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ABSTRACT

The automotive body sheet metal maintenance course is an advanced course in sheet metal techniques and emphasizes the perfection of skills in sheetmetal repair and fabrication techniques. This nine week course (135 clock hours) provides the learner with a variety of experiences and supplies him with general information, technical knowledge, basic skills, attitudes and values required for entry level employment in this field. Instruction will consist of demonstrations, lectures, group discussions, audiovisual aids and resource people from industry. A course outline is provided in the document. The concluding twenty pages contain five post tests for the course. (DS)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

Course Outline
AUTO BODY REPAIR AND REFINISHING 2 - 9035
(Automotive Body Sheet Metal Maintenance II)
Department 48 - Quin 9035.01

DADE COUNTY PUBLIC SCHOOLS
DIVISION OF INSTRUCTION • 1973

D A D E C O U N T Y P U B L I C S C H O O L S

1 4 5 0 N O R T H E A S T S E C O N D A V E N U E

M I A M I, F L O R I D A 33132

Course Outline

AUTO BODY REPAIR AND REFINISHING 2 - 9035
(Automotive Body Sheet Metal Maintenance II)

Department 48 - Quin 9035.01

county office of

VOCATIONAL AND ADULT EDUCATION

February, 1973

Published by the School Board of Dade County

Course Description

9035	48	9035.01	Automotive Body Sheet Metal Maintenance II
State Category Number	County Dept. Number	County Course Number	Course Title

This quinmester course is designed as an advanced course in sheet metal techniques. Emphasis is on the perfection of skills in sheetmetal repair and fabrication techniques. Various types of problems will be utilized to advance the learner's skill through a variety of experiences.

The student will receive the general information, technical knowledge, basic skills, attitudes and values that are required for job entry level as an auto body repair and refinisher helper. This course will be given in a nine weeks period.

Indicators of success: The applicant must demonstrate an eighth grade equivalency score in reading and mathematics. Also have average ability in mechanical aptitudes.

Clock Hours: 135

PREFACE

The following quinmester course outline is a guide to help students become employable with skills, knowledge, attitudes and values necessary for performing the required service of the automotive mechanics as applied to auto body.

This course is designed as a foundation quinmester course for the auto body repairman. This outline consists of nine blocks of instruction which are subdivided into several units each. It is only one part of a series of quinmester outlines designed for the complete auto body repairman. This course is 135 hours in length.

Prerequisites for this course is as follows: the student should have an eighth grade equivalency score in reading, comprehension, arithmetic fundamentals and mechanical aptitude. The student must be physically and mentally able to profit from this training.

Prior to entry into this course, the vocational student will display mastery of the skills indicated in Automotive Body Sheet Metal Maintenance I (9033.05) or Auto Body Welding II (9033.04).

Instructions will consist of demonstrations, lectures, group discussions, audio visual aids and resource people from industry. Instruction will be flexible to meet individual needs and abilities.

The bibliography appearing on the last page of this outline lists several basic references also supplementary references and audio visual aids.

This outline was developed through the cooperative efforts of the instructional quinmester Advisory Committee and Vocational Curriculum Materials Development Services and has been approved by the Dade County Vocational Curriculum Committee.

TABLE OF CONTENTS

GOALS

The auto body repair trainee must be able to:

1. Demonstrate an understanding of school and shop rules.
2. Demonstrate an understanding of safety rules and work habits.
3. Demonstrate an understanding of the proper tools needed to perform the assignment.
4. Demonstrate an understanding of the service tools and bench skills.
5. Demonstrate an understanding of the automotive sheet metal panels.
6. Demonstrate an understanding of the automotive sheet metal shrinking process.
7. Demonstrate an understanding of straightening sheet metal panels.
8. Demonstrate an understanding of checking alignment during the straightening operation.
9. Demonstrate an understanding of the basic body alignment tools and equipment used during the straightening operation.
10. Satisfactorily complete the quinmester post-test.

SPECIFIC BLOCK OBJECTIVES

BLOCK I - ORIENTATION

The student must be able to:

1. List the opportunities that are available for career in auto body and refinishing occupational field by written assignment.
2. Explain what will be expected of him as an auto body repairman by oral assignment.
3. Demonstrate skills and knowledge which will prepare him for a safe working life by actual shop practice.
4. Demonstrate pride and respect for workmanship by his performance.
5. Demonstrate an understanding and acceptance of personal responsibilities by his performance in the shop.
6. Explain the student benefits by oral assignment.

BLOCK II - SERVICE TOOLS AND BENCH SKILLS

The student must be able to:

1. List the general type tools and their use by written assignment.
2. Exhibit the ability to use the applicable tools and perform bench skills in the proper manner by selection and use.
3. Demonstrate the proper care and maintenance of tools and equipment by performance in the shop.
4. Exhibit the ability to observe safety precautions in the use of t tools and equipment by performance in the shop.
5. Exhibit the ability to identify power tools and equipment by oral assignment.
6. Exhibit the ability to perform maintenance and repairs to power tools by performance in the shop.
7. Exhibit the ability to practice safety precautions by observing safety rules.
8. Demonstrate the ability to use measuring devices by performance in the shop.

