, how they operate, safety procedures, and importance of manufacturer recommendations.	Written report is mostly accurate and complete and demonstrates understanding of types of systems, how they operate, safety procedures, and importance of manufacturer recommendations.	Written report is inaccurate and/or incomplete or indicates limited to no understanding of types of systems, how they operate, safety procedures, and importance of manufacturer recommendations.	
<b>Total Score</b>					



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Body Filler Rubric

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Rate the ability of the student to perform body filler tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Safety procedures	
Prepare surface for filler.	
Properly mix body filler.	
Apply body filler.	
Smoothing or sanding technique	
Preparation for paint	
Cleanup/disposal of containers and excess material	

**Comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Damage Panel Rubric

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Rate the ability of the student to prepare, straighten, and rough-out contours of damaged panels to a suitable condition for body filling or metal finishing using power tools, hand tools, and weld-on pull attachments to damaged panels shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Properly uses tools	
Applies proper technique to the situation	
Final stage is inspected.	
Cleanup/disposal	

**Explanation of procedure and/or comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Welding (Non-Structural) Panel Rubric

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Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Set up welding equipment.	
Correct welding position	
Properly uses tools	
Applies proper technique to the situation	
Final stage is inspected.	
Cleanup/disposal	

**Comments:**

## Unit 4: Fundamentals of Collision Repair (Basic Structural Analysis and Damage Repair)

**Competency 1:** Inspect and apply skills and techniques related to vehicles pertaining to structural and damage repair. (DOK 3) CRN1 CRS2 CRS3 CRP4

### Suggested Enduring Understandings

1. Being able to correctly analyze frame damage is an important skill.
2. To return a vehicle to manufacturer's specifications, the technician must be proficient in the skill of measuring.
3. Unibody repair must be performed under guidelines that will not compromise the integrity of the vehicle.

### Suggested Essential Questions

1. Where does a technician find manufacturer's specifications for unibody repair?
2. Why are manufacturer's specifications important?
3. How does a technician know what areas to repair and which to replace?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Identify and inspect, determine necessary action, and perform that procedure when performing frame inspection and repair. (DOK 3) <small>PRA3</small></p>	<p>a. Have students role-play a given situation concerning frame inspection and repair. Have students choose to be a technician, a manager, a customer, or a parts specialist. Have students interact with each other in a variety of situations related to the concern. After each skit, the class will discuss the situations: Pros and cons of each and how each will relate to a successful business. Have students record the results in their journals. <sup>T1</sup> <small>T2 T3 T4 T6, E1 E2 E3 E4 E6 M1 M7</small></p> <p>Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill.</p> <ul style="list-style-type: none"> <li>• Diagnose and measure structural damage using tram and self-centering gauges according to industry specifications.</li> <li>• Attach the vehicle to anchoring devices.</li> <li>• Analyze and identify misaligned or damaged steering, suspension, and power train components that can cause vibration, steering, and wheel alignment problems; align or replace in accordance with vehicle manufacturer's specifications/procedures.</li> <li>• Diagnose and measure structural damage using a universal measuring system (mechanical, electrical, laser).</li> <li>• Diagnose and measure structural vehicles using a dedicated (fixture) measuring system.</li> <li>• Determine the extent of the direct and indirect damage and the direction of impact; document the methods and</li> </ul>	<p>a. Evaluate the journal activity using the <b>Journal Rubric</b>. Evaluate the skit using the <b>Role-Play or Skit Rubric for Employment Skills</b>.</p> <p>Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill.</p>



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sequence of repair.

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b. Identify, diagnose, recommend, and/or perform the necessary repair action in unibody inspection, measurement, and repair. (DOK 3) <sup>PRA3</sup>

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b. Divide students into groups based on learning styles, and assign each to a specific repair related to unibody inspection, measurement, and repair of the damage. Have each group compose guidelines for repair. Have each group role-play, create a multimedia presentation or a rap song, or write a story to discuss the proper and improper procedures related to the guideline. <sup>T1 T2 T3 T4, E1 E2 E3 M1 M7</sup>

Have students observe the instructor demonstrating the given task(s). Have students work in groups and then individually to perform each skill. <sup>CS1 CS2, T1 T2, M1 M7</sup>

- Identify misaligned or damaged steering, suspension, and power train components that can cause vibration, steering, and chassis alignment problems; realign or replace in accordance with vehicle manufacturer's specifications/procedures.
- Diagnose and measure unibody damage using tram and self-centering gauges according to industry specifications.
- Attach anchoring devices to the vehicle; remove or reposition components as necessary.
- Identify heat limitations in unibody vehicles in accordance with vehicle manufacturer's specifications/procedures.
- Identify proper cold stress relief methods.
- Repair damage using power tools and hand tools to restore proper contours and dimensions.
- Remove and reinstall or replace fixed glass (heated and non-heated) using manufacturer's specifications/procedures and recommended materials.

b. Evaluate the skit using the **Role-Play or Skit Rubric**.

Evaluate using the **Frame Inspection and Repair Rubric** and the **Unibody Inspection, Measurement, and Repair Rubric**.

Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill.

**Competency 2:** Identify, analyze, and perform the proper metal welding procedures to complete a repair according to manufacturer's specifications. (DOK 3) <sup>CRN1 CRS2 CRS3 CRP4</sup>

**Suggested Enduring Understandings**

1. Weldable and non-weldable materials may require different repair procedures.
2. Welding and/or cutting materials used in repairing structural materials must be performed in accordance with manufacturer's specifications.

**Suggested Essential Questions**

1. Before a technician welds and/or cuts materials, what is the first step?
2. What are some concerns when repairing materials used in structural situations?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Identify, practice, and evaluate metal welding and cutting procedures for structural applications. (DOK 3)</p>	<p>a. Divide the students into groups, and assign each group a welding or cutting task. Have each group take pictures to create a poster while in the assigned welding or cutting position. The actual pictures from the assignment will be shown and discussed. <b>Be cautious when taking pictures of welding and cutting operations.</b> <small>CS1 CS2 CS4 CS5, T1 T2 T4 E1 M1 M7</small></p> <p>Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill. <small>CS1 CS5, M1 M7</small></p> <ul style="list-style-type: none"> <li>• Identify weldable and non-weldable materials used in collision repair.</li> <li>• Weld and cut high-strength steel and other steels using manufacturer’s specifications/procedures.</li> <li>• Determine the correct welder type, electrode, wire type, diameter, and gas to be used in a specific welding situation.</li> <li>• Set up and adjust the GMAW (MIG) welder to “tune” for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the material being welded.</li> <li>• Store, handle, and install high-pressure gas cylinders.</li> <li>• Determine the work clamp (ground) location and attach.</li> <li>• Use the proper angle of the gun to the joint and direction of gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions.</li> <li>• Protect adjacent panels, glass, vehicle interior, and so forth from welding and cutting operations.</li> <li>• Protect computers and other electronic control modules during welding procedures according to manufacturer’s specifications.</li> <li>• Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, and clamp as required.</li> <li>• Determine the joint type (butt weld with backing, lap, etc.) for the weld being made according to manufacturer’s or industry specifications.</li> <li>• Determine the type of weld (continuous, butt weld with backing, plug, etc.) for each specific welding operation according to manufacturer’s</li> </ul>	<p>a. Evaluate the poster using the <b>Poster Assessment Rubric</b>.</p> <p>Observe and correct students as they weld and/or cut in various positions. Evaluate using the <b>Welding (Structural) Rubric</b>.</p> <p>Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill.</p>

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or industry specifications.

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# Standards

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## Industry Standards

- CRN1 Non-Structural Analysis and Damage Repair
- CRS2 Structural Analysis and Damage Repair
- CRS3 Mechanical and Electrical Components
- CRP4 Painting and Refinishing

## Applied Academic Credit Standards

### *Pre-Algebra*

- PRA1 Apply concepts and perform basic operations using real numbers in real-world contexts.
- PRA2 Apply properties to simplify algebraic expressions, solve linear equations and inequalities, and apply principles of graphing.
- PRA3 Identify and apply geometric principles to polygons, angles, and two- and three-dimensional figures.
- PRA4 Understand measurable attributes of objects and apply various formulas in problem-solving situations.
- PRA5 Interpret, organize, and make predictions about a variety of data using concepts of probability.

### *Survey of Mathematical Topics*

- SMT1 Compute, analyze, and develop a variety of skills necessary to manage personal and business finance to include aspects of employer–employee decision making and consumer credit.
- SMT2 Identify and apply the practices that affect employer and employee decision making.
- SMT3 Demonstrate an understanding of the impact of consumer credit.
- SMT4 Collect and apply information for planning a trip.

## 21st Century Learning Standards

- CS1 Flexibility and Adaptability
- CS2 Initiative and Self-Direction
- CS3 Social and Cross-Cultural Skills
- CS4 Productivity and Accountability
- CS5 Leadership and Responsibility

## National Education Technology Standards for Students

- T1 Creativity and Innovation
- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T4 Critical Thinking, Problem Solving, and Decision Making
- T5 Digital Citizenship
- T6 Technology Operations and Concepts

## ACT College Readiness Standards

- E1 Topic Development in Terms of Purpose and Focus
- E2 Organization, Unity, and Coherence
- E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
- E4 Sentence Structure and Formation
- E5 Conventions of Usage
- E6 Conventions of Punctuation
- M1 Basic Operations and Applications
- M2 Probability, Statistics, and Data Analysis
- M3 Numbers: Concepts and Properties
- M4 Expressions, Equations, and Inequalities

- M5 Graphical Representations
- M6 Properties of Plane Figures
- M7 Measurement
- M8 Functions
- R1 Main Ideas and Author’s Approach
- R2 Supporting Details
- R3 Sequential, Comparative, and Cause–Effect Relationships
- R4 Meaning of Words
- R5 Generalizations and Conclusions
- S1 Interpretation of Data
- S2 Scientific Investigation
- S3 Evaluation of Models, Inferences, and Experimental Results
- W1 Expressing Judgments
- W2 Focusing on the Topic
- W3 Developing a Position
- W4 Organizing Ideas
- W5 Using Language

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## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Role-Play or Skit Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Accuracy</b>	All information was accurate.	Almost all information was accurate.	Most information was accurate.	Very little information was accurate.	
<b>Role</b>	Excellent character development; student contributed in a significant manner.	Good character development; student contributed in a cooperative manner.	Fair character development; student might have contributed.	Little or no character development; student did not contribute much at all.	
<b>Knowledge Gained</b>	Can clearly explain several ways in which his or her character "saw" things differently than other characters and can explain why	Can clearly explain several ways in which his or her character "saw" things differently than other characters	Can clearly explain one way in which his or her character "saw" things differently than other characters	Cannot explain any way in which his or her character "saw" things differently than other characters	
<b>Props</b>	Used several props and showed considerable creativity	Used one or two appropriate props that made the presentation better	Used one or two props that made the presentation better	Used no props to make the presentation better	
<b>Required Elements</b>	Included more information than required	Included all required information	Included most required information	Included less information than required	
<b>Total Score</b>					



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Role-Play or Skit Rubric for Employment Skills

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Accuracy</b>	All information was accurate.	Almost all information was accurate.	Most information was accurate.	Very little information was accurate.	
<b>Role</b>	Excellent character development; student contributed in a significant manner.	Good character development; student contributed in a cooperative manner.	Fair character development; student might have contributed.	Little or no character development; student did not contribute much at all.	
<b>Knowledge Gained</b>	Can clearly explain several ways in which his or her character "saw" things differently than other characters and can explain why	Can clearly explain several ways in which his or her character "saw" things differently than other characters	Can clearly explain one way in which his or her character "saw" things differently than other characters	Cannot explain any way in which his or her character "saw" things differently than other characters	
<b>Content</b>	Used several props and showed considerable creativity	Used one or two appropriate props that made the presentation better	Used one or two props that made the presentation better	Used no props to make the presentation better	
<b>Total Score</b>					



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Poster Assessment Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Required Content</b>	The poster includes all required content elements as well as additional information.	All required content elements are included on the poster.	All but one of the required content elements are included on the poster.	Several required content elements are missing.	
<b>Labels</b>	All items of importance on the poster are clearly labeled with labels that are easy to read.	Almost all items of importance on the poster are clearly labeled with labels that are easy to read.	Many items of importance on the poster are clearly labeled with labels that are easy to read.	Labels are too small to read, or no important items are labeled.	
<b>Attractiveness</b>	The poster is exceptionally attractive in terms of design, layout, and neatness.	The poster is attractive in terms of design, layout, and neatness.	The poster is acceptably attractive though it may be a bit messy.	The poster is distractingly messy or very poorly designed.	
<b>Grammar</b>	There are no grammatical or mechanical mistakes on the poster.	There are 1 to 2 grammatical or mechanical mistakes on the poster.	There are 3 to 4 grammatical or mechanical mistakes on the poster.	There are more than 4 grammatical or mechanical mistakes on the poster.	
<b>Total Score</b>					



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Journal Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Writing Quality</b>	There are a strong writing style and ability to express concepts learned. Excellent spelling, grammar, syntax, spelling, etc.	There are a good writing style and ability to express concepts learned. Very good grammar, syntax, spelling, etc.	There is a writing style that conveys meaning adequately. Some minor grammatical, syntax, and spelling errors	There is difficulty in expressing concepts. There is limited syntax. There are noticeable grammatical and spelling mistakes.	
<b>Content</b>	Clear and complete description of the activity is recorded. All major points are documented.	Very good description of the activity is recorded. Most major points are documented.	Good description of the activity is recorded. Some major points have been omitted.	Limited description of the activity is recorded. Very few major points are documented.	
<b>Insight and Understanding</b>	Definite insights into the implications of the activity are recorded. Awareness of the complexity of issues and situations is present.	Some insight into the issue or situation is recorded. Some sense of complexity is present.	Insight is present from a more simplistic standpoint.	Only limited insight into the issue or situation is recorded.	
<b>Application</b>	Content of the activity is connected to the student's personal life and goals.	Content of the activity is connected to the field of automotive service.	Content of the activity is related to life in general.	Only limited connections	
<b>Total Score</b>					

Comments:



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Frame Inspection and Repair Rubric

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Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Identifies damaged or misaligned structural areas	
Identifies damaged or misaligned electrical areas	
Identifies damaged or misaligned mechanical areas	
Identifies correct location of anchors	
Properly uses tools	
Applies proper technique to the situation	

**Explanation/comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Unibody Inspection, Measurement, and Repair Rubric

Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Inspects all components related to the damaged area	
Identifies misaligned components	
Properly uses tools	
Applies proper technique to the situation	
Final stage is inspected.	
Cleanup/disposal	

**Explanation/comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Welding (Structural) Rubric

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Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Set up welding equipment.	
Correct welding position	
Properly uses tools	
Applies proper technique to the situation	
Final stage is inspected.	
Cleanup/disposal	

**Explanation/comments:**

## Unit 5: Intermediate Painting and Refinishing

**Competency 1:** Identify, perform, and appraise vehicles as it pertains to painting and refinishing. (DOK 3) <sup>CRN1 CRS2</sup>  
CRS3 CRP4

### Suggested Enduring Understandings

1. OSHA guidelines provide for personal and environmental safety.
2. A technician must be proficient in painting and refinishing skills.
3. Preparation of the vehicle is the most important process before painting begins.
4. Painting and refinishing skills must be performed according to manufacturing guidelines.

