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IDENTIFIERS *Oregon Vo Tech Math Project

ABSTRACT

The Oregon Vo-Tech Math Project is designed to provide verbal problem sets for use in vocational education programs in secondary schools and community colleges. A subset of the problem booklets was subjected to evaluation in 12 secondary schools and 7 community colleges in an effort to make the materials more meaningful to students, improve articulation, and investigate the effectiveness of instructional strategies. The problem packages were converted to an individualized format, and a workshop on instructional strategies was conducted prior to implementation. The evaluation instruments consisted of a student form, an instructor form, and the project materials. Nine problem sets classified by mathematics topic were evaluated and revised as a result of the evaluation. This document includes a review of project background and outcomes, description of the evaluation techniques, and conclusions and recommendations. The instruments used and problem solutions are presented in an appendix. Twenty problem packages developed by this project are available. (SD)

PHASE ONE OF TWO FINAL REPORT

THE OREGON VO-TECH MATH PROJECT

(Project No. EP9874)
(Grant No. 22-65-060)

Project Director
Dell L. Swearingen

Linn-Benton Community College

Albany, Oregon

June 27, 1974

STATE DEPARTMENT OF EDUCATION

COMMUNITY COLLEGES AND CAREER EDUCATION

TITLE: The Oregon Vo-Tech Math Project (Phase I)

~~INSTITUTION:~~ ~~Linn-Benton Community College~~

PROJECT DIRECTOR: Dell L. Swearingen, Math Instructor
Address: 6500 S.W. Pacific Blvd
Albany, Oregon 97321
Phone: 928-2361, extension 304

PROJECT DURATION PHASE I: January 1, 1974 through June 30, 1974

PROJECT DURATION PHASE II: July 1, 1974 through June 30, 1975

COSTS:	Federal	Local (in kind)	Other	Total
	$19,858.21	$2,800	$12,500	$35,158.21

NUMBER OF STUDENTS AFFECTED: 500 NUMBER OF STAFF INVOLVED: 30

PROJECT DESCRIPTION:

Oregon high school students who will continue their education in terminal career occupational programs at Oregon community colleges make up more than half of the total Oregon high school enrollment. To provide these students, many of whom have severe learning handicaps, with the mathematics they "need", and to allow for flexibility in mathematics programs, resources must be made available to high school and community college instructors to make mathematics relevant to career occupations.

The ongoing Oregon Vo-Tech Math Project is designed to provide resources in the form of verbal problem sets for occupational courses offered in Oregon community colleges and secondary schools. At the present time the project has produced rough draft problem sets in each of the following areas: Wood Products, Forestry Tech., Marketing, Agriculture, Aviation Mechanics, Machine Tool Tech., Wastewater Tech., Food Processing, Nursing and Dental Assisting, Police and Fire Science, Welding, Building Construction, Diesel Mechanics, Industrial Mechanics, Industrial--Electrical and Hydraulics, Automotive Tech., Electronics, Drafting and Clerical.

At the present time verbal problems previously collected because of demand are out of print. Moreover, they were contained in rough draft booklets according to career cluster areas. These booklets were not in a practical form from a student or instructor's view point. We adopted an individualized format and will print the problem sets accordingly. Such a format allows students to work problems in various career areas and will alleviate material duplication by individual instructors. The above mentioned materials will be printed and ready for dissemination by September 1, 1974. The materials may be obtained through the Division of Continuing Education (DCE) on the Oregon State University Campus at a nominal fee.

Purpose:

The purpose of this phase of the ongoing Oregon Vo-Tech Math Project was to evaluate a small subset of our problem sets which have been individualized. We conducted this evaluation in 12 high schools and seven community colleges. Using the evaluation data, we hoped to: (1) make our materials more meaningful to students, (2) improve articulation and (3) investigate instructional strategies which seem to be most appropriate in the high schools and community colleges.

Prodecures and Outcomes:

The steering committee for the Oregon Vo-Tech Math Project identified the math packages to be evaluated and the high school and community college instructors who were to evaluate the problem sets. The problem packages were converted from their rough draft format to a new individualized format by nine (9) community college instructors. A secretary provided the human resources to type, edit and proofread the testing packages. An intensive, one-day orientation meeting was held at Linn-Benton Community College to suggest possible instructional strategies, encourage articulation and disseminate the evaluation materials. The evaluation instruments consisted of a student form, an instructor form and the project materials.

After the evaluation was successfully begun, nine problem sets in rough draft were sent to earlier project participants. They converted the materials to the new individualized format, classified by math topic. As these problem sets were returned the secretaries began putting them in print-ready form.

Using the information gleaned from the evaluation materials we: (1) altered the format of the problem sets and (2) obtained further funding from OMEC for instructors to work on a summer project aimed at instructional strategies for using the Oregon Vo-Tech Math Project materials.

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A. PROJECT BACKGROUND

The ongoing Oregon Vo-Tech Math Project is designed to provide realistic ~~verbal problem sets~~ for ~~occupational courses offered~~ in Oregon community colleges and high schools. The math problems are identified by observation and discussion with technicians involved in specific career activities. The problems selected are aimed at: (1) providing the math skills necessary for an individual to get a job and perform that job adequately and (2) providing an individual with the math skills necessary for advancement. This information will be valuable in determining course content needed to meet new high school graduation requirements. The problem sets provide a primary resource for planning occupational math curriculum and determining related behavior objectives. They are designed to create a learning climate which will be supportive to and provide positive reinforcement of math concepts with relevancy to specific occupational areas.

The verbal problems were contained in booklets according to career cluster area. These booklets were not in a practical form from the student's or instructor's point of view. We adopted an individualized format and printed the problem sets accordingly. Such a format allows a student to work problems in various career areas and will relieve the instructor from duplicating volumes of material.

Although the realistic occupational math problem sets have been used in many Oregon community college and high school classrooms over the past two years, they had never undergone any type of evaluation.

The steering committee of the Oregon Vo-Tech Math Project felt it was time to evaluate both the new individualized format and the realistic verbal problem sets for the occupational courses. In order to evaluate the individualized problem sets in a realistic setting, we proposed to select 12 high schools, geographically distributed thoughout the state, to serve as evaluation sites. This evaluation was undertaken jointly by high school and community college instructors thus facilitating articulation between the educational institutions, industry and community.

The Oregon high school students who will continue their education in terminal career occurational programs at Oregon community colleges make up more than half of the total high school enrollment. To provide these students with the mathematics they "need" and allow for flexibility in mathematics programs, the objectives and related relevant problem sets needed to be made available to the high school math instructors.

REVIEW OF GOALS AND OBJECTIVES
PRESENTLY COMPLETED

GOALS	OBJECTIVES	ACTIVITIES
1. To evaluate a small subset of the Oregon Vo-Tech Math Project materials in Oregon high schools and community colleges.	1.1 Identify those problem sets and career areas to be evaluated.	1.1.1 By mid-November the project director will identify from the rough draft problems produced the previous two summers those problem sets to be evaluated.
	1.2 Identify twelve model high schools and seven community colleges to evaluate and critique the problem sets.	1.2.1 By mid-December the project director will identify twelve model high schools and seven community colleges to evaluate and critique the problem sets.
	1.3 Adopt an individualized format and convert the choosen subset of rough draft problem sets in specific career areas to this format.	1.3.1 Set up a tenative individualized format. Contact each member of the steering committee for reaction.
		1.3.2 The project director will contact previous project members to convert the choosen subset of the rough draft problems to the new individualized format by the end of November.
		1.3.3 Schedule a meeting of the Oregon Vo-Tech Math Project steering committee to be held on January 26, 1974. To adopt an individualized format for the complete set of roughdraft problems.

GOALS	OBJECTIVES	ACTIVITIES
	1.4 Print the individualized problem sets and evaluation instruments.	1.4.1 A local printer will be contacted by mid-December.
		1.4.2 The individualized problem sets and evaluation instruments will be printed by mid-January.
	1.5 Conduct an orientation meeting for participating instructors.	1.5.1 Participating instructors will receive a letter explaining the orientation meeting to be held at Linn-Benton Community College on January 26, 1974. Instructors will be encouraged to bring other instructors and/or principals from their schools.
		1.5.2 At the orientation meeting on January 26,1974 four schools of varying size and composition will describe their ongoing delivery system using the individualized Vo-Tech math materials.
		1.5.3 The orientation meeting will allow us to explain how to use the evaluation materials. The meeting will also provide an opportunity to disseminate the evaluation materials.

GOALS	OBJECTIVES	ACTIVITIES
	1.6 Conduct staff visitation and follow-up to include a taped interview of each of the participating instructors' reactions to the Vo-Tech materials.	1.6.1 The project director will visit each of the participating schools at least once during the duration of the project. The data collected from these visitations will be incorporated in the final report.
2. Promote articulation between educational institutions, Oregon State Board of Education, community colleges, industry and the community.	2.1 Strengthen lines of articulation between: a. secondary schools, and four year schools. b. math and Vo-Tech instructors. c. schools and the community they serve. d. community colleges and the State Department of Education.	2.1.1 Reorganize the steering committee to provide a better cross section representation of high schools, community colleges, and four year schools. 2.1.2 If a participating instructor feels there is articulation taking place between the math and Vo-Tech department at his school, the project director will request a conference with this instructor's direct supervisor concerning this articulation. 2.1.3 The project director will explain the project at the N.C.T.M. meeting in Portland on February 22 and the N.C.T.M. Annual Meeting in Atlantic City, N.J. in April. 2.1.4 The project director will attend each of the community college math department meetings to keep their departments informed as to the progress of the project.

GOALS	OBJECTIVES	ACTIVITIES
		2.1.5 The project director will speak to the O.C.E. student teachers about the evaluation materials.
		2.1.6 The project director will send minutes of each steering committee meeting to a representative of each community college in Oregon.
		2.1.7 The project director will explain the project to the local apprentice board on January 9, 1974.
		2.1.8 The local apprentice board will be asked to evaluate the individualized problem sets.

EDUCATIONAL SETTING

The Vo-Tech areas evaluated fit into the following career cluster areas: Building Construction, Industrial Mechanics, Metals, Marketing, Clerical, and Wood Products. The evaluation problem sets are individualized by math topics. The math topics include whole numbers, decimals, fractions, and ratio and proportions. Each package includes problems with complete solutions, problems with just the answers, and supplementary problems with answers only included for the instructors.

The following schools participated in an evaluation of the above listed subset of the Oregon Vo-Tech Math Project materials.

*Churchill High School
*Chemeketa Community College
*Marshfield High School
*Blue Mountain Community College
Central Oregon Community College
Sprague High School
Mt. Hood Community College
Burns High School
*Benson High School
*Lane Community College
Clackamas Community College
Portland Community College
*Canby High School
*Rogue Community College
*Philomath High School
*Franklin High School
*Treasure Valley Community College
*Lebanon High School
*Medford Mid-High School
*Roseburg High School
*Baker High School

The Oregon Vo-Tech Math Project rented calculators for those schools that did not have them available for students.

Of the schools which were asked to participate in the project, those marked with (*) supplied us with data.

PERSONNEL

STEERING COMMITTEE

Oregon Vo-Tech Math Project Steering Committee:

Chairman: Dell Swearingen, Linn-Benton Community College

Members: Dr. Bill Simons, Oregon State University

Dr. Bob Main, Oregon College of Education

Harold Hauser, Blue Mountain Community College

Frank Weeks, Mount Hood Community College

Mike Morgan, Linn-Benton Community College

Gene Enfield, Sprague High School

Dennis Dedrick, Medford Mid-High School

Dick Holiday, Rogue Community College

ASSESSMENT TEAM

Burr Pancher will serve both as third party evaluator and chairman of the assesment team. The other two members of the assessment team are:

Dr. Peter C. Scott, Linn-Benton Community College

Mr. C. Y. Arnold, Philomath High School

PROJECT STAFF

The project staff consisted of Linn-Benton Community College students. Without the dedication of these students, the project would not have been completed on time.

Graphic Artist:	Rose Davis
Editor:	Norma Cosler
Assistant Editors:	Rob Mack Mike Long
Typists:	Tina Hale Shelley Mack

Harold Hauser of Blue Mountain Community College was the final proof-reader. He enabled the project staff to meet their deadlines.

F. MAJOR ACCOMPLISHMENTS OR OUTCOMES

(1) On January 26, 1974 the program personnel for the Oregon Vo-Tech Math Project at Linn-Benton Community College conducted an orientation meeting for Vo-Tech math instructors and administrators from the model schools for the project. At the meeting project materials and evaluation instruments were disseminated and explained. Possible instructional strategies were also discussed.

(2) Acquainting the instructors involved in the evaluation with the problem sets has caused them to become more career conscientious. Suggestions gleaned from evaluation participants provided empetus for and the content of an orientation meeting held at The Inn of the Seventh Mountain to discuss instructional strategies (see attached agenda and participant list). Further funding was acquired from O.M.E.C. to conduct a summer project concerning instructional strategies. The problem sets along with this orientation meeting motivated at least five math instructors to develop pilot Vo-Tech math courses to be offered at their high schools.

(3) The use of the evaluation sets has allowed us to finalize a format and convert nine of the complete rough draft sets to this format. The complete problem sets converted to this format are:

1) Clerical
2) Industrial Mechanics
3) Welding
4) Machine Tools
5) Police and Fire Science
6) Auto Mechanics
7) Wastewater Tech
8) Marketing
9) Food Processing

These problems along with the following will be printed and ready for dissemination by September 1, 1974.