BLOCK III - AUTOMOTIVE SHEET METAL PANELS

The student must be able to:

1. List the types of automotive panels by written assignment.
2. List the materials used in automotive panels by written assignment.
3. Explain the manufacturing methods used for automotive panels by oral assignment.
4. List the construction methods of automotive panels by oral assignment.

BLOCK IV - AUTOMOTIVE BODY PANEL REPAIR TOOLS AND EQUIPMENT

The student must be able to:

1. List the hand tools used in automotive body panel repairing by written assignment.
2. List the power tools used in automotive body panel repair by written assignment.
3. Demonstrate an understanding of the shop equipment by performance in the shop.

BLOCK V - PHASES OF METAL STRAIGHTENING

The student must be able to:

1. Explain the roughing operation by oral assignment.
2. Explain the bumping operation by oral assignment.
3. Explain the metal finishing operation by oral assignment.
4. List the safety precautions by written assignment.

BLOCK VI - AUTOMOTIVE SHEET METAL SHRINKING

The student must be able to:

1. Diagnose sheet metal stretches by performance in the shop.
2. Explain the sheet metal shrinking operation by oral assignment.
3. Demonstrate an understanding of the sheet metal shrinking operation by performance in the shop.
4. Explain overshrinking of sheet metal by oral assignment.

BLOCK VII - ALIGNMENT OF BODY OPENINGS

The student must be able to:

1. List the types of body panels and openings by written assignment.
2. Demonstrate an understanding of the methods of checking body alignment by performance in the shop.
3. Demonstrate an understanding of body alignment checking tools and equipment by performance in the shop.

BLOCK VIII - BODY ALIGNMENT TOOLS AND EQUIPMENT

The student must be able to:

1. List the hand tools used for body alignment by written assignment.
2. List the power tools used for body alignment by written assignment.
3. Demonstrate an understanding of the shop equipment used for body alignment by performance in the shop.

BLOCK IX - QUINMESTER POST TEST

The student must be able to:

1. Satisfactorily complete the Quinmester Post test by written assignment.

Course Outline

AUTO BODY REPAIR AND REFINISHING 2 - 9035
(Automotive Body Sheet Metal Maintenance II)

Department 48 - Quin 9035.01

I. ORIENTATION

A. Objectives of Course
   1. Standards
   2. Methods of evaluation
      a. Oral test
      b. Written test
      c. Manipulation
      d. Diagnosis and job performance
   3. Teaching methods

B. Student Benefits
   1. Opportunities for employment
      a. Job opportunities
      b. Scope of trade
   2. Qualification for employment
      a. Job competency
      b. Attitude
      c. Dependability
      d. Pride of workmanship
      e. Experience
      f. Trade certificate
      g. Foundation for more education and training

C. Student Responsibility
   1. Safety regulations
   2. School policies and expenses
   3. Shop rules and procedures
      a. Use and care of equipment
      b. Care of hand tools
      c. Appropriate dress
      d. Reporting loss of equipment
      e. Housekeeping
      f. Reporting defective equipment
      g. Materials and supplies
      h. Employer-employee relations
      i. Employee-customer relations

II. SERVICE TOOLS AND BENCH SKILLS

A. Automotive Hand Tools
   1. Types and sizes
   2. Uses and safety practices
      a. Assembly
      b. Disassembly
      c. Hammering

II. SERVICE TOOLS AND BENCH SKILLS (Contd.)

d. Sawing
e. Drilling
f. Tapping
g. Adjusting
h. Power tools
i. Vises and clamps
j. Straightening devices
k. Soldering

B. Measuring Devices
1. Steel tape
2. Tram gauge
3. Center line gauge
a. Numerical measurements
b. Comparative measurements

III. AUTOMOTIVE SHEET METAL PANELS

A. Types of panels
1. Fender
2. Hood
3. Cowl
4. Dash
5. Door
6. Floor
7. Roof
8. Rear quarter
9. Rocker
10. Deck lid
11. Rear body

B. Materials
1. Steel
2. Aluminum
3. Alloyd

C. Manufacturing Methods
1. Pressed
2. Drawn
3. Stamped
4. Molded

D. Construction Methods
a. Crowns
b. Angles
c. Flanges
d. Box

IV. AUTOMOTIVE BODY PANEL REPAIR TOOLS AND EQUIPMENT

A. Body Panel Repair Hand Tools
1. Body Hammer

a. Types
b. Shapes
c. Construction
(1) Weight
(2) Balance

2. Dollies
a. Types
b. Shapes
c. Construction
(1) Weight
(2) Balance
d. Techniques of use
e. Care
f. Work and safety precautions

3. Body spoons and body picks
a. Types
b. Shapes
c. Uses
d. Construction
(1) Weight
(2) Balance
e. Techniques of use
f. Care