### Suggested Essential Questions

1. What could happen if OSHA guidelines are not followed?
2. Where does a technician find OSHA guidelines?
3. Why is preparation of the vehicle the most important step?
4. How does a technician become proficient in painting and refinishing?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Practice safety precautions for painting and refinishing operations. (DOK 2)</p>	<p>a. Divide students into groups, and have them research local, state, and federal regulations that pertain to painting and refinishing. Have groups debate different sections of the regulations. <sup>CS1 CS2</sup>  <small>CS5, T1 T2 T3 T4, E1 E2 E3 E4 E5 E6</small></p> <p>Guide students in how to properly complete the following. After guided practice, have each student perform each task individually.</p> <ul style="list-style-type: none"> <li>• Identify and take necessary precautions with hazardous operations and materials according to federal, state, and local regulations.</li> <li>• Identify safety and personal health hazards according to OSHA guidelines and the Right to Know Law.</li> <li>• Inspect a spray environment to ensure compliance with federal, state, and local regulations and for safety and cleanliness hazards.</li> <li>• Select and use the NIOSH-approved personal sanding respirator. Inspect the condition, and ensure fit and operation. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulations.</li> <li>• Select and use the NIOSH-approved (Fresh Air Make-Up System) personal painting/refinishing respirator system. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation.</li> <li>• Select and use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects, and detailing (gloves, suits, hoods, eye and ear protection, etc.).</li> </ul>	<p>a. Evaluate the debate using the <b>Debate Rubric</b>.</p> <p>Observe and correct students as they practice safety precautions for painting and refinishing operations.</p>



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b. Demonstrate and evaluate surface preparation information and skills. (DOK 3)

b. Have students role-play a customer concern situation related to surface preparation. Divide students into two groups: Technicians and customers. Have technicians use appropriate graphic organizers (**Fact or Opinion** or the **Step-by-Step Chart**) to evaluate customers' concerns about a particular problem that relates to the current task being taught about an automobile. Have technicians determine the needed action. CS1 CS2 CS5, T1 T2 T3 T4 T6, E1 E2 E3 E4 E5 E6 M1 M7 R1 R2 R3 W1

Have students discuss what they already know about paint spray guns and related equipment and mixing and matching paint. Have students work as a class to complete a **KWL Chart**. (See also the **KWL Chart: Teacher Instructions** at the end of this unit.) In the "K" column, have students list information they currently know about paint spray guns and related equipment and mixing and matching paint. In the "W" column, have students brainstorm a list of things they want to learn about paint spray guns and related equipment and mixing and matching paint. Have students work in groups or as individuals to interview industry members to find answers to their "W" list. Have students return to the KWL chart and list everything they learned from the interviews in the "L" column. CS1 CS2 CS5, T1 T2 T3 T6, E1 E2 E3 E4 M1 M7 R1 R2 R3 W1 W2

Guide students how to properly complete the following. After guided practice, have each student perform each task individually.

- Inspect, remove, store, and replace exterior trim and components necessary for proper surface preparation.
- Soap and water wash entire vehicle; use appropriate cleaner to remove contaminants.
- Inspect and identify substrate, type of finish, and surface condition; develop and document a plan for refinishing using a total product system.
- Remove paint finish in accordance with manufacturer's recommendations.
- Dry or wet sand areas to be refinished.
- Featheredge damaged areas to be refinished.
- Apply suitable metal treatment or primer in accordance with total product systems.
- Mask and protect other areas that will not be refinished.
- Mix primer, primer-surfacer, or primer-sealer.
- Apply primer onto the surface of the repaired area.
- Apply two-component finishing filler to minor surface imperfections.

b. Evaluate the role-play using the **Role-Play or Skit Rubric**. Evaluate the graphic organizer (**Fact or Opinion, Step-by-Step Chart, or the Problem Solution Chart**) for clarity and content.

Have the students evaluate other's KWL projects and presentations for content. Monitor student activity, and evaluate the KWL project for content, clarity, and length.

Observe and correct students as they practice safety precautions for painting and refinishing operations. Evaluate using the **Painting Regulations and Setup Rubric, Surface Preparation Rubric I, and Surface Preparation Rubric II**.

Revisit the **KWL Chart** after practice in the lab to see what areas still need to be addressed in instruction.

- 
- Dry or wet sand the area to which the primer–surfacers has been applied.
  - Dry sand the area to which the two-component finishing filler has been applied.
  - Remove dust from the area to be refinished, including cracks or moldings of adjacent areas.
  - Clean the area to be refinished using a final cleaning solution. Remove, with a tack rag, any dust or lint particles from the area to be refinished.
  - Apply suitable sealer to the area being refinished when sealing is needed or desirable.
  - Scuff sand to remove nibs or imperfections from a sealer.
  - Restore corrosion-resistant coatings, caulking, and seam sealers to repaired areas.
  - Prepare adjacent panels for blending, and prepare plastic panels for refinishing.
  - Introduce, practice, and evaluate paint spray guns and related equipment, mixing, matching, applying paint; and perform final detail operations to a vehicle.
  - Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment).
  - Check and adjust spray gun operation for HVLP (high-volume, low-pressure) or LVLP (low-volume, low-pressure) guns.
  - Set up (fluid needle, nozzle, and cap), adjust, and test a spray gun using fluid, air, and pattern control valves.
  - Determine the type and color of paint already on a vehicle by manufacturer’s vehicle information label.
  - Shake, stir, reduce, catalyze/activate, and strain paint according to manufacturer’s procedures.
  - Apply finish using appropriate spray techniques (gun arc, gun angle, gun distance, gun speed, and spray pattern overlap) for the finish being applied.
  - Apply the selected product on test and let-down panel in accordance with manufacturer’s recommendations; check for color match.
  - Clean interior, exterior, and glass.
  - Clean body openings (door jambs and edges, etc.).
  - Remove overspray.
-

# Standards

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## Industry Standards

- CRN1 Non-Structural Analysis and Damage Repair
- CRS2 Structural Analysis and Damage Repair
- CRS3 Mechanical and Electrical Components
- CRP4 Painting and Refinishing

## Applied Academic Credit Standards

### *Pre-Algebra*

- PRA1 Apply concepts and perform basic operations using real numbers in real-world contexts.
- PRA2 Apply properties to simplify algebraic expressions, solve linear equations and inequalities, and apply principles of graphing.
- PRA3 Identify and apply geometric principles to polygons, angles, and two- and three-dimensional figures.
- PRA4 Understand measurable attributes of objects and apply various formulas in problem-solving situations.
- PRA5 Interpret, organize, and make predictions about a variety of data using concepts of probability.

### *Survey of Mathematical Topics*

- SMT1 Compute, analyze, and develop a variety of skills necessary to manage personal and business finance to include aspects of employer-employee decision making and consumer credit.
- SMT2 Identify and apply the practices that affect employer and employee decision making.
- SMT3 Demonstrate an understanding of the impact of consumer credit.
- SMT4 Collect and apply information for planning a trip.

## 21st Century Learning Standards

- CS1 Flexibility and Adaptability
- CS2 Initiative and Self-Direction
- CS3 Social and Cross-Cultural Skills
- CS4 Productivity and Accountability
- CS5 Leadership and Responsibility

## National Education Technology Standards for Students

- T1 Creativity and Innovation
- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T4 Critical Thinking, Problem Solving, and Decision Making
- T5 Digital Citizenship
- T6 Technology Operations and Concepts

## ACT College Readiness Standards

- E1 Topic Development in Terms of Purpose and Focus
- E2 Organization, Unity, and Coherence
- E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
- E4 Sentence Structure and Formation
- E5 Conventions of Usage
- E6 Conventions of Punctuation
- M1 Basic Operations and Applications
- M2 Probability, Statistics, and Data Analysis
- M3 Numbers: Concepts and Properties
- M4 Expressions, Equations, and Inequalities

- M5 Graphical Representations
- M6 Properties of Plane Figures
- M7 Measurement
- M8 Functions
- R1 Main Ideas and Author's Approach
- R2 Supporting Details
- R3 Sequential, Comparative, and Cause–Effect Relationships
- R4 Meaning of Words
- R5 Generalizations and Conclusions
- S1 Interpretation of Data
- S2 Scientific Investigation
- S3 Evaluation of Models, Inferences, and Experimental Results
- W1 Expressing Judgments
- W2 Focusing on the Topic
- W3 Developing a Position
- W4 Organizing Ideas
- W5 Using Language

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National Institute for Automotive Service Excellence. (n.d.). Retrieved September 12, 2008, from <http://www.asecert.org/>

## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Debate Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Information</b>	All information was accurate and clear.	Most information was accurate and clear.	Most information was accurate but not completely thorough or clear.	Information was inaccurate or needed clarification.	
<b>Rebuttal</b>	All counterarguments were accurate, relevant, and strong.	Most counterarguments were accurate, relevant, and strong.	All counterarguments were accurate and relevant, but some were weak.	Counterarguments were not accurate or relevant.	
<b>Organization</b>	All arguments were logical and clearly followed a premise.	Most arguments were logical and clearly followed a premise.	Arguments were logical but did not always follow a premise.	Arguments were not logical and/or did not follow a premise.	
<b>Understanding of the Topic</b>	The individual/team clearly understood the topic fully and presented in a convincing manner.	The individual/team clearly understood the topic fully and presented with ease.	The individual/team understood the main points of the topic and presented those well.	The individual/team did not exhibit an adequate understanding of the topic.	
<b>Total Score</b>					





Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Step-by-Step Chart

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Have students write the task that they are to accomplish in the task area. Then have students determine and write each step of their procedure with details.

Task	
Step 1:	Details:
Step 2:	Details:
Step 3:	Details:
Step 4:	Details:
Step 5:	Details:
Step 6:	Details:



## KWL Chart: Teacher Instructions

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### Purposes

- To help students access prior knowledge through brainstorming
- To identify areas of student interest or concern
- To aid the teacher in planning lessons as well as checking for understanding
- To track student learning throughout the unit
- To identify areas for further student research/study

### Process

- Use this strategy prior to, during, or at the close of any unit of study. The process can be done individually, in small groups, or as a class activity.
- Post the charts, or have students record their information in groups.
- During the brainstorming phase, emphasize getting lots of ideas rather than debating or discussing the ideas as they are generated. Debates, clarifications, and discussions of ideas occur once the brainstorming is over. Do not clarify any confusion or react in any way other than to record the data. Conflicting data may be recorded.
- During the lesson or unit of study, misconception, confusion, or curiosity should be addressed.



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## KWL Chart

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KNOW	WHAT TO KNOW	WHAT I LEARNED



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Fact or Opinion

---

Write your topic in the top rectangle. Add details to the fact or the opinion blocks.

Topic:

Fact:

Opinion:



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Presentation Assessment Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Content</b>	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
<b>Clarity</b>	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
<b>Presentation</b>	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
<b>Visual Aids</b>	Attractive, accurate, grammatically correct	Adequate, mostly accurate, few grammatical errors	Poorly planned, somewhat accurate, some grammatical errors	Weak, inaccurate, many grammatical errors	
<b>Length</b>	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
<b>Eye Contact</b>	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
<b>Total Score</b>					



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Role-Play or Skit Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Accuracy</b>	All information was accurate.	Almost all information was accurate.	Most information was accurate.	Very little information was accurate.	
<b>Role</b>	Excellent character development; student contributed in a significant manner.	Good character development; student contributed in a cooperative manner.	Fair character development; student might have contributed.	Little or no character development; student did not contribute much at all.	
<b>Knowledge Gained</b>	Can clearly explain several ways in which his or her character "saw" things differently than other characters and can explain why	Can clearly explain several ways in which his or her character "saw" things differently than other characters	Can clearly explain one way in which his or her character "saw" things differently than other characters	Cannot explain any way in which his or her character "saw" things differently than other characters	
<b>Props</b>	Used several props and showed considerable creativity	Used one or two appropriate props that made the presentation better	Used one or two props that made the presentation better	Used no props to make the presentation better	
<b>Required Elements</b>	Included more information than required	Included all required information	Included most required information	Included less information than required	
<b>Total Score</b>					



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Painting Regulations and Setup Rubric

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Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Identifies regulations	
Selects proper safety equipment	
Selects proper spray gun	
Selects proper spray techniques	
Mixes paint properly	
Properly set up for conditions	

**Explanation/comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Surface Preparation Rubric I

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Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Stores trim properly	
Uses soap and water	
Removes paint properly	
Dry sands area to be refinished	
Mask, prime, and seal area.	
Applies proper technique to the situation	
Final stage is inspected.	
Cleanup/disposal	

**Explanation/comments:**





Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Surface Preparation Rubric II

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Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Final cleaning	
Applies sealer	
Proper spray technique	
Adjusts spray pattern	
Proper color match	
Removes overspray	
Final stage is inspected.	
Cleanup/disposal	

**Explanation/comments:**

## Unit 6: Safety (Review), Employability Skills, and Business Skills

**Competency 1:** Introduce and understand general safety rules for working in a shop/lab and industry. (DOK 1) <sup>CRN1</sup>  
CRS2 CRS3 CRP4

### Suggested Enduring Understandings

1. Safety practices must be followed at all times.
2. Automotive technicians must know what actions to take in an emergency.
3. Prevention is the key, but accidents do happen.