1) Wood Products
2) Agriculture
3) Aviation Mechanics
4) Nursing & Dental Assisting
5) Construction
6) Diesel Mechanics
7) Industrial, Electrical and Hydraulics
8) Electronics
9) Drafting
10) Forest Products
11) Forestry
12) Real Estate

The materials may be obtained from O.C.E. on the Oregon State University Campus at a nominal fee.

(4) The project director was able to promote articulation by: 1) attending meetings of the local apprentice board, 2) reporting on the project to; O.C.E. student teachers, N.C.T.M. meeting in Portland, and N.C.T.M. Annual Convention in Atlantic City, 3) visiting each of the participating schools, 4) attending meetings of the community college math department chairmen and steering committee, 5) telephoning schools, 6) attending each of the Executive Meetings of the O.C.T.M. and 7) writing articles for the O.C.T.M. Newsletter and local papers.

(5) Dr. Bob Main, Math Department Chairman at O.C.E., Mike Morgan, LBCC Math Department chairman, and myself are going to offer a

graduate class through D.C.E. on the Oregon Vo-Tech materials and their uses. This will start on October 5, 1974.

C. EVALUATION

As stated earlier, a small subset of the Oregon Vo-Tech Math Project problem sets were evaluated in a number of model schools.

Each of these model schools were invited to Linn-Benton Community College for an orientation meeting on January 16, 1974. The orientation meeting provided an opportunity to disseminate the evaluation materials and discuss possible instructional strategies for using the problem sets. Copies of the letter of invitation, agenda, materials which were evaluated, student and instructors evaluation instruments may be found in the appendix.

The instructors were given flexibility in the use of the problem sets. They were to decide with what type of student and instructional strategy they were to be used. It was felt that from this flexibility could be gleaned functional methods of using the problem sets. In addition insight could be gained into the best use of the problem sets.

Two weeks after the orientation meeting the project director called each participant to see if they had any questions.

As problems developed, the project director made appointments and visited the project participants. The project director travelled to some of the model schools three times. Due to the energy crisis, however it was possible to go to some distant schools only once during the evaluation. The evaluation was conducted from January 16, 1974 thru May 20, 1974. The project director kept in touch with participants by phone.

After the students and instructors at the model schools had filled in the evaluation instruments, the project director met with them and taped their reaction to the problem sets. The project director collected the tapes and evaluation instruments, then the data was condensed over a two-week period by Linn-Benton Community College students. Then the information was given to a third disinterested evaluator. His evaluation of the data is included later in this document. The appendix will include histograms of the students feelings on each of the questions which were asked on their evaluation forms.

The data collected from the instructors will be very useful in revising the problem sets, but the comments are too specific to be helpful to the general reader. Thus they are not included in the appendix.

A majority of the evaluation comments were favorable. However, many errors were found in the materials. The subsequent histogram is a summary of student responses to each question. The questions asked of the students are the following:

2. The problems in this package were:
   too easy [a] about right [b] too difficult [c]

3. How long did it take you to complete this problem package?
   1 class period [a] 2 class periods [b]
   more than 2 class periods [c]

4. How could the material in this package be improved?
   more instruction sheets [a] more instructor help [b]
   packages explaining math concepts [c] group discussions [d]
   work experience [e] more lectures [f]

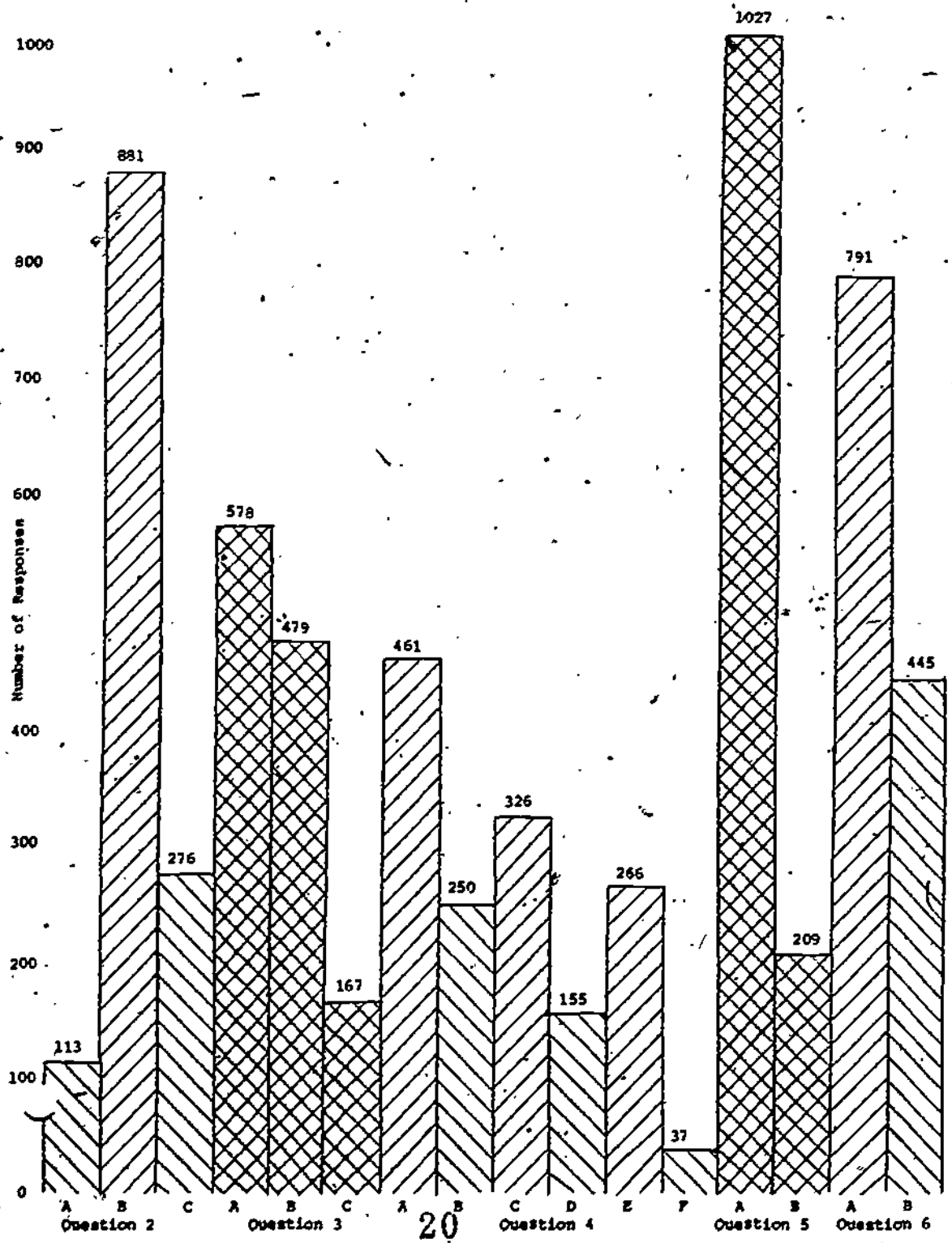
5. Were you able to solve the problems in sections B and C of this package?

yes [a] no [b]

6. Would you like to see more problems of this type used in your math class?

yes [a] no [b]

One might add that the materials have been revised three times since the evaluation was carried out by the model schools.



LINN - BENTON INTERMEDIATE EDUCATION DISTRICT

June 28, 1974

EVALUATION SUMMARY OF VO-TECH MATH PROJECT

As an outside evaluator of the Vo-Tech Math Project, I have studied samples of the individualized math packets, talked with instructors involved in field testing the packets, read the transcripts of taped interviews with students and teachers, and the individual written evaluations by administrators, teachers, and students. From this vantage point I will attempt to make an overall summary statement of the merit of this project.

Overall, the response to these packets was highly positive. The majority feel that the packages are needed to fill a gap in mathematics education. All indicate some positive benefits, even though many encountered some problems in usage.

As expected, the range of responses is quite wide. This variation appears to be due to:

1) Teacher attitude toward vocational education, in general, and practical math, specifically.

2) Ability of teacher to handle package material in his classes.

3) Whether the student was working problems associated with his career objectives.

4) Nature of math exposure prior to involvement with packets.

This project appears to have met and exceeded the objectives set forth in the project proposal. The evaluations are encouraging for further efforts in this direction.

Recommendations that might be made from my study of the evaluation are:

1) That the packets be further revised according to feedback from the field.

2) That considerable attention be given to addition of staff development component to this project, one that will bring math instructors into a closer working relationship to vocational teachers and teach them the best ways to use the material.

P.O. Box 967 · Albany, Oregon 97321 · Phone (503) 926-8621

3) That further revision be directed toward level of difficulty of the packages to eliminate the too hard-too easy criticism.

The Vo-Tech Math Project is a much needed one that can fill a highly identifiable need. The writing team and project director are to be commended for their efforts in a very difficult mission. I fully endorse this project and will lend my support to its continuation.

Burr Fancher
Regional Coordinator
Linn-Benton I. E. D.

BF/gh

D. SUMMARY

The ongoing Oregon Vo-Tech Math Project evaluated a small subset of their materials. These materials were converted to a new individualized format by math topic. The math topics included were: Whole Numbers, Decimals, Fractions, and Ratio and Proportions. The problem sets were chosen from the following career areas: Building Construction, Industrial Mechanics, Metals, Marketing, Clerical, and Wood Products. The participating instructors were allowed to choose both the instructional strategy and the classes in which to conduct the evaluations. The problem sets have been found to be useful at both the high school and community college level. The favorable evaluations and money from O.H.E.C. allowed us to include thirteen math instructors in a summer project dealing with instructional strategies for using the project's materials. This summer project is placing heavy emphasis on creating hands-on activities for the classroom.

E. CONCLUSIONS

1. Both the student and instructor evaluations indicated very positive support for the use of these problem sets in the classroom.

2. Four-year schools need to offer inservice and preservice courses which introduce these materials and their uses.

3. The materials seemed to be less effective in the schools where the problems were assigned only as extra credit.

4. The materials were the most effective when integrated into the regular classroom setting and used with sophomores, juniors or seniors.

5. To improve the use of these problem sets at the high school level, they should include a glossary of terms and more definitions. (Keep in mind they were written for Community College students.)

6. The materials have been found to be effective in the following settings: 1) high school consumer math, 2) shop classes, 3) a two-year high school algebra course, 4) a geometry course, and 5) the 4200 series of industrial math at the community college level.

7. Very little articulation took place between the majority of high school Math, Vo-Tech and Language Arts Departments.

8. Students working on Vo-Tech Math problems shoud have easy access to calculators.

9. The majority of participating instructors would like to see hands-on activities relating to the Vo-Tech problem sets available for classroom use.

10. Vo-Tech Math problem sets need to be developed for other career cluster areas. Instructors commented that we need more Vo-Tech problems which would interest girls.

11. The project director feels that the project was an overwhelming success in that we accomplished every objective, and converted nine complete rough draft sets into print-ready form. In addition we have thirteen math instructors working on instructional strategies which involve making hands-on materials for the classroom from June 20 thru August 3, 1974. We have also encouraged five high school math instructors to develop Vo-Tech math courses for their high schools. It is very encouraging to find classroom instructors solving classroom instructors problems.

P. RECOMMENDATIONS

The participants of the Oregon Vo-Tech Math Project feel:

1. The State Department of Education needs to devise a model articulation system which will work in the high schools and community colleges. Articulation between Math and Vo-Tech departments on the high school level is the exception instead of the rule.

2. The State Department of Education needs to solicit proposals that would develop pilot courses which integrate Vo-Tech, Math and Language Arts courses. We suggest a three-day retreat attended by a Math, Language Arts and Vo-Tech instructor from each of six schools. The topic of this retreat would be discussion of instructional strategies which incorporate the above subjects. A summer project should follow to involve Math, Language Arts and Vo-Tech instructors in the designing and institution of such courses in their schools.

   Presently, each discipline make plans separately. By the time they have had a chance to communicate, they have no chance to compromise. Thus, students find not only the Math, Language Arts but even some of the Vo-Tech courses irrelevant to the real life setting.

3. Future writing teams, such as the welding instructors writing packets this summer, should have a math and communication skills instructor working with them.

4. The total set of Oregon Vo-Tech Project materials needs to be revised in some areas. There is even the question, should they immediately be redone in light of metrication. A system needs to be implemented which keeps the Oregon Vo-Tech materials up to date with the industry they represent.

5. The colleges and universities should offer inservice and preservice courses dealing with instructional strategies for using these problem sets if they are to be functional in schools which have not been involved in the project.

6. Future math instructors should have some knowledge about careers, and what type of mathematics to expect in various occupations. Many math instructors have very little idea about career education except that they don't think they like it.

7. We recommend that where possible students have the opportunity to use calculators in the classroom. We have found that the use of inexpensive calculators not only revives student interest in mathematics, but they have also been found to be effective teaching devices to introduce and chain mathematical concepts.

8. We recommend that the State Department of Education negotiate with a publisher or alternate source such as D.C.E. to publish the Oregon Vo-Tech Math Project materials after this year. Money gained from the sale of the materials could be used to continue curriculum projects of this nature. Four publishers have indicated an interest in such publication. They are in a better position to handle both

national dissemination and have the technical staff needed to really bring these materials to life.