4. Body files
a. Types
b. Uses
c. Care

B. Automotive Body Repair Power Tools
1. Electric disc sander
a. Types
b. Uses
c. Sanding disc
(1) Sizes
(2) Abrasive grits
(3) Uses
d. Work and safety precautions

2. Orbital air sander
a. Types
b. Uses
c. Care
d. Work and safety precautions

3. Abrasive disc
a. Types
b. Uses
c. Composition of discs

4. Body jacks
a. Types
b. Construction
c. Uses
d. Care
e. Work and safety precautions

IV. AUTOMOTIVE BODY PANEL REPAIR TOOLS AND EQUIPMENT

5. Panel cutters
   a. Types
   b. Construction
   c. Uses
   d. Care
   e. Work and safety precautions

C. Shop Equipment
1. Hydraulic jacks
2. Safety stands
3. Hydraulic Hists
4. Bench grinder
   a. Goggles
   b. Eye shields
   c. Guards
5. Hydraulic press
6. Air driven tools
7. Compressed air line and fittings
8. Alignment equipment
9. Electrical equipment
10. Work benches

V. PHASES OF METAL STRAIGHTENING

A. Roughing Procedure
1. Drive metal back into place
   a. Heavy hammer
   b. Dolly
   c. Other striking tools
2. Push metal back into shape
   a. Hydraulic jack on the underside
   b. Mechanical jack on the underside
3. Pull Metal Back into shape
   a. Hydraulic pull pack
   b. Mechanical puller
   c. Portable frame machine

B. Bumping Procedure
1. Restore sheet metal back to normal contour
   a. Hammer
   b. Dolly
   c. Body spoon
2. Hammer on Dolly
   a. Force of hammer blow
   b. Crown on dolly to crown of metal
   c. Amount of hand pressure on dolly
   d. Distance between hammer contact and dolly contact

C. Metal Finishing Procedure
1. Pick hammer
   a. Lift up low spots
   b. Bump down high spots

V. PHASES OF METAL STRAIGHTENING

2. Body file
   a. Remove minor surface irregularities
   b. Shows up large irregularities
   c. Direction of the file stroke
   d. Side shift during the file stroke
3. Electric disc sander
   a. Partial substitute for body file
   b. Buffs the filed surface to remove deep scratches
   c. Star-shaped discs
4. Work and safety precautions
   a. Goggles
   b. Proper clothing
   c. Proper use of tools

VI. AUTOMOTIVE SHEET METAL SHRINKING

A. Stretched Sheet Metal
   1. Diagnosis
      a. Sense of touch
      b. Visual observation
   2. Types
      a. True stretch
      b. False stretch
      c. Inverted stretch or gauge
   3. Factor
      a. Force of impact
      b. Direction of impact
      c. Size of impact object
      d. Incorrect use of tools and equipment
         (1) Hammer and dolly
         (2) Overworking
         (3) Hydraulic pressure
   4. Techniques of identifying stretched metal
      a. Feel
      b. Judgement
      c. Visual observation

B. Shrinking Operation
   1. Hand tools and shop equipment
      a. Hammer
      b. Dolly
      c. Oxyacetylene welding outfit
      d. Wire brush
      e. Scraper
      f. Portable electric sander
      g. Body file
   2. Property changes of sheet metal
      a. Expansion
      b. Contraction
   3. Cleaning of sheet metal
      a. Heat

VI. AUTOMOTIVE SHEET METAL SHRINKING

b. Wire brush
c. Scraper
d. Portable electric sander

4. Upsetting operation
   a. Heat
   b. Quenching
   c. Hammer and dolly
5. Selection and proper heat range
   a. Blue heat
   b. Red heat
6. Cooling methods
   a. Quenching by water
   b. Air temperature
7. Overshrinking
   a. Drawing effect on metal surface
   b. Shrinking gauges
8. Safety precautions
   a. Goggles
   b. Wet sponge
   c. Fire extinguisher

VII. ALIGNMENT OF BODY OPENINGS

A. Body Panels and Openings
   1. Type
      a. Hood
      b. Fender
      c. Door
      d. Cowl
      e. Windshield pillars
      f. Dash
      g. Floor
      h. Pillar Post
      i. Turret top
      j. Back glass opening
      k. Deck lid
      l. Rear body
   2. Methods of checking alignment
      a. Visual
      b. Comparative measurements
         (1) Point of impact
         (2) Direction of impact
         (3) Related damage
         (4) Size of impact object
      c. Manufacture
      d. Year
      e. Model
      f. Manufacture manual
      g. Conventional frame and body
      h. Unitized frame and body

VII. ALIGNMENT OF BODY OPENINGS

3. Importance of checking alignment.
   a. Proper fit
   b. Maintaining contour lines
   c. Free motion of moving parts
      (1) Windows
      (2) Hinged units
         (a) Door
         (b) Hood
         (c) Deck lid
   d. Maintaining sealing qualities