### Suggested Essential Questions

1. What are some safety practices that must be followed?
2. In an emergency, what actions (list several) should be taken? Why?
3. What are some steps that automotive technicians can take to prevent accidents?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Explain the importance of following all safety rules and policies. (DOK 1)	<p>a. Assign students to groups of two or three to create a presentation on an assigned safety topic to identify and describe safety concerns or hazards encountered in working in the automotive lab. Discuss and demonstrate safety practices, prevention, and treatment methods. <sup>CS1 CS2 CS3, T1 T2 T3 T4, E1 E2 E3 E4 M1 M7</sup></p> <p>Safety topics may include but are not limited to reporting all on-the-job injuries and accidents, evacuation policy, substance abuse policy, procedures when working near pressurized or high temperature, electrical hazards and the action to take when an electrical shock occurs when performing collision operations, personal protective equipment, procedures for lifting heavy objects, MSDS sheets, the process by which fires start, fire prevention of various flammable liquids, the classes of fire, and the types of extinguishers.</p>	a. Evaluate using the <b>Presentation Assessment Rubric</b> . Evaluate the safety activity using the <b>Safety Review Rubric I</b> and <b>Safety Review Rubric II</b> .

**Competency 2:** Demonstrate proper use and care for laboratory equipment related to the collision industry. (DOK 2) <sup>CRN1 CRS2 CRS3 CRP4</sup>

### Suggested Enduring Understandings

1. Resume and job applications are the first impressions an employer may have of you.
2. Automotive jobs are available.

### Suggested Essential Questions

1. What information is listed on a resume?
2. Why is it important to complete a job application?
3. When providing a reference, should you call the reference first?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Describe basic employee responsibilities.	a. Give students sample job announcements that have employee responsibilities listed. Have students make a common list of responsibilities that all employers	a. Monitor classroom discussion for content. Ensure

	<p>expect. List the common list items on the board. Lead students in a classroom discussion about each responsibility. Have students pretend they are the manager of a collision shop. Have the managers discuss what responsibility on the common list they would eliminate. Ideally, the group will decide that they are all important and none can be eliminated.</p> <p>As an enrichment activity, have students model basic employee responsibilities in a skit. <small>CS1 CS2 CS4 CS5</small></p>	<p>that all students participate by asking, "What do you think about that comment?"</p> <p>Evaluate the skit using the <b>Role-Play or Skit Rubric</b>.</p>
<p>b. Design a resume and letter of application and complete a job application.</p>	<p>b. Bring samples of good and bad resumes, letters of application, and completed job applications. Ask students to pretend they are the manager of a shop. Have the managers discuss who they would hire and why. Have students work in small groups and then in large groups to create a list of "must do's" for resumes, letters of application, and job applications.</p> <p>Have students do the following: Use technology to design a resume and letter of application. Peer review the resume and letter of application. Research job opportunities using newspaper, journals, and the Internet. Download the job application and complete. Peer review the job application. <small>CS1 CS4 CS5, T1 T2 T3 T4 T6, E1 E2 E3 E4 E5 E6 R1 R2</small></p>	<p>b. Evaluate the resume, letter of application, and completed job application using the <b>Resume Assessment Rubric</b>.</p>
<p>c. Demonstrate an understanding of the impact of consumer credit (advantages and disadvantages of installment loans, applying algebraic formulas to consumer credit). (DOK 2) <small>SMT3</small></p>	<p>c. Each student will visit a local lending institution and obtain and complete a loan application. Students will then research the advantages and disadvantages of installation loans. Using the Internet, students will use loan calculators to compute loan information. Each student will create an electronic presentation of the information. <small>CS1 CS4 CS5, T1 T2 T3 T4 E1 E2 E3 E5 M1 M7</small></p>	<p>c. Evaluate the letter of application using the <b>Letter of Application Rubric</b>. Evaluate the job application by peer review.</p>
<p>d. Design, collect, and apply information for planning a trip. <small>SMT4</small></p>	<p>d. Divide the students into small groups. Each group will make all decisions concerning a trip. The trip can be for a variety of reasons: To attend the collision technician annual meeting, to attend I-Car or ASE certification classes, or other topics that are related to the collision repair industry. Ensure that students complete the following when planning:</p> <ul style="list-style-type: none"> <li>• Investigate and evaluate modes of transportation.</li> <li>• Create a travel budget.</li> <li>• Make travel plans based upon airline schedules.</li> <li>• Apply map-reading skills.</li> <li>• Apply appropriate formulas used for planning a trip.</li> </ul>	<p>d. Evaluate the presentation using the <b>Presentation Assessment Rubric</b>.</p> <p>Evaluate the presentation using the <b>Group Presentation Assessment Rubric</b>. Evaluate the discussion using peer review. Monitor the class</p>

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Have students research modes of transportation, creating a travel budget, travel plans by air, map-reading skills, and formulas for planning a trip. Have students present their information to the class. Each group should have to justify and explain its actions to its peers.

for appropriate questions and discussion topics.

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CS1 CS2 CS5, T1 T2 T3 T4 T6, E1 E2 E3 M1 M7 R1 R2 R5 W1

# Standards

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## Industry Standards

- CRN1 Non-Structural Analysis and Damage Repair
- CRS2 Structural Analysis and Damage Repair
- CRS3 Mechanical and Electrical Components
- CRP4 Painting and Refinishing

## Applied Academic Credit Standards

### *Pre-Algebra*

- PRA1 Apply concepts and perform basic operations using real numbers in real-world contexts.
- PRA2 Apply properties to simplify algebraic expressions, solve linear equations and inequalities, and apply principles of graphing.
- PRA3 Identify and apply geometric principles to polygons, angles, and two- and three-dimensional figures.
- PRA4 Understand measurable attributes of objects and apply various formulas in problem-solving situations.
- PRA5 Interpret, organize, and make predictions about a variety of data using concepts of probability.

### *Survey of Mathematical Topics*

- SMT1 Compute, analyze, and develop a variety of skills necessary to manage personal and business finance to include aspects of employer–employee decision making and consumer credit.
- SMT2 Identify and apply the practices that affect employer and employee decision making.
- SMT3 Demonstrate an understanding of the impact of consumer credit.
- SMT4 Collect and apply information for planning a trip.

## 21st Century Learning Standards

- CS1 Flexibility and Adaptability
- CS2 Initiative and Self-Direction
- CS3 Social and Cross-Cultural Skills
- CS4 Productivity and Accountability
- CS5 Leadership and Responsibility

## National Education Technology Standards for Students

- T1 Creativity and Innovation
- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T4 Critical Thinking, Problem Solving, and Decision Making
- T5 Digital Citizenship
- T6 Technology Operations and Concepts

## ACT College Readiness Standards

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- E2 Organization, Unity, and Coherence
- E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
- E4 Sentence Structure and Formation
- E5 Conventions of Usage
- E6 Conventions of Punctuation
- M1 Basic Operations and Applications
- M2 Probability, Statistics, and Data Analysis
- M3 Numbers: Concepts and Properties
- M4 Expressions, Equations, and Inequalities

- M5 Graphical Representations
- M6 Properties of Plane Figures
- M7 Measurement
- M8 Functions
- R1 Main Ideas and Author's Approach
- R2 Supporting Details
- R3 Sequential, Comparative, and Cause–Effect Relationships
- R4 Meaning of Words
- R5 Generalizations and Conclusions
- S1 Interpretation of Data
- S2 Scientific Investigation
- S3 Evaluation of Models, Inferences, and Experimental Results
- W1 Expressing Judgments
- W2 Focusing on the Topic
- W3 Developing a Position
- W4 Organizing Ideas
- W5 Using Language

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## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Presentation Assessment Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Content</b>	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
<b>Clarity</b>	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
<b>Presentation</b>	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
<b>Visual Aids</b>	Attractive, accurate, grammatically correct	Adequate, mostly accurate, few grammatical errors	Poorly planned, somewhat accurate, some grammatical errors	Weak, inaccurate, many grammatical errors	
<b>Length</b>	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
<b>Eye Contact</b>	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
<b>Total Score</b>					



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Group Presentation Assessment Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Content</b>	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
<b>Clarity</b>	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
<b>Presentation</b>	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
<b>Visual Aids</b>	Attractive, accurate, and grammatically correct	Adequate, mostly accurate, and few grammatical errors	Poorly planned, somewhat accurate, and some grammatical errors	Weak, inaccurate, and many grammatical errors	
<b>Length</b>	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
<b>Participation</b>	Well-balanced participation by all group members	All group members have significant participation.	Most group members participate.	One main speaker with little participation from other group members	
<b>Eye Contact</b>	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
<b>Total Score</b>					



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Safety Review Rubric I

<i>The student</i>	Scoring Criteria			
	Excellent 4	Good 3	Needs Improvement 2	Unacceptable 1
<b>Safety Equipment</b>				
Selects appropriate PPE.				
Wears protective clothing and eye protection.				
Demonstrates fire extinguisher operation.				
<i>Subtotal for safety equipment</i>				
<b>Maintains clean facility</b>				
Cleans area after tasks are complete.				
Stores materials properly.				
<i>Subtotal for facility cleanliness</i>				
<b>Models appropriate behavior</b>				
Observes safety rules.				
Follows written directions.				
Follows oral directions.				
Observes surroundings.				
<i>Subtotal for appropriate behaviors</i>				



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Safety Review Rubric II

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<i>The student</i>	<b>Scoring Criteria</b>			
	Excellent 4	Good 3	Needs Improvement 2	Unacceptable 1
<b>Selects and uses tools</b>				
Uses proper tools.				
Rejects unsafe tools.				
Carries tools properly.				
Cleans tools after use.				
Replaces tools upon completion.				
Observes electrical safety.				
<i>Subtotal for tool selection</i>				
<b>Hazardous chemicals</b>				
Observes label precautions.				
Handles chemicals properly.				
Provides adequate ventilation.				
<i>Subtotal for chemical safety</i>				
<b>Summative Total</b>				



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Role-Play or Skit Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Accuracy</b>	All information was accurate.	Almost all information was accurate.	Most information was accurate.	Very little information was accurate.	
<b>Role</b>	Excellent character development; student contributed in a significant manner.	Good character development; student contributed in a cooperative manner.	Fair character development; student might have contributed.	Little or no character development; student did not contribute much at all.	
<b>Knowledge Gained</b>	Can clearly explain several ways in which his or her character "saw" things differently than other characters and can explain why	Can clearly explain several ways in which his or her character "saw" things differently than other characters	Can clearly explain one way in which his or her character "saw" things differently than other characters	Cannot explain any way in which his or her character "saw" things differently than other characters	
<b>Props</b>	Used several props and showed considerable creativity	Used one or two appropriate props that made the presentation better	Used one or two props that made the presentation better	Used no props to make the presentation better	
<b>Required Elements</b>	Included more information than required	Included all required information	Included most required information	Included less information than required	
<b>Total Score</b>					



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Resume Assessment Rubric

	<b>Excellent 25 Points</b>	<b>Well Done 20 Points</b>	<b>Meets Standards 15 Points</b>	<b>Beginning 10 Points</b>	<b>No Evidence 0 Points</b>	<b>Score</b>
<b>Format</b>	Resume contains name, address, objective, education, experience, and references. All words are spelled correctly.	Contains at least six of the criteria; no more than two spelling errors	Contains at least five of the criteria; no more than four spelling errors	Contains minimal information; more than four spelling errors	Assignment not submitted	
<b>Education</b>	Education includes all schools attended, graduation dates, diploma/degree awarded, and major field of study.	Education includes three of the criteria.	Education includes two of the criteria.	Education includes one of the criteria.	Assignment not submitted	
<b>Experience</b>	Experience includes internships, entry-level jobs, and current position.	Experience includes two of the criteria.	Experience includes one of the criteria.	Experience includes current position only.	Assignment not submitted	
<b>Factual</b>	Contains factual names and dates and is believable	Contains fairly believable names and dates	Resume has unrealistic dates or names.	Resume is unrealistic and contains conflicting	Assignment not submitted	

				information.		
<b>Total Score</b>						





Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Letter of Application Rubric

	<b>Excellent 4 Points</b>	<b>Proficient 3 Points</b>	<b>Needs Improvement 2 points</b>	<b>Unsatisfactory 1 Point</b>	<b>Score</b>
<b>Layout/Design</b>	Creatively designed and easily read; excellent business letter	Attractive and easy to read; good business letter	Appears busy or boring and is difficult to read; needs improvement	Unattractive or inappropriate and very difficult to read; not acceptable	
<b>Information, Style, Audience, and Tone</b>	Accurate and complete information; very well written and presented	Well written and interesting to read	Some information provided but is limited or inaccurate	Poorly written, inaccurate, or incomplete	
<b>Accurate Parts</b>	Complete with all required parts	Some elements may be missing.	Most elements are missing or out of place.	Proper form for a letter not used	
<b>Grammar, Punctuation, and Wording</b>	Excellent presentation, style, grammar, and punctuation	Fair presentation, style, grammar, and punctuation	Missing information and inaccurate punctuation and/or grammar	Poor grammar, punctuation, and wording	
<b>Following Directions and Guidelines</b>	Always on task and always followed directions	Followed directions with some guidance	Required a good bit of extra guidance	Did not follow directions and did not ask for extra help	
<b>Total Score</b>					

## Unit 7: Advanced Non-Structural Analysis and Damage Repair

**Competency 1:** Inspect, analyze, perform, and evaluate procedures and skills pertaining to advanced non-structural analysis and damage repair. (DOK 2) CRN1 CR52 CR53 CRP4

### Suggested Enduring Understandings

1. Know and apply the methods of repairing damage to a vehicle.
2. Proper skills and knowledge of repairing these items restore the vehicle to manufacturer's specifications and establish good customer relations.
3. Proper welding techniques restore vehicle non-structural integrity.
4. Identify and understand the various types of plastics and adhesives and proper application procedures for each.