APPENDIX

For the readers convience the Appendix is arranged in three parts: 1) letters of communication between the project director and participants, 2) letters requesting project materials and 3) a copy of the evaluation materials and summary of results.

In letters requesting copies of the Oregon Vo-Tech Math Project materials, it was not felt appropriate to include copies of all of the communication which took place. Thus the project director selected some letters which seem to typify the scope and interest that others have in the project.

It is worth noting that the heaviest demand so far has been in Oregon, Washington and Canada with over 150 request from Oregon. Although the list is not complete, we have received requests from each of the following states:

Virginia	Nebraska	Montana
New Jersey	Michigan	Alaska
Hawaii	Minnesota	Indiana
New York	California	Florida

LINN-BENTON COMMUNITY COLLEGE
6500 S.W. Pacific Blvd.
Albany, Oregon 97321
503-926-6091

January 4, 1974

You have expressed an interest in participating in the evaluation of a small subset of the Oregon Vo-tech Math Problem Sets.

This evaluation will include the math topics of whole numbers, fractions, decimals, and ratio and proportion. The problems will be selected from seven occupations which fall in the career cluster areas of industrial mechanics, building construction, clerical, marketing, forest products, and metals. The problems seem to be applicable to several high school and community college math courses. We would like to include one math instructor, and hopefully, some Vo-tech instructors from each of the model schools. We will be asking both instructors and students to evaluate the problem sets.

In order to further explain the evaluation process and disseminate materials to be evaluated, an orientation meeting will be held in the board room at Linn-Benton Community College on Saturday, January 26, 1974. An agenda for this meeting and a map directing you to LBCC have been included in this letter. We invite you to bring other instructors or administrators from your school who are interested in this project.

The project will provide a noon meal of Kentucky fried chicken. If this is not to your liking we suggest a sack lunch. The project will provide a grant of $30 to the participating member from each school. If more than one instructor comes from a school, the participants may divide up the $30 if they wish. This money will be distributed at the meeting.

In light of the energy crisis we strongly suggest that you form car pools to come to the meeting. In some cases a community college and a model high school or junior high school are in the same town. In other cases participants will pass through the town of other participants. A car pool would not only help the energy crisis, but would also go a long way in increasing vertical articulation among schools. Some money will be available for travel. The travel money would be mailed to you at a later date. To help you set up car pools, you will find the names and schools of the participants included.

Thank you very much for your interest.

Sincerely,

Dell L. Swearingen

Dell L. Swearingen
Project Director

DLS/bds

encls.

Oregon Vo-Tech Math Project Evaluation

Meeting Agenda for January 26, 1974

9:00 - 9:30	Introduction
9:30 - 10:30	Description of content and evaluation tool
10:30 - 11:00	Break and discussion
11:00 - 11:20	Project operation
11:20 - 12:00	Use of material
12:00 - 12:30	Vo-Tech and Math articulation
12:30 - 1:30	Lunch
1:30 - 2:30	Material distribution and inspection
2:30 - 3:15	Question and answer
3:15 - 4:00	Campus tour (optional)

LINN-BENTON COMMUNITY COLLEGE

6500 S.W. Pacific Blvd.
Albany, Oregon 97321
503-928-2361

May 23, 1974

Dear Participant:

I would like to take this opportunity to thank you for participating in the evaluation of the small subset of Oregon Vo-Tech Math Project materials.

If possible, I would like to have all evaluation forms returned to me by June 4, 1974. It would also be a great help to have a brief summary from your principal and vo-tech departments on their feelings about the materials. I must have these forms back as soon as possible to meet the deadline for our final report to the Oregon State Board of Education.

Due to the energy crisis it was not feasible to get to each school as many times as I had planned. I hope this did not inconvenience you in any way.

For those of you who have calculators and wish to keep them, please contact Mr. Sam Zimmerman at Corvallis Business Machines, 111 NW 2nd, Corvallis, Oregon.

I hope you found these materials interesting and useful. Thanks again for your participation.

Sincerely,

Dell L. Swearingen
Director
Vo-Tech Math Project

DLS/bds

QUESTIONS FOR TAPED INTERVIEW

1. What is the enrollment of your school?

2. What was the enrollment of your math class which used these problems?

3. What type of classroom setting did you use to evaluate the problem sets?

4. What plan of attack or instructional strategy did you use?

5. In what type of math class did you use the individualized math problem sets?

6. Did you enjoy using these individualized verbal problems in your classroom? Will you use them again next year?

7. Did these individualized Vo-Tech math problems help generate articulation between you and your Vo-Tech instructors?

8. Did you have a good communication channel with your Vo-Tech instructors before you received these materials? If so, how did you get it started? If not, why not?

9. What does your principal think of this approach which uses real life verbal problems in the classroom?

10. Did you find the problem sets reasonable?

11. Would you like to see more work done along the lines of instructional strategy for teaching the Vo-Tech math student? If so, along what lines?

12. What do you think of the following instructional strategies: (a) teaching the math in the shop, (b) integration of the Language Arts, Math and Vo-Tech, (c) hands-on materials developed and (d) project approach?

13. Which of these approaches would best suit your teaching situation?

14. If time and money were not a problem, how would you improve the math instruction of the Vo-Tech students in your school?

15. Would you like to see some preservice and inservice courses at the 4-year schools? Can you suggest how these materials might be used?

16. How would you suggest disseminating the materials in Oregon?

17. How will you use these problems next time you teach the class?

18. What did your students think of the first individualized problem sets?

19. In your opinion, which course or courses in high school should include the use of these problems (if any)? On what level would they be most effective?

20. Would you like to see more of these Vo-Tech math problem sets developed? If so, in what occupations and math topics?

21. What other changes would you suggest in format, etc.?

22. Are there other materials you would like to see developed for the Vo-Tech math students?

May 28, 1974

Dear Participants:

The second phase of the Oregon Vo-Tech Math Project concerning the development of teaching strategies will consist of three meetings, (a fourth if the participants feel it is necessary).

The first meeting will be held at the Inn of the Seventh Mountain near Bend, Oregon. It will start at 6:00 pm on June 20 and continue through noon on Saturday, June 22.

The meeting will have two major objectives: 1) to aid communication between high school instructors who would like to offer a vo-tech math course in their high schools; and 2) to investigate possible instructional strategies to help integrate our problem sets into the math classrooms. In addition you will write a contract stating which area and instructional strategy you will develop.

Two weeks after the June 20 meeting we will contact you by phone to see if you would like to have Ed Wright and myself meet with you individually. If not, we will meet with you in your geographical area about mid-summer.

The last meeting will be held at Linn-Benton Community College in Albany, Oregon on August 1 or 2. At this meeting the material which you developed will be presented. After your presentation you will be receiving a check in the amount of _____ for your participation in the project.

We will also provide your meals and lodging while attending the meetings at Bend and Albany. However, we will not pay travel expenses to and from the meetings.

Thank you very much for your continued interest in the Oregon Vo-tech Math Project. We are looking forward to seeing you on June 20, 1974.

Sincerely,

Ed Wright
Group Leader

Dell Swearingen
Project Director

DS/bds

CONFERENCE
June 20-22
Inn of the Seventh Mountain
Bend Oregon 97701

A G E N D A

Thursday, June 20

6:30 PM	Dinner at the Red Toe Restaurant
7:30 PM	Opening Remarks, Ed Wright, Linn-Benton Community College History, Dell Swearingen, Linn Benton Community College Address on classroom instruction, Dr. Bill Fitzgerald, University of Oregon

Note: Dr. Fitzgerald is a visiting professor from Michigan State University. He will be at the meeting as a consultant all day Friday.

Friday, June 21

8:00 AM	Breakfast
9:00 AM	Instruction Strategies Dick Holliday, Rogue Community College Harold Hauser, Blue Mountain Community College Ed Wright, Linn-Benton Community College
10:30 AM	Coffee Break
10:45 AM	Discuss in Small groups-possible use of problem situation in math instruction
12:30 PM	Lunch
2:00 PM	Write Contracts
3:00 PM	High School vocational mathematics content discussion
6:00 PM	Dinner
7:00 PM	Discuss format of developed material and documentation

Saturday, June 20

8:00 AM	Breakfast
9:00 AM	Presentation of Proposals by Members. Each member will present his plan of development. Everyone will receive a copy of topics to be developed.

Note: Please bring curriculum material and texts used in mathematics classes. We will hold an open discussion session centered around this material.

May 29, 1974

Mr. Bill [illegible], Coordinator
[illegible] Technical Division
P. O. Box 349
[illegible], Oregon 97[illegible]

Dear Mr. [illegible]:

The purpose of this letter is to thank you for allowing me to gain access to the math problems compiled by the Oregon Vo-Tech Math Project. I have experimented and stimulated my students in an amazing way. There has been a significant increase in individual participation and the whole lower forming to this segment of our daily work.

I use the vo-tech problems to start my 9th grade math classes daily for the last two nine week sessions. The format is to take from 8 to 12 minutes daily at the beginning of the period to work as a group on a vo-tech problem picked beforehand by the teacher from the set of problems compiled by your Oregon Vo-Tech. Math Project. These problems do not necessarily need to fit into the immediate material involved in the coursework being taught.

I do not require that the students compute these problems like an assignment. I do, however, demand that they listen and are quiet during the short session involved. I find they like this method. I, also, find that I always get voluntary suggestions on how to attack and solve the problem.

The type problems I find most helpful for my students are those concerning computations with fractions, decimals, and ratio-proportion. I find this is a beautiful way to keep these young people in constant review of the basics they will need.

I want to emphasize that these ninth graders are all from the lower or lower medium group of achievers, sprinkled with just a few, who, when turned on, can and do perform very well. It has happened more than a few times that these slow achievers came to the teacher before class time and presented their own vo-tech problem. A good example is the boy who ran a 61 second 440 yard run in one of our track meets. He wanted to know how many miles per hour this was.

Finally, I want to re-state that I believe the key for my success is that there really isn't any so-called work being demanded of the students but, I know by observation, that they are listening and I believe, therefore, they are learning the basics that they perhaps have turned off in the past.

Again, thank you for your assistance. I am looking forward to obtaining the complete set of problems this fall.

Yours truly,

Frank J. Brondacour
Western View Junior High
Route 3 Box 567
Corvallis, Oregon 97330

JOHN TYLER COMMUNITY COLLEGE, Chester, Virginia 23831, Telephone 804/748-6481

April 26, 1974

Mr. Neil Swearingen
Lib - Benton Community College
Albany, Georgia

Dear Mr. Swearingen:

I attended the recent NCTM Annual Meeting in Atlantic City and had the pleasure of attending the discussion of "The Credibility Gap - The Needs of Industry, The Student's Desires, and the Two-Year College Offerings".

I was impressed with your discussion of the Oregon Vo-Tech Math Project. Our college offers several vocational-technical programs and I am most interested in more information, literature, material, etc. of the Oregon project.

I am primarily interested in the material that relates to the following programs:

A. Machine Tool
B. Welding
C. Construction
D. Industrial Mechanics
E. Automotive Technology
F. Electronics
G. Drafting.

Thank you for your time and effort and once again let me say that I enjoyed your presentation at the Annual Meeting.

Sincerely yours,

Joseph T. Jordan
Associate Professor of Mathematics
John Tyler Community College

JTJ:hea

NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS
1906 Association Drive, Reston, Virginia 22091/(703) 620-9840

13 May 1974

Mr. Dell Swearingen, Director
Vo-Tech Math Project
Linn-Benton Community College
6500 SW Pacific Boulevard
Albany, Oregon 97321

Dear Mr. Swearingen:

The National Council of Teachers of Mathematics has developed a Teacher/Learning Center which displays and makes available for use, in the Council's Headquarters facility, the wide range of materials relevant to mathematics education.

We feel that your Vo-Tech Math Project would be an appropriate addition to the NCTM Teacher/Learning Center. Also, we hope that information concerning products with specific relevance for mathematics educators will be routinely forthcoming by including the NCTM Professional Services Office on appropriate mailing lists.

The enclosed brochures describe the Council's concerns, programs, and publications. We look forward to working with you and are always available for assistance in providing professional services to the mathematics community.

Sincerely,

Joseph R. Caravella
Director of Professional Services

JRC:jld

Enclosures

CENTRAL JERSEY INDUSTRY EDUCATION COUNCIL

7 Main Street, Woodbridge, N. J. 07095 · (201) 636-0348

April 22, 1974

Mr. Dell L. Swearingen
Linn-Benton Community College
6500 Southwest Pacific Boulevard
Albany, Oregon 97321

Dear Dell,

I would like to thank you very much for your excellent presentation for our panel program at the NCTM Convention on April 18. The slide program that you had was really very well done as well as being very interesting and informative. When the results of your efforts are finally finished and published, I would very much like to have a copy. Would the best way be, as you suggested at the meeting, to write to the State Department of Education in the Fall?

I must say that you people really plan for marvelous weather at your conventions. I hope that you found your convention to be a worthwhile experience--professionally as well as in the line of pleasure, meaning the sun, the weather, and the beach.

Perhaps someday we will meet again. Again let me thank you for your fine presentation.