B. Body Alignment Checking Equipment
   1. Trams
   2. Telescopic gauges
   3. Steel tapes

VIII. BODY ALIGNMENT TOOLS AND EQUIPMENT

A. Hand Tools
   1. Hammer
   2. Dolly
   3. Spoon
   4. Body file

B. Power Tools
   1. Portable electric sander
   2. Cable puller

C. Shop Alignment Equipment
   1. Hydraulic jacks
   2. Mechanical jacks
   3. Push-pull power tools
   4. Portable frame machine
   5. Frame straightening rack
   6. Oxyacetylene welding outfit
   7. Clamps
   8. Solder-on plates

IX. QUINMESTER POST TEST

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1. ABC of Hand Tools, Part I. 16mm, 18 min, Color, Sound, General Motors.	1-11397
2. ABC of Hand Tools, Part II. 16mm, 16 min, Color, Sound, General Motors.	1-11397
3. Accidents Happen to Sam. 16mm, 13 min, B/W, Sound, National Safety.	1-11339
4. Hammers, 16mm, 11 min, B/W, Sound, 1943. United World Films	515

Films:	Dade County Number
5. I Want a Job. 16mm, 26 min. B/W, Sound, Ford Motor Company	1-11568
6. Know Your Car, 16mm, 15 min, B/W, Sound, 1945, United World Films, Inc.	993
7. Pliers & Screwdrivers. 16mm, 18 min. B/W, Sound, 1943, United World Films, Inc.	525
8. Punches, Drifts & Bars. 16mm, 14 min, B/W, Sound, 1943, United World Films, Inc.	527

A P P E N D I X

Quinmester Post Test Sample

QUINMESTER POST TEST #1

NAME _____ DATE _____ SCORE _____

The following items are multiple choice. Select the one you believe correct. Circle the letter provided at left of item.

1. Because of common usage, sheet steel is called:

   a. Iron
   b. Sheet metal
   c. Fiber glass
   d. None of the above

2. Sheet metal that is stamped into shape must be relatively:

   a. Hard
   b. Stretched
   c. Soft
   d. Burned

3. Sheet metal means:

   a. Iron
   b. Brass
   c. Sheet steel
   d. Fiberglass

4. When enough force has been applied to cuase deformation to sheet metal, it has reached the:

   a. Yield point
   b. Elasticity point
   c. Draw die point
   d. Crown point

5. Many of the inner panels show patters of wavy lines on the surface. These are called:

   a. Work hardening
   b. Bending
   c. Annealing
   d. Stretcher strains

6. Result of deformation under tension is called:

   a. Contracting
   b. Stretching
   c. Quenching
   d. Burning

7. Sheet metal melts at about:

   a. 100°F
   b. 6000°F
   c. 2600°F
   d. 32°F

8. Upsetting is the result of deformation under:

   a. Pressure
   b. Quenching
   c. Tension
   d. None of the above

9. Changing the shape of a sheet of metal may be called:

   a. Cold working
   b. Plastic deformation
   c. Quenching
   d. All of the above

10. Cast iron has no plasticity because it is:

   a. Hollow
   b. Sheet metal
   c. Soft
   d. Rigid

11. Automobile panels are formed in a:

   a. Lathe
   b. Band saw
   c. Burner
   d. Draw die

12. Metal undergoes a change of grain structure when heated to:

   a. 1600°F
   b. 100°F
   c. 32°F
   d. None of the above

13. Immersing hot steel in water is called:

   a. Stretching
   b. Bending
   c. Quenching
   d. Burning

14. Raising the temperature of metal causes it to:

   a. Shrink
   b. Expand
   c. Freeze
   d. Contact

17. The center area of the roof panel is an example of a:

a. Low crown
b. High crown
c. Reverse crown
d. None of the above

18. The strongest type of crown of any panel is:

a. Low
b. High
c. Reverse
d. None of the above

19. Basic types of reinforcements include those:

a. Welded to a panel, welded to a wheel, and formed in the surface of an inner or outer panel
b. Welded to a panel and formed in the surface of an inner or outer panel
c. Formed in the surface of an inner or outer panel
d. Welded to a panel or welded to a wheel

20. The strongest type of reinforcement is:

a. Box
b. Flange
c. Channel
d. None of the above

21. The metalman's work in repairing collision damage is primarily:

a. Drilling holes in metal
b. Undoing the effect of an impact force
c. Sanding an automobile
d. Changing tires

22. The point or area where the object struck and damaged any panel is called the:

a. Simple bends
b. Rolled buckles
c. Impact area
d. None of the above

23. One or both of the surface dimensions of the affected area will be reduced by:

a. An upset
b. A sanding
c. A simple bend
d. A rolled buckle

24. When opposing forces push against an area of the metal and causes it to yield, it is called:

a. A simple bend
b. An upset
c. A fusion
d. A rolled buckle

25. When an upset has caused an adjoining area to bulge so that it appears to be stretched, it is called:

a. A simple bend
b. A rolled buckle
c. An impact area
d. A false stretch

QUINMESTER POST-TEST #2

NAME _____ DATE _____ SCORE _____

The following items are multiple choice. Select the one you believe correct. Circle the letter provided at left of item.