### Suggested Essential Questions

1. What are at least 10 methods of sheet metal repair?
2. What is the function of various types of window regulators?
3. What role does weather stripping play in stopping dust, water, and wind from entering a vehicle?
4. Before welding on a vehicle, what should the technician know about the workpiece?
5. What is the difference between olefin and non-olefin plastic? What are the correct repair methods for each?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify and utilize metal finishing and body filling procedures. (DOK 2)	<p>a. Show the film on metal repair, and place students into groups of three to five each; the groups will demonstrate each procedure to the class. At the end of each demonstration, have students state advantages and disadvantages of each method. <small>CS1 CS2 CS4, E1 M1 M7</small></p> <p>Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill.</p> <ul style="list-style-type: none"> <li>• Remove paint from the damaged area of a body panel.</li> <li>• Locate and reduce surface irregularities on a damaged body panel.</li> <li>• Demonstrate hammer and dolly techniques.</li> <li>• Heat shrink stretched panel areas to the proper contour according to manufacturer's specifications.</li> <li>• Cold shrink stretched panel areas to the proper contour.</li> <li>• Mix body filler.</li> <li>• Apply body filler; shape during curing.</li> <li>• Rough sand cured body filler to contour; finish sand.</li> </ul>	<p>a. Evaluate student responses to the demonstrations.</p> <p>Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill. Evaluate using the <b>Metal Finishing and Body Filler Rubric</b>.</p>
b. Inspect and diagnose moveable glass and hardware. (DOK 2)	<p>b. Using a vehicle door (which can be obtained from salvage yards), attach window motor leads to a battery and demonstrate the operation of the door mechanism. Have students disassemble and</p>	<p>b. Evaluate the journal using the <b>Journal Rubric</b>. Provide feedback to</p>

	<p>assemble the door components. Students will record findings in their journals. <sup>CS1 CS2 CS4, E1 E2 E3 E4</sup> <sub>M1 M7 R1 W1</sub></p> <p>Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill.</p> <ul style="list-style-type: none"> <li>• Inspect, adjust, and repair or replace window regulators; run channels, glass, power mechanisms, and related controls.</li> <li>• Diagnose and repair water leaks, dust leaks, and wind noises; inspect, repair, and replace weather stripping.</li> <li>• Inspect, repair or replace, and adjust removable, manually or power-operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs.</li> </ul>	<p>students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill.</p> <p>Evaluate using the <b>Movable Glass and Hardware Rubric.</b></p>
<p>c. Identify, analyze, and perform operations pertaining to welding. (DOK 2)</p>	<p>c. After demonstration of welding techniques by the instructor, divide students into groups. Each student will perform the welding task(s) and perform visual and destructive tests. If the weld fails either test, have the students determine why the weld failed. Have students perform the welding activity until the welds pass the tests. <sup>CS1</sup> <sub>CS2 CS4 M1 M7</sub></p> <p>Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill.</p> <ul style="list-style-type: none"> <li>• Perform the various welds: Continuous, stitch, tack, plug, butt weld with and without backing, and lap joints.</li> <li>• Perform visual and destructive tests on each weld type.</li> <li>• Identify the causes of various welding defects; make necessary adjustments.</li> <li>• Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments.</li> <li>• Identify the cutting process for different materials and locations in accordance with manufacturer's procedures; perform the cutting operation.</li> </ul>	<p>c. The welding activity is complete when all welds pass the visual and destructive tests.</p> <p>Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill.</p> <p>Evaluate using the <b>Welding (Advanced Non-Structural) Rubric.</b></p>
<p>d. Recognize and apply plastics and adhesives. (DOK 2)</p>	<p>d. Using a damaged bumper cover, each student will correctly repair the damage according to industry standards. <sup>CS1 CS2 CS4 M1 M7</sup></p>	<p>d. Evaluate repair by applying ample pressure to the</p>

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Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill.

- Identify the types of plastics; determine repairability.
- Identify repair procedures; clean and prepare the surface of plastic parts.
- Replace or repair rigid, semi-rigid, and flexible plastic panels according to manufacturer's or industry specifications.
- Remove or repair damaged areas from rigid exterior sheet-molded compound (SMC) panels.
- Replace bonded sheet-molded compound (SMC) body panels; straighten or align panel supports.

repair. If repair fails, repeat until repair is successful.

Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill. Evaluate using the **Plastics and Adhesives Rubric**.

# Standards

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## Industry Standards

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- CRS2 Structural Analysis and Damage Repair
- CRS3 Mechanical and Electrical Components
- CRP4 Painting and Refinishing

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### *Pre-Algebra*

- PRA1 Apply concepts and perform basic operations using real numbers in real-world contexts.
- PRA2 Apply properties to simplify algebraic expressions, solve linear equations and inequalities, and apply principles of graphing.
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- PRA4 Understand measurable attributes of objects and apply various formulas in problem-solving situations.
- PRA5 Interpret, organize, and make predictions about a variety of data using concepts of probability.

### *Survey of Mathematical Topics*

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- SMT2 Identify and apply the practices that affect employer and employee decision making.
- SMT3 Demonstrate an understanding of the impact of consumer credit.
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- CS3 Social and Cross-Cultural Skills
- CS4 Productivity and Accountability
- CS5 Leadership and Responsibility

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- E1 Topic Development in Terms of Purpose and Focus
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- E4 Sentence Structure and Formation
- E5 Conventions of Usage
- E6 Conventions of Punctuation
- M1 Basic Operations and Applications
- M2 Probability, Statistics, and Data Analysis
- M3 Numbers: Concepts and Properties
- M4 Expressions, Equations, and Inequalities

- M5 Graphical Representations
- M6 Properties of Plane Figures
- M7 Measurement
- M8 Functions
- R1 Main Ideas and Author's Approach
- R2 Supporting Details
- R3 Sequential, Comparative, and Cause–Effect Relationships
- R4 Meaning of Words
- R5 Generalizations and Conclusions
- S1 Interpretation of Data
- S2 Scientific Investigation
- S3 Evaluation of Models, Inferences, and Experimental Results
- W1 Expressing Judgments
- W2 Focusing on the Topic
- W3 Developing a Position
- W4 Organizing Ideas
- W5 Using Language

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## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Journal Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Writing Quality</b>	There are a strong writing style and ability to express concepts learned. Excellent spelling, grammar, syntax, spelling, etc.	There are a good writing style and ability to express concepts learned. Very good grammar, syntax, spelling, etc.	There is a writing style that conveys meaning adequately. Some minor grammatical, syntax, and spelling errors	There is difficulty in expressing concepts. There is limited syntax. There are noticeable grammatical and spelling mistakes.	
<b>Content</b>	Clear and complete description of the activity is recorded. All major points are documented.	Very good description of the activity is recorded. Most major points are documented.	Good description of the activity is recorded. Some major points have been omitted.	Limited description of the activity is recorded. Very few major points are documented.	
<b>Insight and Understanding</b>	Definite insights into the implications of the activity are recorded. Awareness of the complexity of issues and situations is present.	Some insight into the issue or situation is recorded. Some sense of complexity is present.	Insight is present from a more simplistic standpoint.	Only limited insight into the issue or situation is recorded.	
<b>Application</b>	Content of the activity is connected to the student's personal life and goals.	Content of the activity is connected to the field of automotive service.	Content of the activity is related to life in general.	Only limited connections	
<b>Total Score</b>					

Comments:



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Metal Finishing and Body Filler Rubric

Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Removes paint from damaged area	
Properly uses tools	
Applies proper technique to the situation	
Heat shrink area, if applicable.	
Cold shrink area, if applicable.	
Apply body filler.	
Rough sand.	
Final sand.	
Final stage is inspected.	
Cleanup/disposal	

**Explanation/comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Movable Glass and Hardware Rubric

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Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Inspect, adjust, and repair/replace window regulators.	
Inspect, adjust, and repair/replace run channels.	
Inspect, adjust, and repair/replace power mechanisms.	
Checks for water leaks, dust leaks, and wind noises	
Inspects weather stripping	
Properly uses tools	
Applies proper technique to the situation	
Final stage is inspected before closing.	
Cleanup/disposal	

**Explanation/comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Welding (Advanced Non-Structural) Rubric

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Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Set up welding equipment.	
Correct welding position	
Properly uses tools	
Applies proper technique to the situation	
Final stage is inspected.	
Cleanup/disposal	

**Explanation/comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Plastics and Adhesives Rubric

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Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Identify type of plastic and determine repairability.	
Proper repair procedures	
Clean and prepare the surface of plastic parts.	
Properly uses tools	
Applies proper technique to the situation	
Final stage is inspected.	
Cleanup/disposal	

**Explanation/comments:**

## Unit 8: Advanced Structural Analysis and Damage Repair

**Competency 1:** Inspect, analyze, perform skills, and evaluate vehicles pertaining to advanced structural analysis and damage repair. (DOK 2) CRN1 CRS2 CRS3 CRP4

### Suggested Enduring Understandings

1. A vehicle's structural integrity and safety are restored after an accident and returned to pre-accident condition.
2. Comprehend how components and parts are constructed and connected to the vehicle.
3. A vehicle will begin to rust, corrode, and deteriorate if the protective coating has not been applied properly.

### Suggested Essential Questions

1. As a technician repairs a damaged vehicle, what should be the repair plan?
2. How long does it take for metal to begin the rusting process?
3. When replacing structural components, what type(s) of weld is/are needed? Why?
4. What metals are weldable and non-weldable?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify, analyze, and perform frame inspection and repair. (DOK 2)	<p>a. Demonstrate the specific task(s) listed below:</p> <ul style="list-style-type: none"> <li>• Remove and replace damaged structural components according to manufacturer's specifications/procedures.</li> <li>• Restore corrosion protection to repaired or replaced frame areas.</li> </ul> <p>Students will record notes in their journals. Divide them into groups, and have each group record the steps on poster paper of the removal/replacement of structural components. Have students perform each task individually to mastery. <small>CS1 CS2, T1 E1 E2 E3 E4 M1 M8</small></p>	<p>a. Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill. Evaluate using the <b>Frame Inspection and Repair Rubric</b>.</p> <p>Evaluate the posters using the <b>Poster Assessment Rubric</b>.</p>
b. Analyze and determine necessary action to repair unibody inspection, measurement, and repair. (DOK 3)	<p>b. Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill.</p> <ul style="list-style-type: none"> <li>• Determine and inspect the locations of all suspension, steering, and power train component attaching points on the vehicle.</li> <li>• Diagnose and measure unibody vehicles using a dedicated (fixture) measuring system.</li> <li>• Diagnose and measure unibody vehicles using a universal measuring system (mechanical, electronic, laser).</li> <li>• Determine the extent of the direct and indirect damage and the direction of impact; plan and document the methods and sequence of repair.</li> <li>• Remove and replace damaged sections of structural steel body panels in accordance with manufacturer's specifications/procedures.</li> <li>• Restore corrosion protection to repaired or replaced unibody structural areas.</li> </ul> <p>Have students visually inspect a vehicle for</p>	<p>b. Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill. Evaluate using the <b>Unibody Inspection, Measurement, and Repair Rubric</b>.</p> <p>Evaluate the presentation using the <b>Group Presentation Assessment Rubric</b>. Student responses will be evaluated using peer review.</p>

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structural damage and evidence of possible damage; take pictures of the damage, and, using Photostory, present findings. Students will determine the necessary action to restore the vehicle to manufacturer's specifications. CS1 CS2, T1 T2, E1 E2 E3 E4 E6 M1 M7 W1

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c. Perform procedures to fixed glass. (DOK 2)

c. Invite a local windshield replacement company to replace a windshield on site. This will provide guided practice in the form of modeling in the lab environment.

c. Evaluate the journal using the **Journal Rubric**.

Have students work in groups and then individually to remove and reinstall or replace modular glass using manufacturer's specifications/procedures and recommended materials. Have students observe the demonstration, practice if the materials are available, and record findings in their journals. CS1 CS2 CS3 E1 E2 E3 E4 E5 E6

Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill. Evaluate using the **Fixed Glass and Hardware Rubric**.

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d. Identify and perform metal welding and cutting principles and practices. (DOK 2) PRA1

d. Identify the properties of the material to be repaired, state the proper tools and repair procedures for the material, and perform the repair procedure according to manufacturer's specifications. CS2 CS3 M1 M7

d. Evaluate using the **Activity Performance Rubric**.

Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill.

- Perform the following welds: Continuous, stitch, tack, plug, butt weld with and without backing, and lap joints.
- Perform visual and destructive tests on each weld type.
- Identify the causes of various welding defects; make necessary adjustments.
- Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments.
- Identify the cutting process for different materials and locations in accordance with manufacturer's procedures; perform the cutting operation.
- Identify different methods of attaching structural components (squeeze-type resistance spot welding (STRSW), riveting, structural adhesive,

Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill. Evaluate using the **Welding (Non-Structural) Rubric**.



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silicone bronze, etc.).

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# Standards

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## Industry Standards

- CRN1 Non-Structural Analysis and Damage Repair
- CRS2 Structural Analysis and Damage Repair
- CRS3 Mechanical and Electrical Components
- CRP4 Painting and Refinishing

## Applied Academic Credit Standards

### *Pre-Algebra*

- PRA1 Apply concepts and perform basic operations using real numbers in real-world contexts.
- PRA2 Apply properties to simplify algebraic expressions, solve linear equations and inequalities, and apply principles of graphing.
- PRA3 Identify and apply geometric principles to polygons, angles, and two- and three-dimensional figures.
- PRA4 Understand measurable attributes of objects and apply various formulas in problem-solving situations.
- PRA5 Interpret, organize, and make predictions about a variety of data using concepts of probability.

### *Survey of Mathematical Topics*

- SMT1 Compute, analyze, and develop a variety of skills necessary to manage personal and business finance to include aspects of employer–employee decision making and consumer credit.
- SMT2 Identify and apply the practices that affect employer and employee decision making.
- SMT3 Demonstrate an understanding of the impact of consumer credit.
- SMT4 Collect and apply information for planning a trip.