Sincerely,

Donna

Donna Cubit-Swoyer
Consultant

DCS/cam

Community College Division
McGraw Hill Book Company
1221 Avenue of the Americas
New York, New York 10020

Dell Swearingen
Dept. of Math
Lynn Benton C.C.
6500 S.W. Pacific Blvd.
Albany, Oregon, 97321

May 16th 1974

Dear Mr. Swearingen,

My goal is to research, develop, and publish innovative educational materials on the applications arts and sciences to two-year, occupational curricula.

Naturally, therefore, I was most interested to hear from Harold Hauser regarding the Oregon Applied Mathematics Program. I wonder if you could fill me in on more of the parameters of the materials that have evolved to date? Specifically, I'd be interested in the course title/description and student population profile, the mode of instruction, the media utilized, the number of modules developed, the key individuals involved, and the time schedules for completion.

I realize that this represents considerable time on your part, and I hope that I can make this up to you in terms of additional outside input. My hope is that over-time, McGraw-Hill will be able to review these programs for possible publication under the McGraw-Hill imprint.

Cordially,

Jerry Stoner

Gerald O. Stoner
Sponsoring Editor

GOS:

CC: HAROLD HAUSER

OREGON VO-TECH MATH PROJECT

LEARNING PACKAGE EVALUATION SHEET

Please check the most appropriate box or boxes.

1. Learning package indentification _____.

2. The problems in this package were:

   too easy [a] about right [b] too difficult [c]

3. How long did it take you to complete this problem package?

   1 class period [a] 2 class periods [b]

   more than 2 class periods [c]

4. How could the material in this package be improved?

   more instruction sheets [a] more instructor help [b]

   packages explaining math concepts [c] group discussions [d]

   work experience [e] more lectures [f]

5. Were you able to solve the problems in sections B and C of this package?

   yes [a] no [b]

   If not, please comment:

   _____

   _____

6. Would you like to see more problems of this type used in your math class?

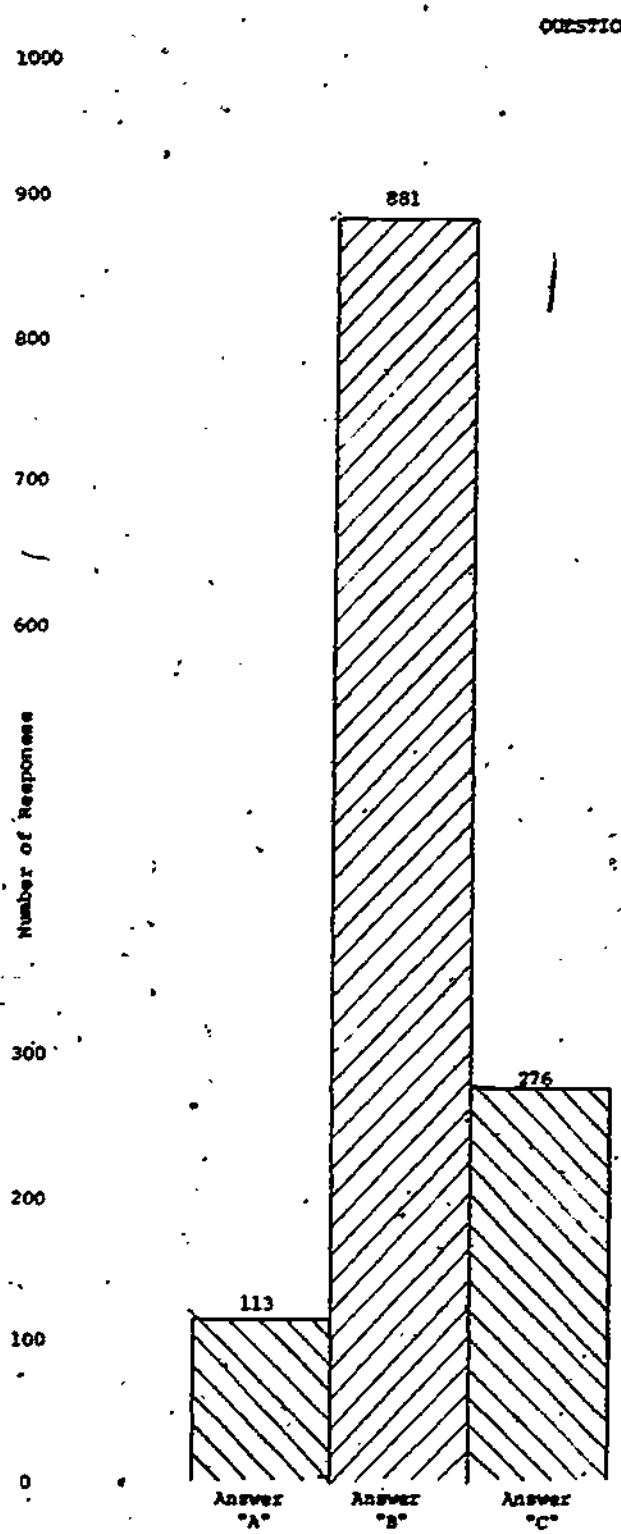
   yes [a] no [b]

7. Other comments:

   _____

   _____

   _____


QUESTION 2
1000
900
800
700
600
300
200
100
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Number of Responses
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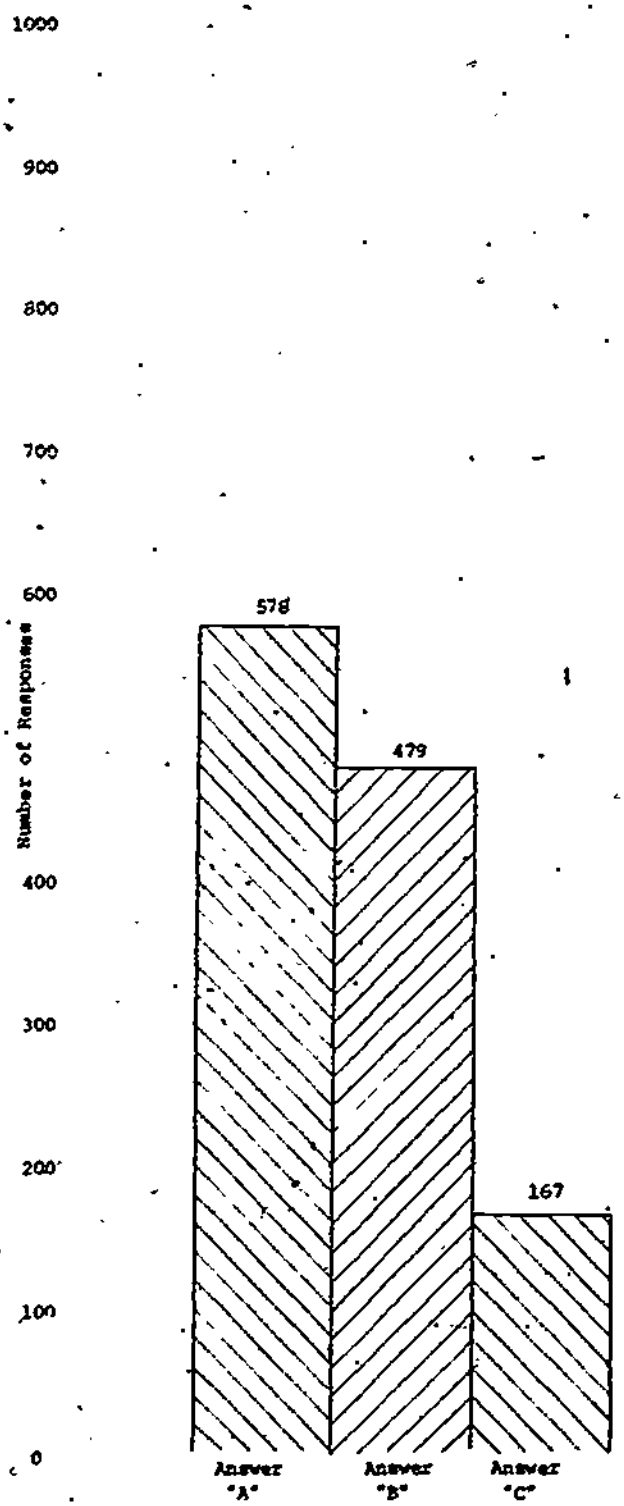
276
113
Answer "A"
Answer "B"
Answer "C"

QUESTION 3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900
800
700
600
400
300
200
100
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Number of Responses
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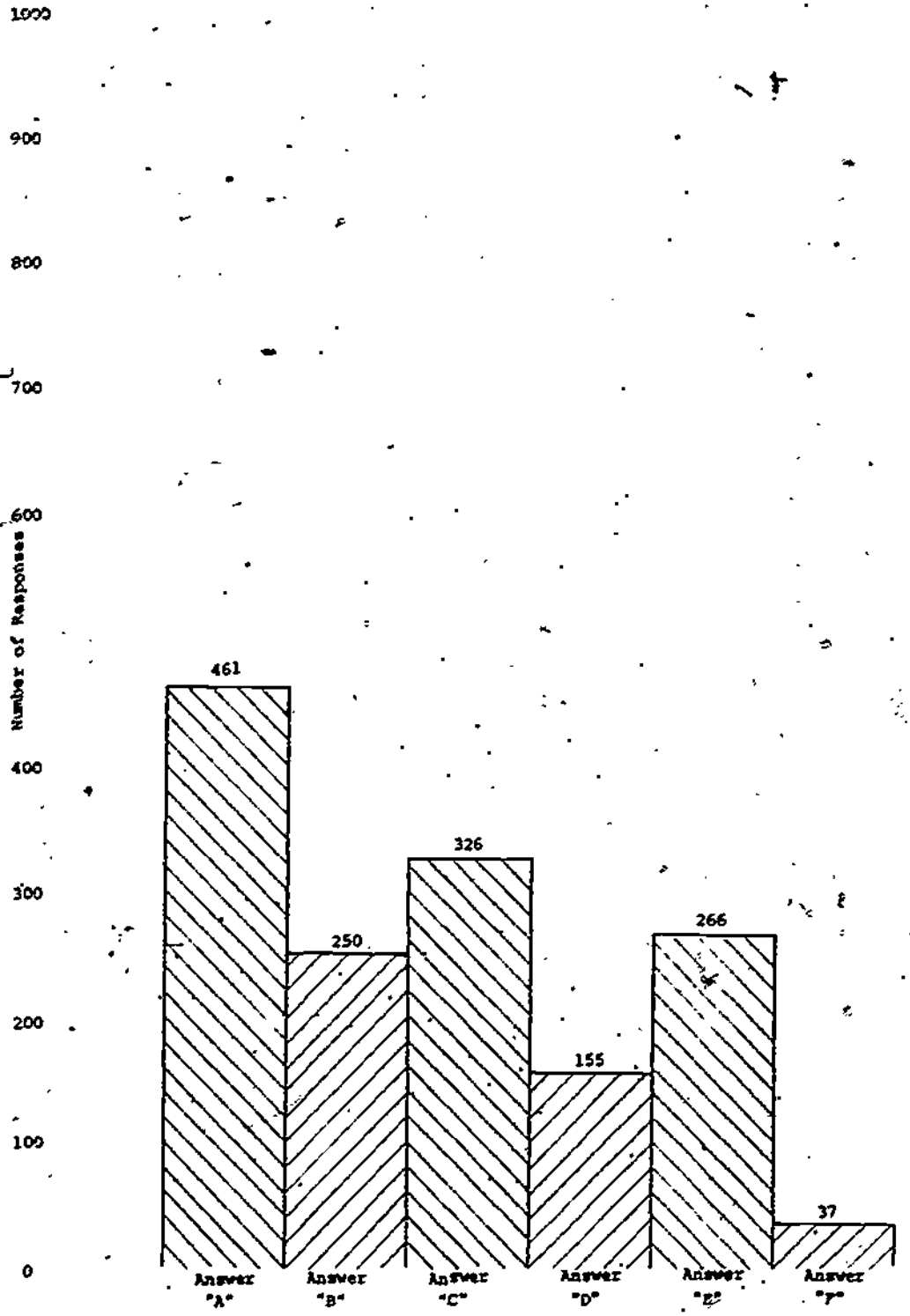
Answer "A"
Answer "B"
Answer "C"