1. The most common types of dolly blocks are:

   a. General purpose
   b. Heel
   c. Toe
   d. All of the above.

2. The dolly block normally is used on the:

   a. Underside or inside of the panel
   b. Outside the panel
   c. Primed panel
   d. None of the above

3. Dollies are used either as a striking tool or as a back-up tool for the:

   a. Chisel
   b. Rubber hammer
   c. Bumping hammer
   d. Pliers

4. The most frequently used dolly is the:

   a. General purpose
   b. Heel
   c. Toe
   d. None of the above

5. The heel dolly and the toe dolly are used in narrow quarters where the:

   a. Panel is unobstructed
   b. Larger general purpose dolly cannot enter
   c. Bumping hammer will enter
   d. Larger general purpose dolly can enter

6. The dolly blocks used to make right angle edges, flanges, and sharp bends, are the:

   a. Heel dolly and general purpose dolly
   b. Toe dolly and dolly spoon
   c. Heel dolly and toe dolly
   d. Toe dolly and general purpose dolly

7. The primary purpose of the dolly is to provide a reaction to the force of a:

   a. Portable grinder
   b. Hammer blow
   c. Porto-power jack
   d. None of the above

8. Using a dolly with the right crown on the working face will result in:

   a. Slower work
   b. Slower and better work
   c. Rougher work
   d. Faster and better work

9. Weight and balance must be considered in selecting a:

   a. Portable welder
   b. Floor jack
   c. Dolly block
   d. None of the above

10. The weight of the dolly block should be three times the weight of the:

    a. Panel
    b. Pry rod
    c. Bumping hammer
    d. None of the above

11. The bumping hammer and dolly block are the metalman's most important tools for:

    a. Welding a panel
    b. Bending a panel
    c. Straightening metal
    d. Straightening a frame

12. The dolly block is used with and without the:

    a. Pliers
    b. Hammer
    c. Hacksaw
    d. None of the above

13. The dolly block is an excellent tool for striking the inner surface to:

    a. Rough out simple dents
    b. metal finish a panel
    c. align a panel
    d. remove the paint

14. An efficient means of smoothing the roughed-out surface is with a:

a. Porto-power jack
b. Hammer and dolly
c. Dolly
d. Hammer

15. When the dolly is held directly under the spot struck by the hammer, it is called a:

a. Hammer-off dolly
b. Hammer-on dolly
c. Hammer-off panel
d. Hammer-off body spoon

16. When the dolly is held to one side under the spot struck by the hammer, face, it is called a:

a. Hammer-off dolly
b. Hammer-on dolly
c. Hammer-off panel
d. Hammer-on panel

17. The type of hammer blows that should be used when practicing to hit the dolly are:

a. Hard blows
b. Light to medium blows
c. Follow-through blows
d. All of the above

18. The bumping hammer should be held:

a. Firmly
b. Lightly
c. Tightly
d. None of the above

19. The effect of the hammer-on dolly blow tends to increase the area of the spot and to:

a. Raise it above the level of the surrounding metal
b. Lower it below the surrounding metal
c. Shrink the metal
d. Cut holes in the metal

20. The action of the hammer and the dolly in the on-dolly operation is concentrated on:

a. A very small spot of metal
b. A very large spot of metal
c. A painted panel
d. None of the above

21. The metalman's hand tools are primarily used for:

a. Welding metal
b. Removing metal
c. Straightening metal or metal finishing
d. Cutting metal

22. The basic metal straightening tools are:

a. Bumping hammer, dolly and spoon
b. Bumping hammer and screwdriver
c. Pliers and screwdriver
d. Bumping hammer and pliers

23. The general purpose bumping hammer is sometimes called a:

a. Sledge hammer
b. Pick hammer
c. Cutting hammer
d. Dinging hammer

24. A bumping hammer with a large head on one end and a pick on the other end is called a :

a. Spoon hammer
b. Sledge hammer
c. Tack hammer
d. Combination hammer

25. The most widely used type of hammer is the:

a. Sledge hammer
b. Ball pen hammer
c. Combination hammer
d. Spoon hammer

QUINMESTER POST TEST #3

NAME _____ DATE _____ SCORE _____

The following items are multiple choice. Select the one you believe correct. Circle the letter provided at the left of the item.