## 21st Century Learning Standards

- CS1 Flexibility and Adaptability
- CS2 Initiative and Self-Direction
- CS3 Social and Cross-Cultural Skills
- CS4 Productivity and Accountability
- CS5 Leadership and Responsibility

## National Education Technology Standards for Students

- T1 Creativity and Innovation
- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T4 Critical Thinking, Problem Solving, and Decision Making
- T5 Digital Citizenship
- T6 Technology Operations and Concepts

## ACT College Readiness Standards

- E1 Topic Development in Terms of Purpose and Focus
- E2 Organization, Unity, and Coherence
- E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
- E4 Sentence Structure and Formation
- E5 Conventions of Usage
- E6 Conventions of Punctuation
- M1 Basic Operations and Applications
- M2 Probability, Statistics, and Data Analysis
- M3 Numbers: Concepts and Properties
- M4 Expressions, Equations, and Inequalities

- M5 Graphical Representations
- M6 Properties of Plane Figures
- M7 Measurement
- M8 Functions
- R1 Main Ideas and Author’s Approach
- R2 Supporting Details
- R3 Sequential, Comparative, and Cause–Effect Relationships
- R4 Meaning of Words
- R5 Generalizations and Conclusions
- S1 Interpretation of Data
- S2 Scientific Investigation
- S3 Evaluation of Models, Inferences, and Experimental Results
- W1 Expressing Judgments
- W2 Focusing on the Topic
- W3 Developing a Position
- W4 Organizing Ideas
- W5 Using Language

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National Institute for Automotive Service Excellence. (n.d.). Retrieved September 12, 2008, from <http://www.asecert.org/>

# Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Activity Performance Rubric

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Task to Be Performed \_\_\_\_\_

	Possible Points	Points Awarded
<b>Safety</b> Personal safety (glasses, clothing, etc.) Safe use of tool Safely performs the task	25	
<b>Performance of the Task</b> Follows the task instructions Performs the task efficiently Performs the task satisfactorily	50	
<b>Lab Maintenance</b> Area cleanup (clean and tidy) Area organization (before, during, and after the task)	25	
<b>Total</b>	100	

**Comments for Deductions:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Group Presentation Assessment Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Content</b>	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
<b>Clarity</b>	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
<b>Presentation</b>	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
<b>Visual Aids</b>	Attractive, accurate, and grammatically correct	Adequate, mostly accurate, and few grammatical errors	Poorly planned, somewhat accurate, and some grammatical errors	Weak, inaccurate, and many grammatical errors	
<b>Length</b>	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
<b>Participation</b>	Well-balanced participation by all group members	All group members have significant participation.	Most group members participate.	One main speaker with little participation from other group members	
<b>Eye Contact</b>	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
<b>Total Score</b>					





Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Poster Assessment Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Required Content</b>	The poster includes all required content elements as well as additional information.	All required content elements are included on the poster.	All but one of the required content elements are included on the poster.	Several required content elements are missing.	
<b>Labels</b>	All items of importance on the poster are clearly labeled with labels that are easy to read.	Almost all items of importance on the poster are clearly labeled with labels that are easy to read.	Many items of importance on the poster are clearly labeled with labels that are easy to read.	Labels are too small to read, or no important items are labeled.	
<b>Attractiveness</b>	The poster is exceptionally attractive in terms of design, layout, and neatness.	The poster is attractive in terms of design, layout, and neatness.	The poster is acceptably attractive though it may be a bit messy.	The poster is distractingly messy or very poorly designed.	
<b>Grammar</b>	There are no grammatical or mechanical mistakes on the poster.	There are 1 to 2 grammatical or mechanical mistakes on the poster.	There are 3 to 4 grammatical or mechanical mistakes on the poster.	There are more than 4 grammatical or mechanical mistakes on the poster.	
<b>Total Score</b>					



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Journal Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Writing Quality</b>	There are a strong writing style and ability to express concepts learned. Excellent spelling, grammar, syntax, spelling, etc.	There are a good writing style and ability to express concepts learned. Very good grammar, syntax, spelling, etc.	There is a writing style that conveys meaning adequately. Some minor grammatical, syntax, and spelling errors	There is difficulty in expressing concepts. There is limited syntax. There are noticeable grammatical and spelling mistakes.	
<b>Content</b>	Clear and complete description of the activity is recorded. All major points are documented.	Very good description of the activity is recorded. Most major points are documented.	Good description of the activity is recorded. Some major points have been omitted.	Limited description of the activity is recorded. Very few major points are documented.	
<b>Insight and Understanding</b>	Definite insights into the implications of the activity are recorded. Awareness of the complexity of issues and situations is present.	Some insight into the issue or situation is recorded. Some sense of complexity is present.	Insight is present from a more simplistic standpoint.	Only limited insight into the issue or situation is recorded.	
<b>Application</b>	Content of the activity is connected to the student's personal life and goals.	Content of the activity is connected to the field of automotive service.	Content of the activity is related to life in general.	Only limited connections	
<b>Total Score</b>					

**Comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Frame Inspection and Repair Rubric

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Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Identifies damaged or misaligned areas	
Remove and replace damaged structural components according to manufacturer's specifications/procedures.	
Restore corrosion protection to repaired or replaced frame areas.	
Properly uses tools	
Applies proper technique to the situation	
Final stage is inspected.	
Cleanup/disposal	

**Explanation/comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Unibody Inspection, Measurement, and Repair Rubric

Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Inspects all components related to the damaged area (steering and power train)	
Identify misaligned components.	
Determine the extent of the direct and indirect damage and the direction of impact.	
Remove and replace damaged sections of structural steel body panels.	
Restore corrosion protection to repaired or replaced unibody structural areas.	
Properly uses tools	
Applies proper technique to the situation	
Final stage is inspected.	
Cleanup/disposal	

**Explanation/comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Fixed Glass and Hardware Rubric

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Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Modular glass (remove and reinstall or replace)	
Checks for water leaks, dust leaks, and wind noises	
Inspects weather stripping	
Properly uses tools	
Applies proper technique to the situation	
Final stage is inspected before closing.	
Cleanup/disposal	

**Explanation/comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Welding (Non-Structural) Rubric

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Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Set up welding equipment.	
Correct welding position	
Perform visual and destructive tests on each weld type.	
Identify the causes of various welding defects.	
Properly uses tools	
Applies proper technique to the situation	
Final stage is inspected.	
Cleanup/disposal	

**Explanation/comments:**

## Unit 9: Advanced Painting and Refinishing

**Competency 1:** Identify, perform, and appraise vehicles pertaining to advanced painting and refinishing. (DOK 2)  
CRN1 CRS2 CRS3 CRP4

### Suggested Enduring Understandings

1. Proper sandpaper selection and usage greatly affects end product quality during refinishing procedures.
2. Proper application techniques greatly influence top coat appearance and quality.

### Suggested Essential Questions

1. What sandpaper grit should be used in final preparation for single-stage, base coat/clear coat, blending, multistage, and overall refinishing?
2. What sandpaper grit should be used in preparation for rigid, semi-rigid, and flexible plastic parts refinishing?
3. Should a paint formula be adjusted to match a vehicle's exact color?
4. How do you tell base coat from single-stage topcoats?
5. What color residue is formed from wet sanding the top coat?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify and perform paint related skills and techniques as it pertains to mixing, matching, and applying. (DOK 2)	<p>a. Acquire panels of different paint type (base coat, single coat, and tri-coat). Place students in groups of three to four, and allow the students to wet sand the panels and observe the residue from the sanding procedures. <small>CS4 M1 M7</small></p> <p>Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill.</p> <ul style="list-style-type: none"> <li>• Apply single-stage topcoat for refinishing.</li> <li>• Apply base coat/clear coat for panel blending or partial refinishing.</li> <li>• Apply base coat/clear coat for overall refinishing.</li> <li>• Refinish rigid, semi-rigid, and flexible plastic parts.</li> <li>• Apply multistage (tri-coat) coats for panel blending or overall refinishing.</li> <li>• Identify and mix paint using a formula.</li> <li>• Identify poor hiding colors; determine necessary action.</li> <li>• Tint color using a formula to achieve a blendable match.</li> <li>• Identify an alternative color formula to achieve a blendable match.</li> </ul>	<p>a. Allow students to observe residue to determine different topcoats. Evaluate using the <b>Activity Performance Rubric</b>.</p> <p>Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill. Evaluate using the <b>Paint (Mixing, Matching, and Applying) Rubric I</b>.</p>
b. Identify and analyze paint defect causes and cures. (DOK 3)	b. Show students video on the proper application of topcoats of different types (base coats/clear coats, single-coat, and tri-coat) describing gun	b. Peer review the procedures. Students will make

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distance and fan pattern. After viewing the film, allow students to apply different types of paints to panels. Techniques should match film techniques.

CS1, T1 T2 M1 M7

Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill.

- Identify blistering (raising of the paint surface); determine the cause(s), and correct the condition.
- Identify blushing (milky or hazy formation); determine the cause(s), and correct the condition.
- Identify a dry spray appearance in the paint surface; determine the cause(s), and correct the condition.
- Identify the presence of fish-eyes (crater-like openings) in the finish; determine the cause(s), and correct the condition.
- Identify lifting; determine the cause(s), and correct the condition.
- Identify clouding (mottling and streaking in metallic finishes); determine the cause(s), and correct the condition.
- Identify orange peel; determine the cause(s), and correct the condition.
- Identify overspray; determine the cause(s), and correct the condition.
- Identify solvent popping in a freshly painted surface; determine the cause(s), and correct the condition.
- Identify sags and runs in a paint surface; determine the cause(s), and correct the condition.
- Identify sanding marks (sandscratch swelling); determine the cause(s), and correct the condition.
- Identify color difference (off-shade); determine the cause(s), and correct the condition.
- Identify tape tracking; determine the cause(s), and correct the condition.
- Identify low gloss condition; determine the cause(s), and correct the condition.
- Identify poor adhesion; determine the cause(s), and correct the condition.
- Identify paint cracking (crow's feet or line-checking, micro-checking, etc.); determine the cause(s), and correct the condition.
- Identify corrosion; determine the cause(s), and correct the condition.

recommendations of how to improve the process.

Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill. Evaluate using the **Paint (Mixing, Matching, and Applying) Rubric II**.



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- Identify dirt or dust in the paint surface; determine the cause(s), and correct the condition.
  - Identify water spotting; determine the cause(s), and correct the condition.
  - Identify finish damage caused by bird droppings, tree sap, and other natural causes; correct the condition.
  - Identify die-back conditions (dulling of the paint film showing haziness); determine the cause(s), and correct the condition.
  - Identify chalking (oxidation); determine the cause(s), and correct the condition.
  - Identify bleed-through (staining); determine the cause(s), and correct the condition.
  - Identify pin-holing; determine the cause(s), and correct the condition.
  - Identify buffing-related imperfections (swirl marks, wheel burns); correct the condition.
  - Measure mil thickness.

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c. Explain and perform final detail practices. (DOK 2)

c. Students will observe the instructor demonstrating the given task(s). Each student will perform the task(s). Provide guided practice in the form of modeling in the lab environment the following skills. Have students work in groups and then individually to perform each skill.

- Apply decals, transfers, tapes, woodgrains, pinstripes (painted and taped), and so forth. (DOK 2)
- Denib, buff, and polish finishes where necessary. (DOK 2)

c. Provide feedback to students related to each skill performed. Continue to provide lab opportunities to students until mastery is reached in each skill. Evaluate student performances using the **Paint Defects Rubric I and Paint Defects Rubric II**.

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# Standards

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## Industry Standards

- CRN1 Non-Structural Analysis and Damage Repair
- CRS2 Structural Analysis and Damage Repair
- CRS3 Mechanical and Electrical Components
- CRP4 Painting and Refinishing

## Applied Academic Credit Standards

### *Pre-Algebra*

- PRA1 Apply concepts and perform basic operations using real numbers in real-world contexts.
- PRA2 Apply properties to simplify algebraic expressions, solve linear equations and inequalities, and apply principles of graphing.
- PRA3 Identify and apply geometric principles to polygons, angles, and two- and three-dimensional figures.
- PRA4 Understand measurable attributes of objects and apply various formulas in problem-solving situations.
- PRA5 Interpret, organize, and make predictions about a variety of data using concepts of probability.

### *Survey of Mathematical Topics*

- SMT1 Compute, analyze, and develop a variety of skills necessary to manage personal and business finance to include aspects of employer–employee decision making and consumer credit.
- SMT2 Identify and apply the practices that affect employer and employee decision making.
- SMT3 Demonstrate an understanding of the impact of consumer credit.
- SMT4 Collect and apply information for planning a trip.

## 21st Century Learning Standards

- CS1 Flexibility and Adaptability
- CS2 Initiative and Self-Direction
- CS3 Social and Cross-Cultural Skills
- CS4 Productivity and Accountability
- CS5 Leadership and Responsibility

## National Education Technology Standards for Students

- T1 Creativity and Innovation
- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T4 Critical Thinking, Problem Solving, and Decision Making
- T5 Digital Citizenship
- T6 Technology Operations and Concepts

## ACT College Readiness Standards

- E1 Topic Development in Terms of Purpose and Focus
- E2 Organization, Unity, and Coherence
- E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
- E4 Sentence Structure and Formation
- E5 Conventions of Usage
- E6 Conventions of Punctuation
- M1 Basic Operations and Applications
- M2 Probability, Statistics, and Data Analysis
- M3 Numbers: Concepts and Properties
- M4 Expressions, Equations, and Inequalities

- M5 Graphical Representations
- M6 Properties of Plane Figures
- M7 Measurement
- M8 Functions
- R1 Main Ideas and Author's Approach
- R2 Supporting Details
- R3 Sequential, Comparative, and Cause–Effect Relationships
- R4 Meaning of Words
- R5 Generalizations and Conclusions
- S1 Interpretation of Data
- S2 Scientific Investigation
- S3 Evaluation of Models, Inferences, and Experimental Results
- W1 Expressing Judgments
- W2 Focusing on the Topic
- W3 Developing a Position
- W4 Organizing Ideas
- W5 Using Language

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## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Activity Performance Rubric

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Task to Be Performed \_\_\_\_\_

	Possible Points	Points Awarded
<b>Safety</b> Personal safety (glasses, clothing, etc.) Safe use of tool Safely performs the task	25	
<b>Performance of the Task</b> Follows the task instructions Performs the task efficiently Performs the task satisfactorily	50	
<b>Lab Maintenance</b> Area cleanup (clean and tidy) Area organization (before, during, and after the task)	25	
<b>Total</b>	100	

**Comments for Deductions:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Paint (Mixing, Matching, and Applying) Rubric I

Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Apply base coat/clear coat for panel blending or partial refinishing.	
Apply base coat/clear coat for overall refinishing.	
Refinish rigid, semi-rigid, and flexible plastic parts.	
Apply multistage (tri-coat) coats for panel blending or overall refinishing.	
Properly uses tools	
Applies proper technique to the situation	
Final stage is inspected.	
Cleanup/disposal	

**Explanation/comments:**





Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Paint (Mixing, Matching, and Applying) Rubric II

Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Identify and mix paint using a formula.	
Identify poor hiding colors; determine necessary action.	
Tint color using a formula to achieve a blendable match.	
Identify an alternative color formula to achieve a blendable match.	
Properly uses tools	
Applies proper technique to the situation	
Final stage is inspected.	
Cleanup/disposal	

**Explanation/comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Paint Defects Rubric I

Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Identify the defect (Circle the ones that apply.): <ul style="list-style-type: none"> <li>• Blistering (raising of the paint surface)</li> <li>• Blushing (milky or hazy formation)</li> <li>• Dry spray appearance in the paint surface</li> <li>• Fish-eyes (crater-like openings) in the finish</li> <li>• Lifting</li> <li>• Clouding (mottling and streaking in metallic finishes)</li> <li>• Orange peel; overspray</li> <li>• Solvent popping in freshly painted surface</li> <li>• Sags and runs in paint surface</li> <li>• Sanding marks (sandscratch swelling)</li> <li>• Color difference (off-shade)</li> <li>• Tape tracking</li> <li>• Low gloss condition</li> </ul>	
Determine the cause(s), and state how to correct the condition.	
Final stage is inspected.	
Cleanup/disposal	
Total	

**Explanation/comments:**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Paint Defects Rubric II

Rate the ability of the student to perform welding tasks shown below using the following scale:

- 4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker
- 3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker
- 2 Introductory – Can perform the task, but some coaching and further training are required.
- 1 Limited – Can perform the task with extensive coaching. Further training and practice are required.