QUESTION 4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500
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300
200
100
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Number of Responses
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155
266
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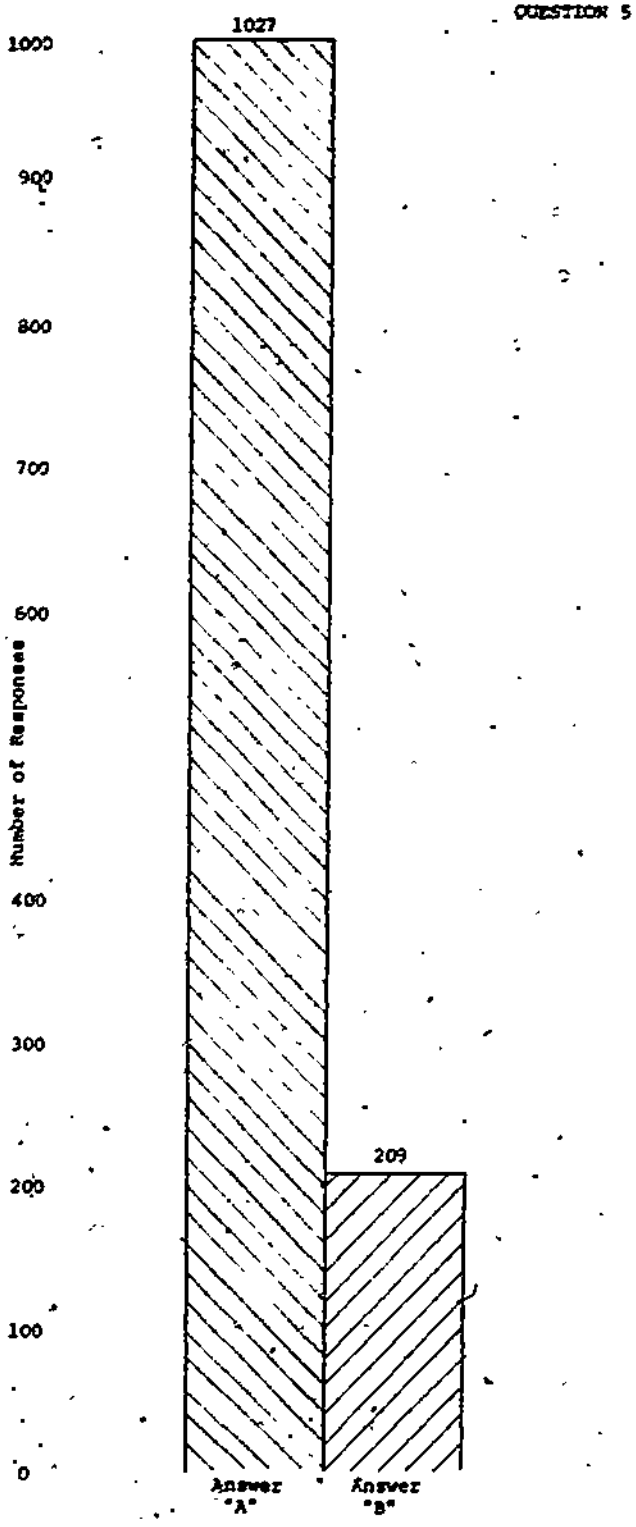
Answer "A"
Answer "B"
Answer "C"
Answer "D"
Answer "E"
Answer "F"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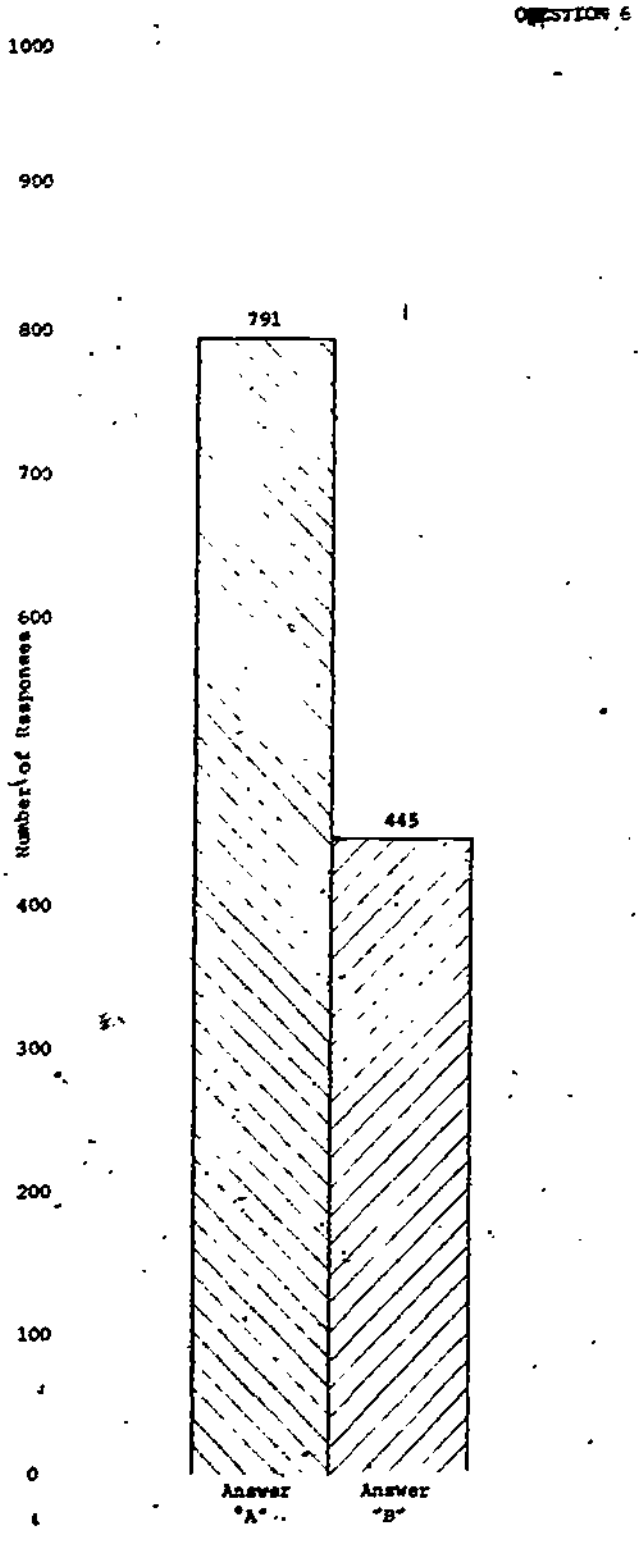
900
800
700
600
400
300
200
100
0
Number of Responses
Answer "A"
Answer "B"


QUESTION 6
1000
900
800
700
600
400
300
200
100
0
Number of Responses
791
445
Answer "A"
Answer "B"

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

WHOLE NUMBERS — CLERICAL

A, Problems with Solutions

1, Statistics show that our town has 20,258 persons under 25 years old; 16,977 between 25 and 65 years of age; and 8,968 over 65 years old, How many people live in our town?

Solution:

Add 20,258
16,977
+ 8,968
46,203 people

2, Man-Hours Lost From Industrial Accidents, 1973

Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
185	96	128	89	195	116	129	160	98	114	136	145

(a) Compute the total 1973 man-hours lost

(b) What is the average monthly man-hours lost?

Solution:

(a) 185 + 96 + 128 + 89 + 195 + 116 + 129 + 160 + 98 + 114 + 136 + 145 = 1591 man-hours lost

(b) Divide the total by the number of addends,

$$\frac{1591 \text{ man-hours lost}}{12} = 132.583 \text{ average man-hours lost}$$

3, If there are 759 families in the suburb of Linnville and the median family income is $12,750 a year, what should be a good estimate of the annual income of the community?

Solution:

759 families x $12,750 per family = $9,677,250

B. Problems with Separate Solutions

4. Burns Bakery uses 59 lbs of rye flour a week. They have 354 lbs on hand. How many weeks will it last?

Solution:

5. At the beginning of the week Smith's Grocery had 14 brooms in stock. During the week a shipment of 3 dozen arrived and all of them were put in stock. At the end of the week 23 remained in stock. How many were sold during the week?

Solution:

6. A ticket seller at a baseball game was given 150 eighty-five cent tickets and $25.00 in change. At the end of the game he turned in 17 tickets and $138.25 in money.

(a) Is this the amount of money he should have returned?

(b) If not, how much was it more or less than the correct amount?

Solution:

C. Problems without Solutions

7. The following quotations were given for two days for the New York Stock Exchange.

	Friday	Thursday
Volume of shares traded	14,150,00	18,300,000
Different companies whose stock was traded (Issues Traded)	1,582	1,612
Issues that advanced in price	741	584
Issues that declined in price	604	832

(a) How much less was the volume for Friday than it had been on Thursday?

(b) What was the difference in issues traded for the two days?

(c) How many more stocks showed advances on Friday than on Thursday?

(d) By how much did those stocks showing advances outnumber those showing declines on Friday?

Solution:

8. Deliveries of milk to the Green Haven Cheese Factory from five local dairies were as follows: 2,470 gallons; 3,240 gallons; 2,210 gallons; 1,570 gallons and 3,765 gallons. How many gallons were delivered to the factory?

Solution:

C. Problems without Solutions (continued)

9. The New York Stock Exchange listed the following stocks as the ten leaders in volume of sales for a particular day:

Imperial Cp of Amer	425,700
Bristol Myers	233,700
Sinclair	199,400
Occidental Petrol	136,300
Eastern Airlines	128,700
Gulf and Western	125,600
Chrysler	125,400
Gerber Products	124,400
American Motors	120,500
Swift Company	109,100

(a) What was the total number of shares sold for the top ten companies that day?

(b) By how many shares did the volume of Chrysler stock exceed the sales of American Motors Stock?

(c) What was the total number of shares sold of Sinclair, Occidental Petrol, and Gulf and Western?

Solution:

10. Vistors to the county museum during the first week after it had opened were as follows: Sunday, 869; Monday, 456; Tuesday, 317; Wednesday, 725; Thursday, 294; Friday, 375; and Saturday, 961. What was the average daily attendance?

Solution:

C. Problems without Solutions (continued)

11. A real estate agent sold a 37-acre farm at $420.00 per acre. He took as part payment a smaller farm of 16 acres at $500.00 per acre. How much cash should he receive in addition?

Solution:

Solutions to B problems

B.4

$$\frac{354 \text{ lbs}}{59 \text{ lbs/week}} = \frac{354 \text{ lbs} \times \text{week}}{59 \text{ lbs}} = 6 \text{ weeks}$$

B.5

There are 12 in a dozen. Multiply 3 x 12 and add 14. This tells how many he had to sell all together. Then subtract 23.

$$\begin{array}{rl} (3)(12 \text{ brooms}) = & 36 \text{ brooms} \\ & +14 \text{ brooms} \\ \hline & 50 \text{ brooms} \\ & -23 \text{ brooms} \\ \hline & 27 \text{ brooms} \end{array}$$

B.6

(a) First find out how many tickets he sold:

150 tickets - 17 tickets = 133 tickets

At $0.85 per ticket: (133 tickets)($0.85/ticket) = $113.05

He should turn in this plus the $25.00: $113.05 + $25.00 = $138.05

The anwser to (a) is No.

(b) The difference between $138.25 - $138.05 = $0.20

He turned in $0.20 more than the correct amount.

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

FRACTIONS : CLERICAL

A. Problems with Solutions

1. If 1/20 of each paycheck is deducted for insurance, what is the total annual salary of a man who receives $1,710.00 each month after the deduction has been made?

Solution:

$1,710 is 19/20 of the paycheck before deductions

$1,710 = (19/20)x x = total monthly salary

$34,200 = I9x

$1,800 = x

total annual salary = ($1,800)(12) = $21,600

2. During the week the stockroom issued the following amounts of No. 206 nails.

Monday	26 7/8 lbs
Tuesday	18 1/3 lbs
Wednesday	21 5/16 lbs
Thursday	24 3/8 lbs
Friday	19 7/16 lbs
Total	_____ lbs

If there were 206 1/8 lbs on hand at the beginning of the week, how many pounds were remaining in stock at the end of the week?

Solution:

26 7/8 lb + 18 1/3 lb + 21 5/16 lb + 24 3/8 lb + 19 7/16 lb =

26 42/48 lb + 18 16/48 lb + 21 15/48 lb + 24 18/48 lb + 19 21/48 lb =

108 112/48 lb = 110 1/3 lbs

Amount remaining = 206 3/24 lbs - 110 8/24 lbs

= 205 27/24 lbs - 110 8/24 lbs

= 95 19/24 lbs

A. Problems with Solutions (continued)

3. Mr. Jones must have new baseboard installed in two offices. One office is 12 3/4 ft by 14 2/3 ft with a 3 ft door. The other office is 13 1/6 ft by 17 1/2 ft with a 2 1/2 ft door. How many feet of baseboard should Mr. Jones order?

Solution:

We add the perimeters of both rooms and subtract the door widths

12 3/4 ft + 12 3/4 ft + 14 2/3 ft + 14 2/3 ft - 3 ft =

12 9/12 ft + 12 9/12 ft + 14 8/12 ft + 14 8/12 ft - 3 ft =

49 34/12 ft = 51 5/6 ft

17 1/2 ft + 17 1/2 ft + 13 1/6 ft + 13 1/6 ft - 2 1/2 ft =

17 3/6 ft + 17 3/6 ft + 13 1/6 ft + 13 1/6 ft - 2 3/6 ft =

58 5/6 ft

51 5/6 ft + 58 5/6 ft = 110 2/3 ft

B. Problems with Separate Solutions

4. $100 was divided among three people. The first received 2/5 of the amount and the second received 1/4. How much did each of the three people receive?

Solution:

5. A freight car which is 7/16 full takes on an additional load of 1/5 of its capacity. At its first delivery stop, 3/8 of its capacity is delivered. What fraction of its capacity is now available for use?

Solution:

B. Problems with Separate Solutions (continued)

6. Mr. White owned 1/3 of a business, Mr. Boyt owned 1/2, Mr. Evans owned 1/9 and Mr. Baines owned the remainder. If Mr. Baines' share was worth $3,700, how much were the shares held by each of the other partners worth?

Solution:

C. Problems without Solutions

7. Calculate the cubic feet of storage in a bin which measures 2 5/12 ft by 3 1/8 ft by 1 3/4 ft. (length x width x depth)

Solution:

8. A clerk cannot find the production figures for two years ago. He has last year's figures showing 511,000 units produced and remembers figuring that last year's production was up approximately 1/6 over the year before. Approximately what was the production two years ago?