1. The two basic steps of a straightening operation are:

   a. Welding and roughing
   b. Roughing and bumping
   c. Bumping and shrinking
   d. Roughing and brazing

2. The most cirtical step of the straightening operation is:

   a. Shrinking
   b. Welding
   c. Bumping
   d. Roughing

3. Restoring the final surface smoothness to damaged panels after the straightening operations is called:

   a. Metal finishing
   b. Rough finish
   c. Sanding
   d. None of the above

4. Metal finishing serves as a means of locating the:

   a. Welded areas in the metal panel
   b. Low areas in the metal surface
   c. Painted areas in the outer panel
   d. Holes in the metal panel

5. The low areas in the panel are lifted up by means of a:

   a. Floor jack
   b. Bumping spoon
   c. Pick hammer
   d. Sledge hammer

6. The basic cutting tools used in metal finishing are the:

   a. 14" body file and the disc sander
   b. Disc sander and the sledge hammer
   c. 14" body file and the slide hammer
   d. 14" body file and the rubber hammer

7. The variable factor that must be controlled to obtain desired results when using the hammer-on dolly is:

   a. The force of the hammer blow
   b. The crown of the working surface of the dolly block in contact with the underside panel
   c. The amount of hand pressure applied to the dolly block
   d. All of the above

8. The result of using the hammer-on dolly too much is:

   a. Overstretching
   b. Quenching
   c. Contracting
   d. Brazing

9. A hammer blow should never be struck except on metal which has been raised above the proper level when:

   a. Using the hammer-on dolly
   b. Using the hammer and pliers
   c. Using the hammer-off dolly
   d. None of the above

10. When using a hammeroff dolly, the first hammer blows should fall on the high metal farthest from the dent, and the following blows should work:

    a. Outward progressively
    b. Inward progressively
    c. From the center to the outside
    d. On the underside of the panel

11. When working off-dolly the force of the hammer blow must be limited just enough to:

    a. Make the hammer bounce
    b. Drive the high spot down to level
    c. Drive the metal into a high spot
    d. Drive the high spot below level

12. A body spoon is never used for repairing any panel in which a dolly block:

    a. does not have free access to the inner surface of a panel
    b. Has free access to the inner surface of a panel
    c. Will not fit the corwn of the panel
    d. None of the above

13. Used with the bumping hammer, the body spoon serves the same purpose as the:

    a. Slide hammer
    b. Porto-power jack
    c. Dolly block
    d. Sledge hammer

14. With a good set of body spoons, the metalsman can repair panels:

    a. By not cutting out the inner panel and welding back the inner panel
    b. By cutting out the inner panel and welding back the inner panel
    c. By cutting out the outer panel and welding the outer panel in place
    d. By welding the spoon to the outer or inner panel

15. The body spoon may be used to:

    a. Remove the headlight
    b. Straighten a wheel
    c. Replace a fender
    d. Pry out low metal

16. One factor affecting the effectiveness of the body spoon as a substitute for a dolly block is:

    a. Stretching
    b. Balance
    c. Impact point
    d. Yield point

17. The choice of a body spoon is governed by the condition of the:

    a. Panel to be repaired
    b. Whole automobile
    c. Tires
    d. Bumping hammer

18. The purpose of using the body file is to remove minor surface irregularities and:

    a. Straighten the inner panel
    b. Cut the low spots in the panel
    c. Show up larger surface irregularities
    d. None of the above

19. To use the body file efficiently, it is necessary to consider:

    a. The direction of the file stroke and the side shift during the file stroke
    b. The weight of the panel and the weight of the body file
    c. The weight of the panel and the weight of the disc sander
    d. The direction of the file stroke and the weight of the panel

20. The file should be stroked in the general direction of the:

    a. Inner panel
    b. Flattest crown of the panel
    c. Highest crown of the panel
    d. Reverse crown of the panel

21. The shift of the file during the stroke is important because it:

a. Cuts a single and narrow strip of metal
b. Does not cut any of the metal
c. Straightens the inner panels
d. Determines the area covered by the file

22. The first shift of the body file is to make the contact area of the teeth move from:

a. The left side to the right side during the backward stroke
b. The front to the rear end of the file during the forward stroke
c. The front to the side during the bakcward stroke
d. None of the above

23. The second shift of the body file is a side-slipping action which causes the file to finish the stroke:

a. A few inches to one side of the line on which it was started
b. In a long, narrow cutting action
c. In a short, rapid, choppy stroke
d. All of the above

24. The protable disc sander commonly used in sheet metal repair is:

a. An electric unit operating on 110 volt, 30 amp power supply
b. An electric unit operating on 12 volt supply
c. Operated manually
d. Gas operated

QUINMESTER POST-TEST #4

NAME _____ DATE _____ SCORE _____

The following items are multiple choice. Select the one you believe correct. Circle the letter provided at the left of the item.