Task	Rating
Explanation (Student must explain job actions before beginning.)	
Safety procedures	
Identify the defect (Circle the ones that apply.): <ul style="list-style-type: none"> <li>• Poor adhesion</li> <li>• Paint cracking (crow's feet or line-checking, micro-checking, etc.)</li> <li>• Corrosion</li> <li>• Dirt or dust in the paint surface</li> <li>• Water spotting</li> <li>• Finish damage caused by bird droppings, tree sap, and other natural causes</li> <li>• Die-back conditions (dulling of the paint film showing haziness)</li> <li>• Chalking (oxidation)</li> <li>• Bleed-through (staining)</li> <li>• Pin-holing</li> <li>• Buffing-related imperfections (swirl marks, wheel burns)</li> </ul>	
Determine the cause(s), and state how to correct the condition.	
Measure mil thickness.	
Cleanup/disposal	
Total	

**Explanation/comments:**

# Student Competency Profile

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Student's Name: \_\_\_\_\_



This record is intended to serve as a method of noting student achievement of the competencies in each course. This record can be duplicated for each student, and it can serve as a cumulative record of competencies achieved over the course.

In the blank before each competency, place the date on which the student mastered the competency.

## Unit 1: Fundamentals of Collision Repair

- \_\_\_\_\_ 1. Introduce, describe, and distinguish local program and vocational/career technical center policies and procedures. (DOK 1)
- \_\_\_\_\_ 2. Introduce, describe, and express employment opportunities and responsibilities of the collision repair industry. (DOK 1)
- \_\_\_\_\_ 3. Investigate and replicate leadership skills and personal development. (DOK 1)
- \_\_\_\_\_ 4. Model general safety rules for working in a shop/lab and an industry setting. (DOK 3)
- \_\_\_\_\_ 5. Interpret and apply service specifications and information. (DOK 3)
- \_\_\_\_\_ 6. Demonstrate measurement practices used in the automotive service. (DOK 2)
- \_\_\_\_\_ 7. Manage personal and business finances to include aspects of employer–employee decision making and consumer credit. (DOK 2)

## Unit 2: Fundamentals of Collision Repair (Mechanical and Electrical Components)

- \_\_\_\_\_ 1. Identify, evaluate, and practice suspension and steering components and systems. (DOK 2)
- \_\_\_\_\_ 2. Practice concepts and procedures related to electrical/electronic systems. (DOK 2)
- \_\_\_\_\_ 3. Diagnose and apply practices related to brakes and braking systems. (DOK 3)
- \_\_\_\_\_ 4. Discuss and apply practices related to heating and air conditioning. (DOK 1)
- \_\_\_\_\_ 5. Identify and discuss cooling systems. (DOK 1)
- \_\_\_\_\_ 6. Diagnose and repair active restraint systems procedures and practices. (DOK 2)

## Unit 3: Fundamentals of Collision Repair (Basic Non-Structural Analysis and Damage Repair)

- \_\_\_\_\_ 1. Inspect, analyze, perform, and evaluate procedures and skills pertaining to non-structural analysis and damage repair. (DOK 3)

## Unit 4: Fundamentals of Collision Repair (Basic Structural Analysis and Damage Repair)

- \_\_\_\_\_ 1. Inspect and apply skills and techniques related to vehicles pertaining to structural and damage repair. (DOK 3)
- \_\_\_\_\_ 2. Identify, analyze, and perform the proper metal welding procedures to complete a repair according to manufacturer's specifications. (DOK 3)

## Unit 5: Intermediate Painting and Refinishing

- \_\_\_\_\_ 1. Identify, perform, and appraise vehicles as it pertains to painting and refinishing. (DOK 3)

**Unit 6: Safety (Review), Employability Skills, and Business Skills**

- \_\_\_\_\_ 1. Introduce and understand general safety rules for working in a shop/lab and industry. (DOK 1)  
Demonstrate proper use and care for laboratory equipment related to the collision industry.
- \_\_\_\_\_ 2. (DOK 2)

**Unit 7: Advanced Non-Structural Analysis and Damage Repair**

- Inspect, analyze, perform, and evaluate procedures and skills pertaining to advanced non-  
\_\_\_\_\_ 1. structural analysis and damage repair. (DOK 2)

**Unit 8: Advanced Structural Analysis and Damage Repair**

- Inspect, analyze, perform skills, and evaluate vehicles pertaining to advanced structural analysis  
\_\_\_\_\_ 1. and damage repair. (DOK 2)

**Unit 9: Advanced Painting and Refinishing**

- \_\_\_\_\_ 1. Identify, perform, and appraise vehicles pertaining to advanced painting and refinishing. (DOK 2)

# Appendix A: 21st Century Skills Standards

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- CLS1 Flexibility and Adaptability
- CLS2 Initiative and Self-Direction
- CLS3 Social and Cross-Cultural Skills
- CLS4 Productivity and Accountability
- CLS5 Leadership and Responsibility

Today's life and work environments require far more than thinking skills and content knowledge. The ability to navigate the complex life and work environments in the globally competitive information age requires students to pay rigorous attention to developing adequate life and career skills.

## **CS 1 Flexibility and Adaptability**

- Adapting to varied roles and responsibilities
- Working effectively in a climate of ambiguity and changing priorities

## **CS 2 Initiative and Self-Direction**

- Monitoring one's own understanding and learning needs
- Going beyond basic mastery of skills and/or curriculum to explore and expand one's own learning and opportunities to gain expertise
- Demonstrating initiative to advance skill levels toward a professional level
- Defining, prioritizing, and completing tasks without direct oversight
- Utilizing time efficiently and managing workload
- Demonstrating commitment to learning as a lifelong process

## **CS 3 Social and Cross-Cultural Skills**

- Working appropriately and productively with others
- Leveraging the collective intelligence of groups when appropriate
- Bridging cultural differences and using differing perspectives to increase innovation and the quality of work

## **CS 4 Productivity and Accountability**

- Setting and meeting high standards and goals for delivering quality work on time
- Demonstrating diligence and a positive work ethic (e.g., being punctual and reliable)

## **CS 5 Leadership and Responsibility**

- Using interpersonal and problem-solving skills to influence and guide others toward a goal
- Leveraging strengths of others to accomplish a common goal
- Demonstrating integrity and ethical behavior
- Acting responsibly with the interests of the larger community in mind

# Appendix B: Mississippi Academic Standards

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## Pre-Algebra

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- PRA1 Apply concepts and perform basic operations using real numbers in real-world contexts.
- PRA2 Apply properties to simplify algebraic expressions, solve linear equations and inequalities, and apply principles of graphing.
- PRA3 Identify and apply geometric principles to polygons, angles, and two- and three-dimensional figures.
- PRA4 Understand measurable attributes of objects and apply various formulas in problem-solving situations.
- PRA5 Interpret, organize, and make predictions about a variety of data using concepts of probability.

**1. Apply concepts and perform basic operations using real numbers in real-world contexts.**

- a. Define, classify, and order rational and irrational numbers and their subsets. (DOK 1)
- b. Formulate and solve standard and real-life problems involving addition, subtraction, multiplication, and division of rational numbers. (DOK 2)
- c. Apply the concepts of greatest common factor (GCF) and least common multiple (LCM) to monomials with variables. (DOK 2)
- d. Simplify and evaluate expressions using order of operations, and use real number properties to justify solutions. (DOK 2)
- e. Explain the rules of exponents related to multiplication and division of terms with exponents. (DOK 2)
- f. Recognize and appropriately use exponential and scientific notation. (DOK 1)
- g. Explain and use the inverse relationship between square roots and squares. (DOK 2)

**2. Apply properties to simplify algebraic expressions, solve linear equations and inequalities, and apply principles of graphing.**

- a. Simplify and evaluate numerical and algebraic expressions. (DOK 1)
- b. Apply properties of real numbers with an emphasis on the distributive properties of multiplication over addition and subtraction. (DOK 1)
- c. Solve and check equations and inequalities using one variable. (DOK 2)
- d. Model inequalities (and their solutions) on a number line. (DOK 1)
- e. Graph linear equations and nonlinear equations ( $y = x^2$ ) using multiple methods including t-tables and slope–intercept. (DOK 2)
- f. Given a linear graph, identify its slope as positive, negative, undefined, or zero, and interpret slope as rate of change. (DOK 2)
- g. Determine slope, x-intercept, and y-intercept from a graph and/or equation in slope–intercept or standard form. (DOK 1)
- h. Add, subtract, and multiply monomials and binomials. (DOK 1)
- i. Predict characteristics of a graph given an equation or t-table. (DOK 2)

**3. Identify and apply geometric principles to polygons, angles, and two- and three-dimensional figures.**

- a. Locate and identify angles formed by parallel lines cut by a transversal(s) (e.g., adjacent, vertical, complementary, supplementary, corresponding, alternate interior, and alternate exterior). (DOK 1)
- b. Find missing angle measurements for parallel lines cut by a transversal(s) and for a vertex of a polygon. (DOK 1)
- c. Explain the Pythagorean theorem, and apply it to solve routine and non-routine problems. (DOK 3)
- d. Solve real-world and non-routine problems involving congruent and similar figures. (DOK 3)
- e. Use two-dimensional representations (nets) of three-dimensional objects to describe objects from various perspectives. (DOK 2)

4. **Understand measurable attributes of objects, and apply various formulas in problem-solving situations.**
  - a. Solve real-world application problems that include length, area, perimeter, and circumference using standard measurements. (DOK 2)
  - b. Develop, analyze, and explain methods for solving problems involving proportions, such as scaling and finding equivalent ratios. (DOK 3)
  - c. Use formulas and/or appropriate measuring tools to find length and angle measures (to appropriate levels of precision), perimeter, area, volume, and surface area of polygons, circles, spheres, cones, pyramids, and composite or irregular figures. (DOK 1)
5. **Interpret, organize, and make predictions about a variety of data using concepts of probability.**
  - a. Use a given mean, mode, median, and range to summarize and compare data sets including investigation of the different effects that change in data values have on these measures. (DOK 2)
  - b. Select the appropriate measures of central tendency for a particular purpose. (DOK 2)
  - c. Make and list conjectures by calculating probability for experimental or simulated contexts. (DOK 3)
  - d. Construct and interpret scatterplots to generalize trends from given data sets. (DOK 3)

## Survey of Mathematical Topics

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- SMT1 Compute, analyze, and develop a variety of skills necessary to manage personal and business finance to include aspects of employer–employee decision making and consumer credit.
- SMT2 Identify and apply the practices that affect employer and employee decision making.
- SMT3 Demonstrate an understanding of the impact of consumer credit.
- SMT4 Collect and apply information for planning a trip.

1. **Compute, analyze, and develop a variety of skills necessary to manage personal and business finance to include aspects of employer–employee decision making and consumer credit.**
  - a. Develop a household budget. (DOK 2)
  - b. Use and apply basic accounting procedures to maintain and balance a checkbook. (DOK 2)
  - c. Identify the terminology of and apply the process of filing personal income tax. (DOK 2)
  - d. Identify and explain the components and processes involved in the purchase, operation, and maintenance of a personal vehicle. (DOK 2)
  - e. Determine the advantages and disadvantages of housing alternatives. (DOK 2)
  - f. Use information and data to make sound decisions regarding personal savings. (DOK 3)
  - g. Identify life and health insurance terminology, and apply it to real-world situations. (DOK 2)
  - h. Compute and compare various forms of earnings, and calculate gross pay, deductions, and net pay. (DOK 2)
  - i. Compare and contrast the finances of credit cards. (DOK 2)
  - j. Identify and evaluate modes of transportation. (DOK 2)
  - k. Identify and explain the components and processes involved in the stock market, and apply them to real-world applications. (DOK 2)
2. **Identify and apply the practices that affect employer and employee decision making.**
  - a. Identify and apply appropriate algebraic formulas to personal finance situations. (DOK 2)
  - b. Apply linear programming to business decisions. (DOK 2)
  - c. Identify and apply appropriate algebraic formulas to personal and business investments. (DOK 2)
3. **Demonstrate an understanding of the impact of consumer credit.**
  - a. Identify and explain the advantages and disadvantages of installment loans. (DOK 2)
  - b. Identify and apply appropriate algebraic formulas to consumer credit. (DOK 2)
4. **Collect and apply information for planning a trip.**
  - a. Investigate and evaluate modes of transportation. (DOK 2)
  - b. Create a travel budget. (DOK 2)



- c. Make travel plans based upon airline schedules. (DOK 2)
- d. Apply map-reading skills. (DOK 1)
- e. Apply appropriate formulas used for planning a trip. (DOK 1)

# Appendix C: ACT College Readiness Standards

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## English

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### E1 Topic Development in Terms of Purpose and Focus

- Identify the basic purpose or role of a specified phrase or sentence.
- Delete a clause or sentence because it is obviously irrelevant to the essay.
- Identify the central idea or main topic of a straightforward piece of writing.
- Determine relevancy when presented with a variety of sentence-level details.
- Identify the focus of a simple essay, applying that knowledge to add a sentence that sharpens that focus or to determine if an essay has met a specified goal.
- Delete material primarily because it disturbs the flow and development of the paragraph.
- Add a sentence to accomplish a fairly straightforward purpose such as illustrating a given statement.
- Apply an awareness of the focus and purpose of a fairly involved essay to determine the rhetorical effect and suitability of an existing phrase or sentence or to determine the need to delete plausible but irrelevant material.
- Add a sentence to accomplish a subtle rhetorical purpose such as to emphasize, to add supporting detail, or to express meaning through connotation.
- Determine whether a complex essay has accomplished a specific purpose.
- Add a phrase or sentence to accomplish a complex purpose, often expressed in terms of the main focus of the essay.