Solution:

9. If it requires 16 weeks at 40 hours per week for 22 men to complete a job, how many weeks would it take them to complete the job working 56 hours per week if they accomplish only 9/10 as much per hour when working for a greater number of hours per week?

Solution:

C. Problems without Solutions (continued)

10. Total area of Grey's Lumber Mill is 1,773 sq ft. The parts department occupies 591 sq ft. What fraction of the total space does the parts department occupy?

Solution:

Solutions to B problems

B.4

($100)(2/5) = $40	1st person receives
($100)(1/4) = $25	2nd person receives
($100 - $40) - $25 = $35	3rd person receives

B.5

7/16 + 1/5 = 35/80 + 16/80 = 51/80	amount of capacity that the car carries
51/80 - 3/8 = 51/80 - 30/80 = 21/80	amount of capacity now available

B.6

x = Mr. Baines' share	B = total amount in business
1/3 + 1/2 + 1/9 + x = 1	$3,700 = (1/18)B
6/18 + 9/18 + 2/18 + x = 1	($3,700)(18) = B
x = 1/18	$66,600 = B
Mr. White (1/3)($66,600) = $22,200	
Mr. Hoyt (1/2)($66,600) = $33,300	
Mr. Evers (1/9)($66,600) = $ 7,400	

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

DECIMALS CLERICAL

A. Problems with Solutions

1. Sales for the day in one department of a notions store were as follows: $26.50, $0.76, $12.20, $3.56, $20.09, $8.80, $5.60, $3.76 and $4.20. Find the total of all sales that were less than $10.00 and the total sales for the day.

Solution:

It is necessary to add all numbers less than $10.00. Remember to keep the decimals in a vertical line.

$ .76
3.56
8.80
5.60
3.76
4.20
$26.68

For the second part, add $26.68 to all those values over $10.00.

$26.68
26.50
12.20
20.09
$85.47

2. The monthly telephone bills for the Banes Optical Company for 6 months were: $47.16, $59.25, $63.75, $43.50, $59.25 and $87.16. What was the average monthly telephone bill during this time?

Solution:

To find the average, add all the bills and divide by the number of bills.

$ 47.16
59.25
63.75
43.50
59.25
87.16
$360.07

$\frac{\$360.07}{6} = \$60.01$

A. Problems with Solutions (continued)

3. Find the cost of shipping 37 boxes whose average weight is 26.25 lbs at 16.5¢ per hundred pounds.

Solution:

total weight = (26.25 lbs/box)(37 boxes)

= 971.25 lbs

971.25 lbs expressed in hundreds of lbs = 9.7125 lbs

cost = (9.7125 hundred lbs)($0.165/hundred lbs)

= $1.60

B. Problems with Separate Solutions

4. J. Jenkins worked 43 hours during the week at the rate of $2.35 an hour. What was his gross earnings if he was paid 1 1/2 times his regular rate for any time over 40 hours?

Solution:

5. Mrs. Harvey assembles, on an average, 217 items per day at 12¢ each. How much does she earn in a week if she maintains this average for 6 days?

Solution:

B. Problems with Separate Solutions (continued)

6. From 26.653 tons of steel, 18.36 tons are sold. How many tons are left?

Solution:

C. Problems without Solutions

7. If 35.6 miles of highway cost $1,157,000, what would 46.3 miles cost at the same price per mile?

Solution:

8. Upholstery fabric costs $3.97 a yard. What is the cost of 12.35 yards?

Solution:

9. During the week, R. J. Hopland worked 8 1/4 hours, 7 hours, 10 hours, 7 3/4 hours, 6 3/4 hours and 4 hours. If he received $6.50 per hour, how much did he earn?

Solution:

10. What is the tax on a piece of property if the assessed valuation is $660 and the tax rate is $8.33 per $100?

Solution:

C. Problems without Solutions (continued)

11. Pencils for the office cost two and forty-three hundredths cents apiece. How much would one gross (144) cost?

Solution:

Solutions to B problems

B.4

For 40 hours work he makes

(40 hrs)($2.35/hr) = $94.00

For his overtime he makes

(43 hrs - 40 hrs)($2.35/hr)(1.5) = (3 hrs)($3.525/hr)

= $10.575 rounds to $10.58

Total Pay = $94.00 + $10.58 = $104.58

B.5

In one day she earns

(217 items)($0.12/item) = $26.04

In 6 days she would earn

($26.04)(6) = $156.24

B.6

The rule for subtracting decimals is the same as for adding - keep the decimals in a line.

```
 26.653 tons
-18.36  tons
---------
  8.293 tons
```

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

RATIO AND PROPORTION — CLERICAL

A. Problems with Solutions

1. A salesman was paid a commission of $20 for selling $250 worth of goods. What sould be his commission on $350 of sales at the same rate of commission?

   The ratio of the dollars of commissions equals the ratio of the dollars of sales.

   Solution:

$$\frac{\$20}{\$250} = \frac{x}{\$350}$$

$$250x = (\$350)(20)$$

$$250x = \$7,000$$

$$x = \$28$$

2. A logging crew cuts, loads, and trucks 9,300 board feet of timber to the mill in 3 days and continues to work at the same rate. On what day is the 150,000th board foot delivered to the mill?

   Solution:

$$\frac{3 \text{ days}}{9{,}300 \text{ board ft}} = \frac{x}{150{,}000 \text{ board ft}}$$

$$(9{,}300 \text{ board ft})x = 450{,}000 \text{ board ft} \times \text{day}$$

$$x = \frac{450{,}000 \text{ board ft} \times \text{day}}{9{,}300 \text{ board ft}}$$

$$x = 48 \text{ days}$$

A. Problems with Solutions (continued)

3. Dick was paid $5.85 for working 4 1/2 hours. At the same rate, how much should he be paid for working 7 hours?

The ratio of the dollars equals the ratio of the hours.

Solution:

$$\frac{4.5 \text{ hr}}{\$5.85} = \frac{7 \text{ hr}}{s}$$

$$(4.5 \text{ hr})s = \$40.95 \times \text{hr}$$

$$s = \frac{\$40.95 \times \text{hr}}{4.5 \text{ hr}}$$

$$s = \$9.10$$

B. Problems with Separate Solutions

4. If 6 yards of cloth cost $5.25, what will 10 yards cost at tha same rate?

Solution:

5. If 9 yards of goods cost $7.50, how many yards can be bought for $50.00?

Solution:

B. Problems with Separate Solutions (continued)

6. Aaron Rank sells a customer a 5-yard remnant of Chintz for $2.75. "Here's another piece of 13 yards," he says, "that you can buy at the same rate." How much is Aaron Rank asking for the 13 yard piece?

Solution:

C. Problems without Solutions

7. Apex Company granted wage increases to its employees. The monthly payroll rose from $10,000 to $12,000. Steve's wages, which had been $575, rose in proportion. How much a month did he earn after the raise?

Solution:

8. A firm's expenses for 5 weeks amounted to $1,600. At this rate what would the expenses amount to in a year?

Solution:

C. Problems without Solutions (continued)

9. Carl Maynard, maintenance supervisor, drove to the plant Monday morning and found that the cellar was flooded to a depth of 18 inches. He turned on the pump and in 40 minutes the water level went down 1 1/2 inches. At this rate, how long did it take Carl to pump all the water out of the cellar?

Solution:

10. Compare the cost of paint at $5.00 a gallon with the cost of paint at $1.50 a quart.

Solution:

11. A man receives $14 for working 8 hrs. How much would he receive for working 50 hours, at the same rate of pay?

Solution:

Solutions to B problems

8.4

$$\frac{6 \text{ yards}}{\$5.25} = \frac{10 \text{ yards}}{s}$$

$$(6 \text{ yards})s = \$52.50 \text{ x yards}$$

$$s = \frac{\$52.50 \text{ x yards}}{6 \text{ yards}} \qquad s = \$8.75$$

Solutions to B problems (continued)

B.5

$$\frac{3 \text{ yards}}{\$7.50} = \frac{x}{\$50}$$

$$(\$7.50)x = \$450 \text{ yards}$$

$$x = \frac{\$450 \text{ yards}}{\$7.50}$$

$$x = 60 \text{ yards}$$

B.6

$$\frac{5 \text{ yards}}{\$2.75} = \frac{13 \text{ yards}}{x}$$

$$(5 \text{ yards})x = \$35.75 \text{ yards}$$

$$x = \frac{\$35.75 \text{ yards}}{5 \text{ yards}}$$

$$x = \$7.15$$

Solutions to C Problems

C.7

(a) Subtract
18,300,000 shares
- 14,150,000 shares
4,150,000 shares

(b) Subtract
1,612 issues
- 1,582 issues
30 issues

(c) Subtract
741 stocks
- 584 stocks
157 stocks

(d) Subtract
741 stocks
- 604 stocks
137 stocks

C.8

2,470 gallons
3,240 gallons
2,210 gallons
1,570 gallons
+ 3,765 gallons
13,255 gallons

C.9

(a)
425,700
233,700
199,400
136,300
128,700
125,600
125,400
124,400
120,500
+ 109,100
1,728,800 shares

(b)
125,400
- 120,500
4,900 shares

(c)
199,400
136,300
+ 125,600
461,300 shares

Solutions to C problems (continued)

C.10

$$\frac{869 + 456 + 317 + 725 + 294 + 375 + 961}{7} = \frac{3,997 \text{ people}}{7 \text{ days}}$$

$$= 571 \text{ people per day}$$

C.11

($420.00/acre)(37 acres) - ($500.00/acre)(16 acres) =

$15,540 - $8,000 = $7,540

Solutions to C problems

C.7

$$\frac{\$1,157,000}{35.6 \text{ miles}} = \$32,500 \text{ per mile}$$

$(\$32,500/\text{mile})(46.3 \text{ miles}) = \$1,504,750$

C.8

$(12.35 \text{ yards})(\$3.97/\text{yard}) = \$49.03$

C.9

$8.25 \text{ hr} + 7 \text{ hr} + 10 \text{ hr} + 7.75 \text{ hr} + 6.75 \text{ hr} + 4 \text{ Hr} = 43.75 \text{ hr}$

$(43.75 \text{ hr})(\$6.50/\text{hr}) = \$284.38$

C.10

$$(\$660)\left(\frac{\$8.33}{\$100}\right) = (\$660)(0.0833)$$

$= \$54.98$

C.11

$(144 \text{ pencils})(2.43¢/\text{pencil}) = (144 \text{ pencils})(\$0.0243/\text{pencil})$

$= \$3.50$

Solutions to C problems

C.7

$$\left(\frac{29}{12}\text{ ft}\right)\left(\frac{25}{8}\text{ ft}\right)\left(\frac{7}{4}\text{ ft}\right) = \frac{5075}{384}\text{ cu ft}$$

$$= 13\ \frac{83}{384}\text{ cu ft}$$

C.8

x = production of two years ago

511,000 units = (7/6)x

3,066,000 units = 7x

438,000 units = x

C.9

(16 weeks)(40 hours/week)(22) = 14,080 hours to complete job

$w\left(\frac{9}{10}\right)(56\text{ hrs/week})(22) = 14,080\text{ hrs}$

$w\left(\frac{504}{10}\text{ hrs/week}\right)(22) = 14,080\text{ hrs}$

$w\left(\frac{11,088}{10}\text{ hrs/week}\right) = 14,080\text{ hrs}$

$w = (14,080\text{ hrs})\left(\frac{10}{11,088\text{ hr/week}}\right)$

$w = \frac{140,800\ \cancel{\text{hr}} \times \text{week}}{11,088\ \cancel{\text{hr}}}$

$w = 12\ \frac{7,744}{11,088}\text{ weeks}$

$w = 12\ \frac{44}{63}\text{ weeks}$

Solutions to C problems

C.10

$$\frac{591 \text{ sq ft}}{1,773 \text{ sq ft}} = \frac{1}{3}$$

Solutions to C problems

C.7

$$\frac{\$10,000}{\$12,000} = \frac{\$575}{x} \qquad 10,000x = \$6,900,000 \qquad x = \$690$$

C.8

$$\frac{5 \text{ weeks}}{\$1,600} = \frac{52 \text{ weeks}}{x}$$

$$(5 \text{ weeks})x = \$83,200 \text{ weeks}$$

$$x = \frac{\$83,200 \text{ weeks}}{5 \text{ weeks}}$$

$$x = \$16,640$$

C.9

$$\frac{40 \text{ min}}{1.5 \text{ in}} = \frac{x}{18 \text{ in}}$$

$$(1.5 \text{ in})x = 720 \text{ min(in)}$$

$$x = \frac{720 \text{ min(in)}}{1.5 \text{ in}}$$

$$x = 480 \text{ min} = 8 \text{ hrs}$$

C.10

$$\frac{\$5.00}{4} : \$1.50$$

$$\$1.25 : \$1.50$$

$$5 : 6$$

C.11

$$\frac{\$14}{8 \text{ hr}} = \frac{x}{50 \text{ hr}}$$

$$(8 \text{ hr})x = \$700 \text{ hr}$$

$$x = \frac{\$700 \text{ hr}}{8 \text{ hr}}$$

$$x = \$87.50$$

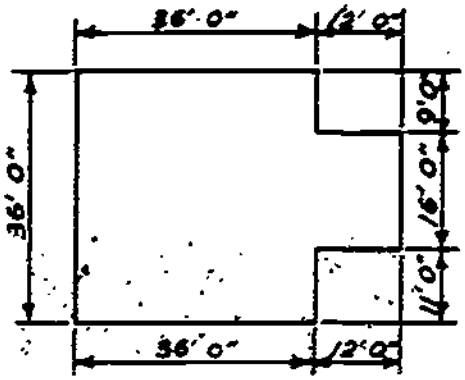
OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

WHOLE NUMBERS — CONSTRUCTION

A. Problems with Solutions

1. Find the total lineal feet of wall for the floor plan shown.



Solution:

lineal feet = 36' + 36' + 12' + 9' + 16' + 11' + 12' + 36'

= 168 ft

2. If one man could lay 115 square feet of flooring per hour, how many square feet could a crew of three men lay in an 8-hour day?