1. The portable disc sander commonly used in sheet metal repair is:

   a. An electric unit operating on 110 volt, 30 amp power supply
   b. An electric unit operating on 12 volt supply
   c. Operated manually
   d. Gas operated

2. The handle at the spindle end of the portable disc sander may be:

   a. Bent into any shape
   b. Welded into one place
   c. Mounted on either side
   d. All of the above

3. An important factor in the life of a disc sander is:

   a. Proper care
   b. Proper handling
   c. Proper cleaning
   d. All of the above

4. The protable electric disc sander should:

   a. Be picked up by the cord
   b. Not be picked up by the cord
   c. Not be picked up by the handle
   d. Be picked up by the disc

5. If the back-up pad on the disc sander is warped, it will:

   a. Operate smoothly
   b. Cause a vibration
   c. Not operate
   d. Cause overheating

6. Probably the most common cause of serious damage to the disc sander motor is:

   a. Overcooling
   b. Warping of the backup pad
   c. Overheating
   d. None of the above

7. The most common cause of overheating of the disc sander motor is:

   a. Clogging of the motor ventilating system
   b. Vibration of the backup pad
   c. A broken electric cord
   d. An improper disc being used

8. The solution to overheating of the disc sander is periodic:

   a. Painting of the disc sander
   b. Oiling of the disc sander
   c. Changing of the discs
   d. Cleaning of the disc sander

9. A third wire is provided in the cord of all protable electric tools so that:

   a. It is easy to pick up the electric tool
   b. The case can be connected to the ground circuit
   c. The cord will be stronger
   d. None of the above

10. Operating an ungrounded portable electric tool can result in:

   a. Severe electric shock
   b. Death
   c. Injuries
   d. All of the above

11. Sanding discs used in sheet metal repair work consists of:

   a. A soft paper disc coated on both sides with abrasive grit
   b. A stiff fiber disc coated on one side with abrasive grit
   c. A metal disc coated on both sides with abrasive grit
   d. A stiff fiber disc without any abrasive grit

12. The grit used almost universally is:

   a. Copper oxide
   b. Mercury
   c. Aluminum oxide
   d. Iron oxide

13. The grit is bonded to the fiber disc by:

   a. Glue or tape
   b. Resin or tape
   c. Glue or resin
   d. None of the above

14. The resin-bonded discs are more expensive but they are:

a. Much more durable than the glue-bonded discs
b. Less durable than the glue-bonded discs
c. As durable as the glue-bonded discs
d. None of the above

15. Grit sizes are identified by:

a. Weight
b. Length
c. Number
d. Height

16. The common sizes of a sanding disc are:

a. 5 and 6 inches in diameter
b. 9 and 11 inches in diameter
c. 7 and 9½ inches in diameter
d. 8 and 10 inches in diameter

17. Sanding discs of smaller idameter are usually obtained by:

a. Cutting a larger disc down to the size needed
b. Ordering the special discs from the manufacturer
c. Both a and b
d. None of the above

18. The center hole of a sanding disc usually is:

a. 7/8 inch or 1/2 inch in diameter
b. 5/8 inch or 1/2 inch in diameter
c. 7/8 inch or 1/4 inch in diameter
d. 5/8 inch or 1/4 inch in diameter

19. Number 16 grit size is a larger abrasive than:

a. Number 24
b. Number 36
c. Number 50
d. All of the above

20. Grit sizes and numbers of abrasive materials mean:

a. The larger the number, the larger the grit size
b. The larger the number, the smaller the grit size
c. The number in the same as the grit size
d. None of the above

21. Glue-bonded discs are made in:

a. Open coat or cloth coat disc
b. Open coat or closed coat disc
c. Closed coat or paper coat disc
d. None of the above

22. A disc that has the grit applied in light layers so that the fiber backing shows through is called:

a. Cloth coat disc
b. A closed coat disc
c. An open coat disc
d. A paper coat disc

23. The type of disc used primarily for removal of paint is called:

a. An open coat disc
b. A cloth coat disc
c. A paper coat disc
d. A closed coat disc

24. A disc that has the grit applied in a heavy layer so that it will stand up under heavy-duty conditions is called:

a. A cloth coat disc
b. A paper coat disc
c. A closed coat disc
d. An open ocat disc

25. Resin-bonded discs are made in:

a. Six types of coats
b. Four types of coats
c. Five types of coats
d. Only one type of coat

QUINMESTER POST-TEST #5

NAME _____ DATE _____ SCORE___ ___

The following items are multiple choice. Select the one you believe correct. Cirlce the letter provided at left of item.

1. A careful inspection of the damaged automobile is necessary to determine:

   a. The extent of the damage
   b. The repair plan and methods
   c. If it is repairable
   d. All of the above

2. If a roof panel is to be replaced, the best results can be accomplished by first:

   a. Cutting the existing roof panel off
   b. Aligning and straightening the body pillars and reinforcements before cutting the roof off
   c. Cutting the damaged pillars and headers off with the roof panel
   d. Either one of the above methods give equal results

3. The oxyacetylene torch is used to heat severely damaged pillars and reinforcements to:

   a. Temper the metal
   b. Soften and anneal work-hardened conditions
   c. Stretch shortened metals
   d. Oxidize metal to remove excess carbon