### E2 Organization, Unity, and Coherence

- Use conjunctive adverbs or phrases to show time relationship in simple narrative essays (e.g., *then, this time, etc.*).
- Select the most logical place to add a sentence in a paragraph.
- Use conjunctive adverbs or phrases to express straightforward logical relationships (e.g., *first, afterward, in response*).
- Decide the most logical place to add a sentence in an essay.
- Add a sentence that introduces a simple paragraph.
- Determine the need for conjunctive adverbs or phrases to create subtle logical connections between sentences (e.g., *therefore, however, in addition*).
- Rearrange the sentences in a fairly uncomplicated paragraph for the sake of logic.
- Add a sentence to introduce or conclude the essay or to provide a transition between paragraphs when the essay is fairly straightforward.
- Make sophisticated distinctions concerning the logical use of conjunctive adverbs or phrases, particularly when signaling a shift between paragraphs.
- Rearrange sentences to improve the logic and coherence of a complex paragraph.
- Add a sentence to introduce or conclude a fairly complex paragraph.
- Consider the need for introductory sentences or transitions, basing decisions on a thorough understanding of both the logic and rhetorical effect of the paragraph and essay.

### E3 Word Choice in Terms of Style, Tone, Clarity, and Economy

- Revise sentences to correct awkward and confusing arrangements of sentence elements.
- Revise vague nouns and pronouns that create obvious logic problems.
- Delete obviously synonymous and wordy material in a sentence.
- Revise expressions that deviate from the style of an essay.
- Delete redundant material when information is repeated in different parts of speech (e.g., *alarmingly startled*).

- Use the word or phrase most consistent with the style and tone of a fairly straightforward essay.
- Determine the clearest and most logical conjunction to link clauses.
- Revise a phrase that is redundant in terms of the meaning and logic of the entire sentence.
- Identify and correct ambiguous pronoun references.
- Use the word or phrase most appropriate in terms of the content of the sentence and tone of the essay.
- Correct redundant material that involves sophisticated vocabulary and sounds acceptable as conversational English (e.g., *an aesthetic viewpoint* versus *the outlook of an aesthetic viewpoint*).
- Correct vague and wordy or clumsy and confusing writing containing sophisticated language.
- Delete redundant material that involves subtle concepts or that is redundant in terms of the paragraph as a whole.

#### **E4 Sentence Structure and Formation**

- Use conjunctions or punctuation to join simple clauses.
- Revise shifts in verb tense between simple clauses in a sentence or between simple adjoining sentences.
- Determine the need for punctuation and conjunctions to avoid awkward-sounding sentence fragments and fused sentences.
- Decide the appropriate verb tense and voice by considering the meaning of the entire sentence.
- Recognize and correct marked disturbances of sentence flow and structure (e.g., participial phrase fragments, missing or incorrect relative pronouns, dangling or misplaced modifiers).
- Revise to avoid faulty placement of phrases and faulty coordination and subordination of clauses in sentences with subtle structural problems.
- Maintain consistent verb tense and pronoun person on the basis of the preceding clause or sentence.
- Use sentence-combining techniques, effectively avoiding problematic comma splices, run-on sentences, and sentence fragments, especially in sentences containing compound subjects or verbs.
- Maintain a consistent and logical use of verb tense and pronoun person on the basis of information in the paragraph or essay as a whole.
- Work comfortably with long sentences and complex clausal relationships within sentences, avoiding weak conjunctions between independent clauses and maintaining parallel structure between clauses.

#### **E5 Conventions of Usage**

- Solve such basic grammatical problems as how to form the past and past participle of irregular but commonly used verbs and how to form comparative and superlative adjectives.
- Solve such grammatical problems as whether to use an adverb or adjective form, how to ensure straightforward subject–verb and pronoun–antecedent agreement, and which preposition to use in simple contexts.
- Recognize and use the appropriate word in frequently confused pairs such as *there* and *their*, *past* and *passed*, and *led* and *lead*.
- Use idiomatically appropriate prepositions, especially in combination with verbs (e.g., *long for*, *appeal to*).
- Ensure that a verb agrees with its subject when there is some text between the two.
- Ensure that a pronoun agrees with its antecedent when the two occur in separate clauses or sentences.
- Identify the correct past and past participle forms of irregular and infrequently used verbs and form present–perfect verbs by using *have* rather than *of*.
- Correctly use reflexive pronouns, the possessive pronouns *its* and *your*, and the relative pronouns *who* and *whom*.
- Ensure that a verb agrees with its subject in unusual situations (e.g., when the subject–verb order is inverted or when the subject is an indefinite pronoun).
- Provide idiomatically and contextually appropriate prepositions following verbs in situations involving sophisticated language or ideas.
- Ensure that a verb agrees with its subject when a phrase or clause between the two suggests a different number for the verb.

## E6 Conventions of Punctuation

- Delete commas that create basic sense problems (e.g., between verb and direct object).
- Provide appropriate punctuation in straightforward situations (e.g., items in a series).
- Delete commas that disturb the sentence flow (e.g., between modifier and modified element).
- Use commas to set off simple parenthetical phrases.
- Delete unnecessary commas when an incorrect reading of the sentence suggests a pause that should be punctuated (e.g., between verb and direct object clause).
- Use punctuation to set off complex parenthetical phrases.
- Recognize and delete unnecessary commas based on a careful reading of a complicated sentence (e.g., between the elements of a compound subject or compound verb joined by *and*).
- Use apostrophes to indicate simple possessive nouns.
- Recognize inappropriate uses of colons and semicolons.
- Use commas to set off a nonessential/nonrestrictive appositive or clause.
- Deal with multiple punctuation problems (e.g., compound sentences containing unnecessary commas and phrases that may or may not be parenthetical).
- Use an apostrophe to show possession, especially with irregular plural nouns.
- Use a semicolon to indicate a relationship between closely related independent clauses.
- Use a colon to introduce an example or an elaboration.

## Math

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### M1 Basic Operations and Applications

- Perform one-operation computation with whole numbers and decimals.
- Solve problems in one or two steps using whole numbers.
- Perform common conversions (e.g., inches to feet or hours to minutes).
- Solve routine one-step arithmetic problems (using whole numbers, fractions, and decimals) such as single-step percent.
- Solve some routine two-step arithmetic problems.
- Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, and computing with a given average.
- Solve multistep arithmetic problems that involve planning or converting units of measure (e.g., feet per second to miles per hour).
- Solve word problems containing several rates, proportions, or percentages.
- Solve complex arithmetic problems involving percent of increase or decrease and problems requiring integration of several concepts from pre-algebra and/or pre-geometry (e.g., comparing percentages or averages, using several ratios, and finding ratios in geometry settings).

### M2 Probability, Statistics, and Data Analysis

- Calculate the average of a list of positive whole numbers.
- Perform a single computation using information from a table or chart.
- Calculate the average of a list of numbers.
- Calculate the average, given the number of data values and the sum of the data values.
- Read tables and graphs.
- Perform computations on data from tables and graphs.
- Use the relationship between the probability of an event and the probability of its complement.
- Calculate the missing data value, given the average and all data values but one.
- Translate from one representation of data to another (e.g., a bar graph to a circle graph).
- Determine the probability of a simple event.
- Exhibit knowledge of simple counting techniques.\*
- Calculate the average, given the frequency counts of all the data values.
- Manipulate data from tables and graphs.

- Compute straightforward probabilities for common situations.
- Use Venn diagrams in counting.\*
- Calculate or use a weighted average.
- Interpret and use information from figures, tables, and graphs.
- Apply counting techniques.
- Compute a probability when the event and/or sample space is not given or obvious.
- Distinguish between mean, median, and mode for a list of numbers.
- Analyze and draw conclusions based on information from figures, tables, and graphs.
- Exhibit knowledge of conditional and joint probability.

### **M3 Numbers: Concepts and Properties**

- Recognize equivalent fractions and fractions in lowest terms.
- Recognize one-digit factors of a number.
- Identify a digit's place value.
- Exhibit knowledge of elementary number concepts including rounding, the ordering of decimals, pattern identification, absolute value, primes, and greatest common factor.
- Find and use the least common multiple.
- Order fractions.
- Work with numerical factors.
- Work with scientific notation.
- Work with squares and square roots of numbers.
- Work problems involving positive integer exponents.\*
- Work with cubes and cube roots of numbers.\*
- Determine when an expression is undefined.\*
- Exhibit some knowledge of the complex numbers.†
- Apply number properties involving prime factorization.
- Apply number properties involving even and odd numbers and factors and multiples.
- Apply number properties involving positive and negative numbers.
- Apply rules of exponents.
- Multiply two complex numbers.†
- Draw conclusions based on number concepts, algebraic properties, and/or relationships between expressions and numbers .
- Exhibit knowledge of logarithms and geometric sequences.
- Apply properties of complex numbers.

### **M4 Expressions, Equations, and Inequalities**

- Exhibit knowledge of basic expressions (e.g., identify an expression for a total as  $b + g$ ).
- Solve equations in the form  $x + a = b$ , where  $a$  and  $b$  are whole numbers or decimals.
- Substitute whole numbers for unknown quantities to evaluate expressions.
- Solve one-step equations having integer or decimal answers.
- Combine like terms (e.g.,  $2x + 5x$ ).
- Evaluate algebraic expressions by substituting integers for unknown quantities.
- Add and subtract simple algebraic expressions.
- Solve routine first-degree equations.
- Perform straightforward word-to-symbol translations.
- Multiply two binomials.\*
- Solve real-world problems using first-degree equations.
- Write expressions, equations, or inequalities with a single variable for common pre-algebra settings (e.g., rate and distance problems and problems that can be solved by using proportions).
- Identify solutions to simple quadratic equations.
- Add, subtract, and multiply polynomials.\*

- Factor simple quadratics (e.g., the difference of squares and perfect square trinomials).\*
- Solve first-degree inequalities that do not require reversing the inequality sign.\*
- Manipulate expressions and equations.
- Write expressions, equations, and inequalities for common algebra settings.
- Solve linear inequalities that require reversing the inequality sign.
- Solve absolute value equations.
- Solve quadratic equations.
- Find solutions to systems of linear equations.
- Write expressions that require planning and/or manipulating to accurately model a situation.
- Write equations and inequalities that require planning, manipulating, and/or solving.
- Solve simple absolute value inequalities.

### M5 Graphical Representations

- Identify the location of a point with a positive coordinate on the number line.
- Locate points on the number line and in the first quadrant.
- Locate points in the coordinate plane.
- Comprehend the concept of length on the number line.\*
- Exhibit knowledge of slope.\*
- Identify the graph of a linear inequality on the number line.\*
- Determine the slope of a line from points or equations.\*
- Match linear graphs with their equations.\*
- Find the midpoint of a line segment.\*
- Interpret and use information from graphs in the coordinate plane.
- Match number line graphs with solution sets of linear inequalities.
- Use the distance formula.
- Use properties of parallel and perpendicular lines to determine an equation of a line or coordinates of a point.
- Recognize special characteristics of parabolas and circles (e.g., the vertex of a parabola and the center or radius of a circle).†
- Match number line graphs with solution sets of simple quadratic inequalities.
- Identify characteristics of graphs based on a set of conditions or on a general equation such as  $y = ax^2 + c$ .
- Solve problems integrating multiple algebraic and/or geometric concepts.
- Analyze and draw conclusions based on information from graphs in the coordinate plane.

### M6 Properties of Plane Figures

- Exhibit some knowledge of the angles associated with parallel lines.
- Find the measure of an angle using properties of parallel lines.
- Exhibit knowledge of basic angle properties and special sums of angle measures (e.g.,  $90^\circ$ ,  $180^\circ$ , and  $360^\circ$ ).
- Use several angle properties to find an unknown angle measure.
- Recognize Pythagorean triples.\*
- Use properties of isosceles triangles.\*
- Apply properties of  $30^\circ$ - $60^\circ$ - $90^\circ$ ,  $45^\circ$ - $45^\circ$ - $90^\circ$ , similar, and congruent triangles.
- Use the Pythagorean theorem.
- Draw conclusions based on a set of conditions.
- Solve multistep geometry problems that involve integrating concepts, planning, visualization, and/or making connections with other content areas.
- Use relationships among angles, arcs, and distances in a circle.

### M7 Measurement

- Estimate or calculate the length of a line segment based on other lengths given on a geometric figure.
- Compute the perimeter of polygons when all side lengths are given.

- Compute the area of rectangles when whole number dimensions are given.
- Compute the area and perimeter of triangles and rectangles in simple problems.
- Use geometric formulas when all necessary information is given.
- Compute the area of triangles and rectangles when one or more additional simple steps are required.
- Compute the area and circumference of circles after identifying necessary information.
- Compute the perimeter of simple composite geometric figures with unknown side lengths.\*
- Use relationships involving area, perimeter, and volume of geometric figures to compute another measure.
- Use scale factors to determine the magnitude of a size change.
- Compute the area of composite geometric figures when planning or visualization is required.

### M8 Functions

- Evaluate quadratic functions, expressed in function notation, at integer values.
- Evaluate polynomial functions, expressed in function notation, at integer values.†
- Express the sine, cosine, and tangent of an angle in a right triangle as a ratio of given side lengths.†
- Evaluate composite functions at integer values.†
- Apply basic trigonometric ratios to solve right-triangle problems.†
- Write an expression for the composite of two simple functions.†
- Use trigonometric concepts and basic identities to solve problems.†
- Exhibit knowledge of unit circle trigonometry.†
- Match graphs of basic trigonometric functions with their equations.