Solution:

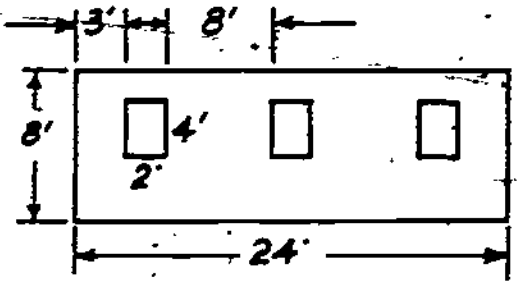
(115 sq ft/man hr)(3 men) = 345 sq ft/hr

(345 sq ft/hr)(8 hr) = 2,760 sq ft

therefore three men could lay 2,760 sq ft in 8 hours

A. Problems with Solutions (continued)

3. Determine the number of 4' x 8' sheets of sheet rock needed for the wall in the accompanying figure.



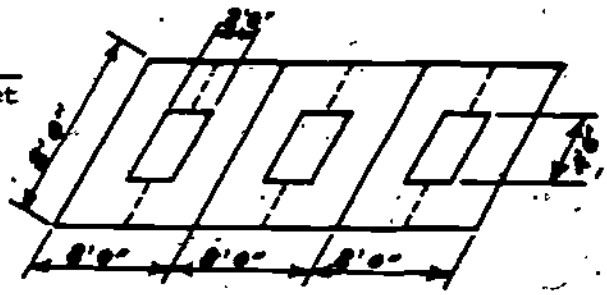
In calculating the number of sheets of sheetrock, the number, size, and location of openings must be considered since the minimum number of joints is desirable.

Solution:

In this figure the size and location of the openings make it necessary to cut the openings from full sheets of material.

$$\frac{\text{lineal feet of wall}}{\text{width of wall board}} = \frac{24\ \cancel{ft}}{4\ \cancel{ft}/\text{sheet}}$$

$$= 6 \text{ sheets}$$



B. Problems with Separate Solutions

4. From a board 96 inches long 3 pieces are to be cut--24 inches, 28 inches, and 36 inches in length. How long is the piece that remains?

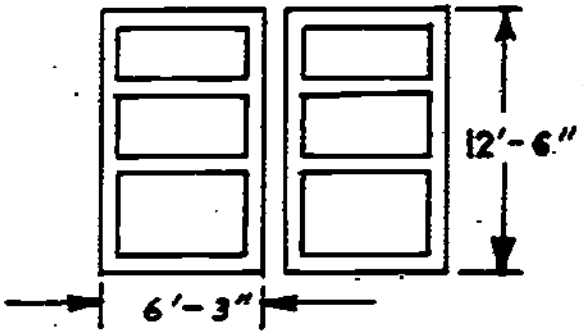
Solution:

5. How many pieces of tile will be needed to cover a floor having an area of 35 square yards if there are 16 pieces of tile per square yard?

Solution:

B. Problems with Separate Solutions (continued)

6. How many linear feet of 2" x 6" will be needed to frame the sliding door as shown?



How many 14 foot pieces would be needed? How many board feet would this be? If 2" x 6" cost $150 per thousand board foot, how much would these 14 foot pieces cost?

$$\text{board feet} = \frac{(\text{thickness, in})(\text{width, in})(\text{length, ft})}{12}$$

Solution:

C. Problems without Solutions

7. The walls of a building measure 242 feet, 143 feet, 210 feet, 18 feet, 32 feet, and 125 feet. What is the total length of the walls?

Solution:

C. Problems without Solutions (continued)

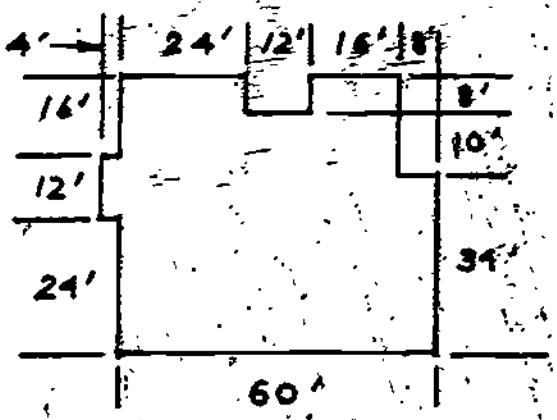
8. A pile of lumber contains 205 boards 10 feet long, 83 boards 12 feet long, 172 boards 8 feet long, and 16 boards 16 feet long.

a) How many boards are in the pile?

b) How many linear feet of lumber are in the pile?

Solution:

9. The number of studs in the exterior walls can be estimated by finding the lineal feet of wall, with no deductions. How many studs would be required for the exterior walls for the floor plan shown?



Solution:

C. Problems without Solutions (continued)

10. A room is 15 feet wide and 21 feet long. How many 9" x 9" tile would be needed to cover the floor of this room?

Solution:

Solutions to B problems

B.4

24" + 28" + 36" = 88 in

96" - 88" = 8 in

therefore 8 inches remains

B.5

(35 ~~sq yds~~)(16 tiles/~~sq yd~~) = 560 tiles

B.6

linear feet = (4)(12' 6") + (8)(6' 3")

= 48' 24" + 48' 24"

= 50' + 50' = 100 ft

$\frac{100\ \cancel{ft}}{14\ \cancel{ft}} = 7.1$ therefore 8 pieces 14 feet long are needed

board feet = $\left[\frac{(2)(6)(14)}{12}\right]8$ = 112 board ft

cost = (\$150/thousand ~~board~~ ft)(0.112 thousand ~~board~~ ft)

= \$16.80

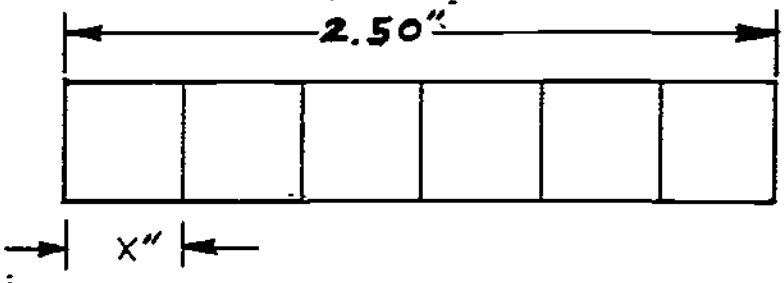
OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

DECIMALS CONSTRUCTION

A. Problem with Solution

1. A steel sheet 2.5 inches wide is to be sheared into 6 strips of equal width. How wide will each strip be?



Solution:

x = width of strips

$$x = \frac{2.5 \text{ in}}{6 \text{ strips}}$$

x = 0.42 in per strip

B. Problem with Separate Solution

2. How high would a pile of 18 metal sheets reach if each sheet is 0.0181" thick?

Solution:

C. Problems without Solutions

3. If nails cost $19.85 per 100-lb keg, how much would 539 pounds cost? (The 39 pounds were bought at the same rate)

Solution:

C. Problems without Solutions (continued)

4. How many metal sheets will there be in a stack of sheets approximately 24 inches high if each sheet is 0.0096 inches thick?

Solution:

5. Concrete for a slab floor cost $341.42. At $19.85 per cubic yard, how many yards of concrete were used?

Solution:

Solution to B problem

B.2

height = (18 sheets)(0.0181 in/sheet)

= 0.3258 in

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

FRACTIONS — CONSTRUCTION

A. Problems with Solutions

1. What is the thickness of a table top made of 3/4 inch plywood and covered with 3/16 inch glass?

Solution:

thickness = 3/4" + 3/16" = 12/16" + 3/16" = 15/16 in

2. How many pieces of lumber 1 5/8 inches wide will be needed to cover a space 39 inches wide?

Solution:

p = number of pieces needed

$$p = \frac{39 \text{ in}}{1\ 5/8 \text{ in/piece}}$$

$$p = \frac{39 \text{ in} \times \text{piece}}{13/8 \text{ in}}$$

p = (39 pieces)(8/13)

p = 24 pieces

B. Problems with Separate Solutions

3. A carpenter needed a piece of lumber 2 7/8 inches wide. How wide a piece is left if the original piece was 5 5/8 inches, and 3/16 inch is allowed for the saw cut?

Solution:

4. What is the thickness of a wall if the stud is 3 5/8 inches, the exterior covering 11/16 inch and the interior covering 13/32 inch?

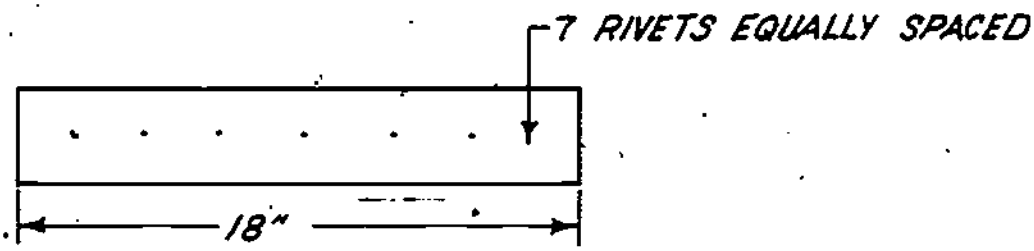
Solution:

C. Problems without Solutions

5. If 5/32 inch is allowed for each cut, what will be the width of each of three equal pieces cut from a piece of lumber 7 5/8 inches wide?

Solution:

6. Compute the rivet spacing on the drawing.



Solution:

7. Find the length of the rivets (1/8 inch diameter) needed to rivet one thickness of 28-gauge (0.0149 inch thick) sheet metal and one piece of 12-gauge (0.1046 inch thick) band iron to the closest 32nd of an inch.

Note: In order to form the head on a rivet it must project 1 1/2 times the diameter of the rivet beyond the thickness of the material being riveted.

Solution:

Solutions to B problems

B.3

amount left = (5 5/8" - 2 7/8") - 3/16"

= (4 13/8" - 2 7/8") - 3/16"

= 2 6/8" - 3/16"

= 2 12/16" - 3/16"

= 2 9/16 in

B.4

thickness = 3 5/8" + 11/16" + 13/32"

= 3 20/32" + 22/32" + 13/32"

= 3 55/32"

= 4 23/32 in

Solutions to C problems

C.7

total length = 242' + 143' + 210' + 18' + 32' + 125'

= 770 ft

C.8

a)
$$\begin{array}{r} 205 \text{ boards} \\ 83 \text{ boards} \\ 172 \text{ boards} \\ +\ 16 \text{ boards} \\ \hline 476 \text{ boards} \end{array}$$

b) (205 boards)(10 ft/board) = 2,050 ft

(83 boards)(12 ft/board) = 996 ft

(172 boards)(8 ft/board) = 1,376 ft

(16 boards)(16 ft/board) = 256 ft

Total linear feet = 2,050' + 996' + 1,376' + 256'

= 4,678 ft

C.9

total lineal feet = 24' + 4' + 12' + 4' + 16' + 24' + 8' +

12' + 8' + 16' + 8' + 10' + 8' + 34' + 60'

= 248 ft

therefore 248 studs are required

C.10

(15 ft)(12 in/ft) = 180 in

(21 ft)(12 in/ft) = 252 in

$$\frac{180 \text{ in}}{9 \text{ in/tile}} = \frac{180 \text{ in} \times \text{tile}}{9 \text{ in}} = 20 \text{ tiles}$$

$$\frac{252 \text{ in}}{9 \text{ in/tile}} = \frac{252 \text{ in} \times \text{tile}}{9 \text{ in}} = 28 \text{ tiles}$$

(20 tiles)(28 tiles) = 560 sq tiles

therefore 560 tiles 9" x 9" are required

Solutions to C problems

C.3

total cost = ($19.85/hundred lbs)(5.39 hundred lbs)

= $106.99

C.4

s = number of sheets

$$s = \frac{24 \text{ in}}{0.0096 \text{ in/sheet}}$$

$$s = \frac{24 \text{ in} \times \text{sheet}}{0.0096 \text{ in}}$$

s = 2,500 sheets

C.5

$$\text{yards of concrete} = \frac{\$341.42}{\$19.85/\text{cu yd}}$$

$$= \frac{\$341.42 \times \text{cu yd}}{\$19.85}$$

= 17.2 cu yds

Solutions to C problems

C.5

$$\text{width of pieces} = \frac{7\ 5/8" - (2)(5/32")}{3 \text{ pieces}}$$

$$= \frac{7\ 5/8" - 5/16"}{3 \text{ pieces}}$$

$$= \frac{7\ 10/16" - 5/16"}{3 \text{ pieces}}$$

$$= \frac{7\ 5/16"}{3 \text{ pieces}}$$

$$= \frac{117/16 \text{ in/piece}}{3}$$

$$= \left(\frac{1}{3}\right)\left(\frac{117}{16} \text{ in per piece}\right)$$

$$= 39/16 \text{ in per piece}$$

$$= 2\ 7/16 \text{ in per piece}$$

C.6

$$\text{placement of rivets} = \frac{18 \text{ in}}{8 \text{ spaces}}$$

$$= 2\ 1/4 \text{ in per space}$$

C.7

$$\text{length of rivet} = 0.0149" + 0.1046" + (1.5)(1/8")$$

$$= 0.1195" + (3/2)(1/8")$$

$$= \frac{1,195"}{10,000} + \frac{3"}{16}$$

$$= \frac{38,240"}{320,000} + \frac{60,000"}{320,000}$$

$$= \frac{98,240"}{320,000}$$

$$= \frac{9.8"}{32}$$

therefore 10/32 inch is needed

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

WHOLE NUMBERS — FOREST PRODUCTS

A. Problems with Solutions

1. The purchaser of timber is required to post bond to cover the value of the timber cut. One purchaser has obtained bond to cover timber cuts in several sales in the Ochoco National Forest as indicated below. What is the total bond required of the purchaser?