4. When using the oxyacetylene torch for heating damaged metal for the purpose of straightening the metal should be heated to which color:

   a. White
   b. Blue
   c. Yellow-orange
   d. Cherry-red

5. The best type of flame to use for heating metal is:

   a. Oxidizing flame
   b. Carburizing flame
   c. Neutral flame
   d. All of the above

6. When straightening body pillars, roof headers, windshield posts and openings, which of the following must be the most accurate:

   a. Door openings
   b. Windshield openings
   c. Roof rails and headers
   d. Deck lid opening

7. The best possible method to install a new roof panel would be to:

   a. Electric spot-weld
   b. Braze with oxyacetylene torch
   c. Electric arc-weld
   d. Weld with oxyacetylene torch

8. If installing a new roof panel with the oxyacetylene torch, brazing as much as possible would be best because:

   a. It is stronger than welding
   b. It is much easier to do
   c. It takes less time
   d. It creates less heat distortion

9. Door alignment can be accomplished by adjusting hinges:

   a. In or out
   b. Up or down
   c. Backward or forward
   d. All of the above

10. In the assembly of auto body panels in the factory, the major part of welding is done by:

    a. Electric spot-welder
    b. Electric arc-welder
    c. Oxyacetylene torch
    d. Micro-wire welder

11. Hydraulic jacks used in the repair of damaged auto bodies are considered better than mechanical jacks because:

    a. They are less expensive
    b. They require less care
    c. They are more powerful
    d. All of the above

12. A portable frame machine can be used to:

    a. Straighten and align body pillars
    b. Straighten and align quarter pillars
    c. Straighten and align unitized bodies
    d. All of the above

13. Hydraulic jacks are used to:

    a. Unfold damaged pillars
    b. Relieve pressure on metal
    c. Assist in aligning metal
    d. All of the above

14. In checking body shell alignment, which of the following items is considered best:

    a. Tram gauge
    b. Steel tape
    c. Yard stick
    d. Length of string

15. The use of "tension" as a repair technique, can best be applied to which of the following damage conditions:

    a. Stretched metal on high-crown panel
    b. Simple displacement on low-crown panel
    c. Overshrunk metal
    d. Stretched metal on reverse-crown panel

16. The metal becomes stretched, it is necessary to shink it so it will become metal finished:

    a. Become metal finished
    b. Occupay the same space as originally
    c. Be easy to use the electric sander
    d. All of the above

17. The face of the shrinking hammer is:

    a. Convex
    b. Concave
    c. Cross-grooved
    d. None of the above

18. When shrinking metal, the color of the heated spot should be:

    a. Red hot
    b. White hot
    c. Blue hot
    d. Straw hot

19. When shrinking metal with a torch, the heat should be first applied to:

    a. The edge of the area
    b. The whole panel
    c. The center of the area
    d. All of the above

20. The type flame used for shrinking metal is:

a. Carbonizing
b. Oxidizing
c. Neutral
d. None of the above

21. When shrinking an area on a plane flat surface, the heat spots should be approximately:

a. 2 inches in diameter
b. Size of a silver dollar
c. 3 inches in diameter
d. Size of a nickle

22. Quenching is used in the:

a. Metal finishing operation
b. Shrinking operation
c. Electric welding operation
d. All of the above

23. Knowing when to quench is largely a matter of:

a. Experience
b. Reading
c. Feel
d. None of the above

24. Quenching is a means of controlling:

a. The rate of impact to the metal
b. The rate of sanding the metal
c. The rate of hammering the metal
d. The rate of cooling the metal

25. Overshrinking sheet metal may result in the formation of:

a. Short gouges in the metal
b. Long wavy buckles in the metal
c. Round dents in the metal
d. None of the above

ANSWER KEY TO QUINMESTER POST-TESTS

TEST #1	TEST #2	TEST #3	TEST #4	TEST #5
1. b	1. d	1. b	1. a	1. d
2. c	2. a	2. d	2. c	2. b
3. c	3. c	3. a	3. d	3. b
4. a	4. a	4. b	4. b	4. d
5. d	5. b	5. c	5. b	5. c
6. b	6. c	6. a	6. c	6. b
7. c	7. b	7. d	7. a	7. a
8. a	8. d	8. a	8. d	8. d
9. a	9. c	9. c	9. b	9. d
10. d	10. c	10. b	10. d	10. a
11. d	11. c	11. b	11. b	11. c
12. a	12. b	12. b	12. c	12. d
13. c	13. a	13. c	13. c	13. d
14. b	14. b	14. a	14. a	14. a
15. d	15. b	15. d	15. c	15. b
16. c	16. a	16. b	16. c	16. b
17. a	17. b	17. a	17. c	17. c
18. c	18. b	18. c	18. a	18. a
19. b	19. a	19. a	19. d	19. c
20. a	20. a	20. b	20. b	20. c
21. b	21. c	21. d	21. b	21. d
22. c	22. a	22. b	22. c	22. b
23. a	23. d	23. a	23. a	23. a
24. b	24. d	24. a	24. c	24. d
25. d	25. c		25. d	25. b