### Notes

- Students who score in the 1–12 range are most likely beginning to develop the knowledge and skills assessed in the other ranges.
- Standards followed by an asterisk (\*) apply to the PLAN and ACT Mathematics Tests only.
- Standards followed by a dagger (†) apply to the ACT Mathematics Test only.

## Reading

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### R1 Main Ideas and Author’s Approach

- Recognize a clear intent of an author or narrator in uncomplicated literary narratives.
- Identify a clear main idea or purpose of straightforward paragraphs in uncomplicated literary narratives.
- Infer the main idea or purpose of straightforward paragraphs in uncomplicated literary narratives.
- Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in uncomplicated passages.
- Identify a clear main idea or purpose of any paragraph or paragraphs in uncomplicated passages.
- Infer the main idea or purpose of straightforward paragraphs in more challenging passages.
- Summarize basic events and ideas in more challenging passages.
- Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in more challenging passages.
- Infer the main idea or purpose of more challenging passages or their paragraphs.
- Summarize events and ideas in virtually any passage.
- Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in virtually any passage.
- Identify clear main ideas or purposes of complex passages or their paragraphs.

### R2 Supporting Details

- Locate basic facts (e.g., names, dates, events) clearly stated in a passage.
- Locate simple details at the sentence and paragraph level in uncomplicated passages.
- Recognize a clear function of a part of an uncomplicated passage.

- Locate important details in uncomplicated passages.
- Make simple inferences about how details are used in passages.
- Locate important details in more challenging passages.
- Locate and interpret minor or subtly stated details in uncomplicated passages.
- Discern which details, though they may appear in different sections throughout a passage, support important points in more challenging passages.
- Locate and interpret minor or subtly stated details in more challenging passages.
- Use details from different sections of some complex informational passages to support a specific point or argument.
- Locate and interpret details in complex passages.
- Understand the function of a part of a passage when the function is subtle or complex.

### **R3 Sequential, Comparative, and Cause—Effect Relationships**

- Determine when (e.g., first, last, before, after) or if an event occurred in uncomplicated passages.
- Recognize clear cause—effect relationships described within a single sentence in a passage.
- Identify relationships between main characters in uncomplicated literary narratives.
- Recognize clear cause—effect relationships within a single paragraph in uncomplicated literary narratives.
- Order simple sequences of events in uncomplicated literary narratives.
- Identify clear relationships between people, ideas, and so forth in uncomplicated passages.
- Identify clear cause—effect relationships in uncomplicated passages.
- Order sequences of events in uncomplicated passages.
- Understand relationships between people, ideas, and so forth in uncomplicated passages.
- Identify clear relationships between characters, ideas, and so forth in more challenging literary narratives.
- Understand implied or subtly stated cause—effect relationships in uncomplicated passages.
- Identify clear cause—effect relationships in more challenging passages.
- Order sequences of events in more challenging passages.
- Understand the dynamics between people, ideas, and so forth in more challenging passages.
- Understand implied or subtly stated cause—effect relationships in more challenging passages.
- Order sequences of events in complex passages.
- Understand the subtleties in relationships between people, ideas, and so forth in virtually any passage.
- Understand implied, subtle, or complex cause—effect relationships in virtually any passage.

### **R5 Meaning of Words**

- Understand the implication of a familiar word or phrase and of simple descriptive language.
- Use context to understand basic figurative language.
- Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in uncomplicated passages.
- Use context to determine the appropriate meaning of virtually any word, phrase, or statement in uncomplicated passages.
- Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in more challenging passages.
- Determine the appropriate meaning of words, phrases, or statements from figurative or somewhat technical contexts.
- Determine, even when the language is richly figurative and the vocabulary is difficult, the appropriate meaning of context-dependent words, phrases, or statements in virtually any passage.

### **R6 Generalizations and Conclusions**

- Draw simple generalizations and conclusions about the main characters in uncomplicated literary narratives.
- Draw simple generalizations and conclusions about people, ideas, and so forth in uncomplicated passages.



- Draw generalizations and conclusions about people, ideas, and so forth in uncomplicated passages.
- Draw simple generalizations and conclusions using details that support the main points of more challenging passages.
- Draw subtle generalizations and conclusions about characters, ideas, and so forth in uncomplicated literary narratives.
- Draw generalizations and conclusions about people, ideas, and so forth in more challenging passages.
- Use information from one or more sections of a more challenging passage to draw generalizations and conclusions about people, ideas, and so forth.
- Draw complex or subtle generalizations and conclusions about people, ideas, and so forth, often by synthesizing information from different portions of the passage.
- Understand and generalize about portions of a complex literary narrative.

## Science

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### S1 Interpretation of Data

- Select a single piece of data (numerical or nonnumerical) from a simple data presentation (e.g., a table or graph with two or three variables, a food web diagram).
- Identify basic features of a table, graph, or diagram (e.g., headings, units of measurement, axis labels).
- Select two or more pieces of data from a simple data presentation.
- Understand basic scientific terminology.
- Find basic information in a brief body of text.
- Determine how the value of one variable changes as the value of another variable changes in a simple data presentation.
- Select data from a complex data presentation (e.g., a table or graph with more than three variables, a phase diagram).
- Compare or combine data from a simple data presentation (e.g., order or sum data from a table).
- Translate information into a table, graph, or diagram.
- Compare or combine data from two or more simple data presentations (e.g., categorize data from a table using a scale from another table).
- Compare or combine data from a complex data presentation.
- Interpolate between data points in a table or graph.
- Determine how the value of one variable changes as the value of another variable changes in a complex data presentation.
- Identify and/or use a simple (e.g., linear) mathematical relationship between data.
- Analyze given information when presented with new, simple information.
- Compare or combine data from a simple data presentation with data from a complex data presentation.
- Identify and/or use a complex (e.g., nonlinear) mathematical relationship between data.
- Extrapolate from data points in a table or graph.
- Compare or combine data from two or more complex data presentations.
- Analyze given information when presented with new, complex information.

### S2 Scientific Investigation

- Understand the methods and tools used in a simple experiment.
- Understand the methods and tools used in a moderately complex experiment
- Understand a simple experimental design.
- Identify a control in an experiment.
- Identify similarities and differences between experiments.
- Understand the methods and tools used in a complex experiment.
- Understand a complex experimental design.
- Predict the results of an additional trial or measurement in an experiment.
- Determine the experimental conditions that would produce specified results.

- Determine the hypothesis for an experiment.
- Identify an alternate method for testing a hypothesis.
- Understand precision and accuracy issues.
- Predict how modifying the design or methods of an experiment will affect results.
- Identify an additional trial or experiment that could be performed to enhance or evaluate experimental results.

### **S3 Evaluation of Models, Inferences, and Experimental Results**

- Select a simple hypothesis, prediction, or conclusion that is supported by a data presentation or a model.
- Identify key issues or assumptions in a model.
- Select a simple hypothesis, prediction, or conclusion that is supported by two or more data presentations or models.
- Determine whether given information supports or contradicts a simple hypothesis or conclusion and why.
- Identify strengths and weaknesses in one or more models.
- Identify similarities and differences between models.
- Determine which model(s) is/are supported or weakened by new information.
- Select a data presentation or a model that supports or contradicts a hypothesis, prediction, or conclusion.
- Select a complex hypothesis, prediction, or conclusion that is supported by a data presentation or model.
- Determine whether new information supports or weakens a model and why.
- Use new information to make a prediction based on a model.
- Select a complex hypothesis, prediction, or conclusion that is supported by two or more data presentations or models.
- Determine whether given information supports or contradicts a complex hypothesis or conclusion and why.

## **Writing**

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### **W1 Expressing Judgments**

- Show a little understanding of the persuasive purpose of the task but neglect to take or to maintain a position on the issue in the prompt.
- Show limited recognition of the complexity of the issue in the prompt.
- Show a basic understanding of the persuasive purpose of the task by taking a position on the issue in the prompt but may not maintain that position.
- Show a little recognition of the complexity of the issue in the prompt by acknowledging, but only briefly describing, a counterargument to the writer's position.
- Show understanding of the persuasive purpose of the task by taking a position on the issue in the prompt.
- Show some recognition of the complexity of the issue in the prompt by doing the following:
  - Acknowledging counterarguments to the writer's position
  - Providing some response to counterarguments to the writer's position
- Show clear understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a broad context for discussion.
- Show recognition of the complexity of the issue in the prompt by doing the following:
  - Partially evaluating implications and/or complications of the issue, and/or
  - Posing and partially responding to counterarguments to the writer's position
- Show clear understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a critical context for discussion.
- Show understanding of the complexity of the issue in the prompt by doing the following:
  - Examining different perspectives, and/or
  - Evaluating implications or complications of the issue, and/or
  - Posing and fully discussing counterarguments to the writer's position

## **W2 Focusing on the Topic**

- Maintain a focus on the general topic in the prompt through most of the essay.
- Maintain a focus on the general topic in the prompt throughout the essay.
- Maintain a focus on the general topic in the prompt throughout the essay, and attempt a focus on the specific issue in the prompt.
- Present a thesis that establishes focus on the topic.
- Maintain a focus on discussion of the specific topic and issue in the prompt throughout the essay.
- Present a thesis that establishes a focus on the writer's position on the issue.
- Maintain a clear focus on discussion of the specific topic and issue in the prompt throughout the essay.
- Present a critical thesis that clearly establishes the focus on the writer's position on the issue.

## **W3 Developing a Position**

- Offer a little development, with one or two ideas; if examples are given, they are general and may not be clearly relevant; resort often to merely repeating ideas.
- Show little or no movement between general and specific ideas and examples.
- Offer limited development of ideas using a few general examples; resort sometimes to merely repeating ideas.
- Show little movement between general and specific ideas and examples.
- Develop ideas by using some specific reasons, details, and examples.
- Show some movement between general and specific ideas and examples.
- Develop most ideas fully, using some specific and relevant reasons, details, and examples.
- Show clear movement between general and specific ideas and examples.
- Develop several ideas fully, using specific and relevant reasons, details, and examples.
- Show effective movement between general and specific ideas and examples.

## **W4 Organizing Ideas**

- Provide a discernible organization with some logical grouping of ideas in parts of the essay.
- Use a few simple and obvious transitions.
- Present a discernible, though minimally developed, introduction and conclusion.
- Provide a simple organization with logical grouping of ideas in parts of the essay.
- Use some simple and obvious transitional words, though they may at times be inappropriate or misleading.
- Present a discernible, though underdeveloped, introduction and conclusion.
- Provide an adequate but simple organization with logical grouping of ideas in parts of the essay but with little evidence of logical progression of ideas.
- Use some simple and obvious, but appropriate, transitional words and phrases.
- Present a discernible introduction and conclusion with a little development.
- Provide unity and coherence throughout the essay, sometimes with a logical progression of ideas.
- Use relevant, though at times simple and obvious, transitional words and phrases to convey logical relationships between ideas.
- Present a somewhat developed introduction and conclusion.
- Provide unity and coherence throughout the essay, often with a logical progression of ideas.
- Use relevant transitional words, phrases, and sentences to convey logical relationships between ideas.
- Present a well-developed introduction and conclusion.

## **W5 Using Language**

- Show limited control of language by doing the following:
  - Correctly employing some of the conventions of standard English grammar, usage, and mechanics, but with distracting errors that sometimes significantly impede understanding
  - Using simple vocabulary
  - Using simple sentence structure

- Correctly employing some of the conventions of standard English grammar, usage, and mechanics, but with distracting errors that sometimes impede understanding
- Using simple but appropriate vocabulary
- Using a little sentence variety, though most sentences are simple in structure
- Correctly employing many of the conventions of standard English grammar, usage, and mechanics, but with some distracting errors that may occasionally impede understanding
- Using appropriate vocabulary
- Using some varied kinds of sentence structures to vary pace
- Correctly employing most conventions of standard English grammar, usage, and mechanics with a few distracting errors but none that impede understanding
- Using some precise and varied vocabulary
- Using several kinds of sentence structures to vary pace and to support meaning
- Correctly employing most conventions of standard English grammar, usage, and mechanics with just a few, if any, errors
- Using precise and varied vocabulary
- Using a variety of kinds of sentence structures to vary pace and to support meaning

## Appendix D: National Industry Standards

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The Collision Repair Technology program is written to incorporate the National Automotive Technicians Education Foundation (NATEF) and the Inter-Industry Conference on Auto Collision Repair (I-CAR) learning objectives, content, and hours.

- CRN1 Non-Structural Analysis and Damage Repair
- CRS2 Structural Analysis and Damage Repair
- CRS3 Mechanical and Electrical Components
- CRP4 Painting and Refinishing

# Appendix E:

## National Educational Technology Standards for Students

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**T1** Creativity and Innovation

**T2** Communication and Collaboration

**T3** Research and Information Fluency

**T4** Critical Thinking, Problem Solving, and Decision Making

**T5** Digital Citizenship

**T6** Technology Operations and Concepts

**T1** Creativity and Innovation

Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students:

- a. apply existing knowledge to generate new ideas, products, or processes.
- b. create original works as a means of personal or group expression.
- c. use models and simulations to explore complex systems and issues.
- d. identify trends and forecast possibilities.

**T2** Communication and Collaboration

Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. Students:

- a. interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.
- b. communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- c. develop cultural understanding and global awareness by engaging with learners of other cultures.
- d. contribute to project teams to produce original works or solve problems.

**T3** Research and Information Fluency

Students apply digital tools to gather, evaluate, and use information. Students:

- a. plan strategies to guide inquiry.
- b. locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
- c. evaluate and select information sources and digital tools based on the appropriateness to specific tasks.
- d. process data and report results.

**T4** Critical Thinking, Problem Solving, and Decision Making

Students use critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students:

- a. identify and define authentic problems and significant questions for investigation.
- b. plan and manage activities to develop a solution or complete a project.
- c. collect and analyze data to identify solutions and/or make informed decisions.
- d. use multiple processes and diverse perspectives to explore alternative solutions.

**T5** Digital Citizenship

Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students:

- a. advocate and practice safe, legal, and responsible use of information and technology.

- b. exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.
- c. demonstrate personal responsibility for lifelong learning.
- d. exhibit leadership for digital citizenship.

**T6** Technology Operations and Concepts

Students demonstrate a sound understanding of technology concepts, systems, and operations. Students:

- a. understand and use technology systems.
- b. select and use applications effectively and productively.
- c. troubleshoot systems and applications.
- d. transfer current knowledge to learning of new technologies.