Name of Sale	Amount of Bond
Latigo	$ 34,500
Dry Mountain	45,000
Crowsfoot Salvage	62,000
Wickiup	125,000
Claw Creek	34,000
Sundown	46,000
Yellow Belly	500
Sourdough	75,000
Copperson Two	18,000

Solution:

Total amount = $34,500 + $45,000 + $62,000 + $125,000 +

$34,000 + $46,000 + $500 + $75,000 + $18,000

= $440,000

2. Complete the following cost analysis report for a timber sale in the Deschutes National Forest.

		units of area	COSTS per unit	total
1. Machine	a) Piling		$55	
	b) Burning	462	$10	
2. Hand	a) Piling	15	$80	
	b) Burning	15	$10	
3. Other	a) Spur Road - Landing & Slash	--	---	$905
	b) Mapping and Signing	--	---	$373
4. Supplemental Protection		--	---	$3,307
5. Improvement		--	---	$239
6. Indirect Costs		--	---	$22,937
	TOTAL COSTS	--	---	

A. Problems with Solutions (continued)

2. Solution:

Items 3 through 6 are single item costs and do not depend on per unit costs. Thus these costs appear only in the "total" column.

1. a) (462 units)($55/unit) = $25,410
   b) (462 units)($10/unit) = $4,620

2. a) (15 units)($80/unit) = $1,200
   b) (15 units)($10/unit) = $150

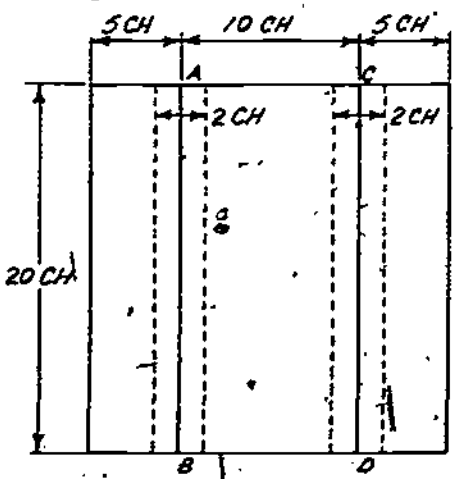
Total Costs = $25,410 + $4,620 + $1,200 + $150 + $905 +

$373 + $3,307 + $239 + $22,937 +

= $59,141

3. If a timber cruiser ran two parallel lines AB and CD across a forty acre tract (1/16 of a section - see sketch) and tallied all trees for one chain on each side of each line, how many acres of timber would be tally?

Definition: 10 square chains equals one acre



Solution:

We need to know the area in each rectangle along the lines AB and CD and then add these areas.

Area = width x length

= (2 ch)(20 ch)

= 40 square chains

We have 2 equal rectangles, therefore total area = 40 sq ch + 40 sq ch = 80 sq ch

$$\text{Acres} = \frac{80 \text{ sq ch}}{10 \text{ sq ch/acre}} = \frac{80 \text{ sq ch} \times \text{acre}}{10 \text{ sq ch}} = 8 \text{ acres}$$

B. Problems with Separate Solutions

4. The following information was obtained during a precruise in a proposed sale area in the Ocboco National Forest.

Unit No	Acres	Plots
1	156	17
2	33	4
3	20	2
4	122	13
5	16	2
6	59	6
7	83	9

a) Determine the total number of acres and plots in this precruise.

Determine the average number of: (to the nearest whole number)

b) plots per unit
c) acres per unit
d) acres per plot

Solution:

5. A truck load of alder trees for pulp wood is delivered to a paper mill. The loaded truck weighs 74,540 lbs and the empty truck weighs 24,140 lbs. The driver-owner of the truck is paid $3.65 per ton for delivery of the load. Find the total weight of the load and the trucker's pay. The seller of the trees is paid by the cord which is figured on the basis of 5,000 lbs per cord. Find the number of cords in the truck load to the nearest hundredth.

Definitions: Cord - a unit of wood measurement 4 feet wide, 8 feet long, and 4 feet high

Solution:

B. Problems with Separate Solutions (continued)

6. A hardboard plant operates for three 8-hour shifts. A certain day's production in 1/8" measure board for the day shift was 224,000; swing shift was 179,200; graveyard shift was 224,000. The total production for the year up to this day was 99,941,815 standard boards. Find the total production for the year as of this day.

Solution:

C. Problems without Solutions

7. A company employs a total of 15 people. Six of them earn $8,500 per year; two earn $10,500; two were employed at an annual salary of $11,000. The remaining employees earn $9,800. Determine the average annual salary for the employees.

Solution:

8. A forester strip cruises a 40 acre tract and obtains a sample from 1/5 or 20% of the tract. How many acres does he sample?

Solution:

C. Problems without Solutions (continued)

9. The following items are costs incurred by a self-employed logger with one employee who operates an average of 10 hours per day throughout the work season of 120 days. Determine the annual business cost and the cost per hour of operation due to the following items:

Business Liability Insurance	$ 443/yr
Workman's Compensation	706
Life Insurance ($50,000)	1,190
Office in home @ $25/mo x 12 mo.	300
Telephone in home.	240
Bookkeeping, Taxes, Attorney	500
Pick up @ 17¢/mile x 25,000 miles.	4,250
Firewagon @ $1000 divided over 10 yrs.	100
Chain Saws & Small Tools	600
72 Chokers @ $25 each (3/4 in)	1,800
Moving Cost.	250
Other Costs.	OPEN

Solution:

10. The Oregon State Department of Forestry furnishes fire protection for 16.3 million acres of forests. An average of 1,057 fires are controlled annually. The average number of acres of forest burned each year during the last six years was 14,641 acres. Fire control expenditures total $674,000 annually.

a) Determine the average number of acres of forest burned per fire each year to the nearest acre.

b) Determine the average per acre cost for fire suppression each year to the nearest ten cents.

Solution:

C. Problems without Solutions (continued)

11. Fill in the blanks below and cross-check.

Volume in Board Feet, Decimal Scale

Log#	Gross Scale	Deductions for defects	Net Scale
1	660	0-	
2	30	0-	
3	660	60-	
4	160	50-	
5	140	40-	
6	1,010	470-	
7	2,060	20-	
8	430	0-	
9	780	330-	
10	300	10-	
Totals			

Cross-check total net scale

Solution:

Solutions to B problems

B.4

a) 156 acres + 33 acres + 20 acres + 122 acres + 16 acres + 59 acres + 83 acres = 489 acres

17 plots + 4 plots + 2 plots + 13 plots + 2 plots + 6 plots + 9 plots = 53 plots

b) $\frac{53 \text{ plots}}{7 \text{ units}} = 8 \text{ plots per unit}$

c) $\frac{489 \text{ acres}}{7 \text{ units}} = 70 \text{ acres per unit}$

d) $\frac{489 \text{ acres}}{53 \text{ plots}} = 9 \text{ acres per plo}$

Solutions to B problems (continued)

B.5

Load weight in pounds = 74,540 lbs - 24,140 lbs

= 50,400 lbs

$$\text{Tons of load} = \frac{50{,}400 \text{ lbs}}{2{,}000 \text{ lbs/ton}} = 25.2 \text{ tons}$$

Pay for load delivery = (25.2 tons)($3.65/ton) = $91.98

$$\text{Cords in load} = \frac{50{,}400 \text{ lbs}}{5{,}000 \text{ lbs/cord}} = 10.08 \text{ cords}$$

B.6

Production of day	224,000 standard boards
	179,200 standard boards
+	224,000 standard boards
	627,200 standard boards

Production of year	99,941,815 standard boards
+	627,200 standard boards
	100,569,015 standard boards

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

DECIMALS FOREST PRODUCTS

A. Problems with Solutions

1. A rectangular piece of land 4.7 chains by 16.2 chains contains how many square chains and how many acres? (10 square chains equals one acre)

Solution:

$$\text{Area, square chains} = (4.7 \text{ chains})(16.2 \text{ chains})$$

$$= 76 \text{ sq chains}$$

$$\text{Area, acres} = \frac{\text{area, sq chains}}{\text{sq chains/acre}}$$

$$= \frac{76 \text{ sq chains}}{10 \text{ sq chains/acre}}$$

$$= 7.6 \text{ acres}$$

2. Complete the labor cost report below.

a)	Timber Fallers	35 hrs @ $13.50	_____
b)	Buckers	67 hrs @ $11.75	_____
c)	Cat Skinners	150 hrs @ $7.00	_____
d)	Over-time, Cat Skinners	15 hrs @ $11.00	_____
e)	Chokermen	40 hrs @ $3.50	_____
	Total		_____

Solution:

a)	$ 472.50
b)	787.25
c)	1,050.00
d)	165.00
e)	+ 140.00
Total	$2,614.75

B. Problems with Separate Solutions

3. The formula commonly used for determining the board foot content of sawed lumber is

$$\text{board feet} = \frac{(\text{thickness, in})(\text{width, in})(\text{length, ft})}{12}$$

Compute the total volume of board feet and the total price for the following items of lumber: (TBF means thousand board feet)

# Pieces	Size	Price/TBF
129	2 x 6 x 16 ft	$ 169.00
256	2 x 4 x 18 ft	170.00
346	2 x 8 x 20 ft	185.50
87	2 x 6 x 14 ft	170.00
44	2 x 4 x 12 ft	170.00

Solution:

4. A rule of thumb for estimating the number of board feet of lumber in a saw log (which assumes a 4 inch slab and a 5/16 inch saw kerf) is Doyle's Rule. This rule results in a large underscale for small logs and overscale for large logs. Use this formula to estimate the board feet of lumber in 16 foot logs whose "diameters inside bark" (d.i.b.) are 10 inches, 20 inches, and 40 inches. D is "diameter inside bark" in inches.

Solution: Doyle's Rule:

$$\text{board feet} = \left(\frac{D - 4}{4}\right)^2 (\text{length, ft})$$

Solution:

C. Problems without Solutions

5. In measuring the cubic foot contents of logs it is convenient to assume a circular cross-section, determine this cross-sectional area (Basal area) in square feet, and then simply multiply the Basal area by the length in feet to obtain the total volume.

Since logs are not perfect cylinders, various methods have been devised for approximating the volume. Three common formulas are:

Huber's Volume = $(B_{\frac{1}{2}})(L)$

Smalian's Volume = $\left(\frac{B + b}{2}\right)(L)$

Newton's Volume = $(B + 4\ B_{\frac{1}{2}} + b)\left(\frac{L}{6}\right)$

Where $B_{\frac{1}{2}}$ = Basal area at log midpoint

B = Basal area at the large end

b = Basal area at the small end

L = Log length

Compute the volume of a 16 foot log whose diameter(d.i.b.) is 20 inches on the small end, 21 inches at the midpoint and 22 inches on the large end -- using each of the above formulas.

Solution:

C. Problems without Solutions (continued)

6. There isn't a reliable method for converting from board feet log scale to board feet of lumber. A rule of thumb formula (which provides a close approximation to Scribner's log rule) for the board feet of lumber in a 16 foot log is:

$$(0.8)(D - 1)^2 - \frac{D}{2}$$ where D is the diameter inside bark (d.i.b.)

Use this formula to estimate the number of board feet in 16 foot logs whose d.i.b. are 10 inches, 20 inches, and 40 inches.

Solution:

7. Complete the following portion of a timber sale contract:

Species	Class of Material	Unit	Price per Unit	No. of Units	Total
Ponderosa Pine	Sawlogs	M bd ft	$110	350.41	_____
Spruce	Sawlogs	M bd ft	$125	108.40	_____
Douglas Fir	Peeler logs	M bd ft	$138	185.00	_____
Oak	Fuelwood	Cord	$10	78.00	_____
			Grand Total		_____

Solution:

Solutions to B problems

B.3

# Pieces	Size	Board ft	Price/TBF	Cost
129	2 x 6 x 16 ft	2,064	$ 169.00	$ 348.82
256	2 x 4 x 18 ft	3,072	170.00	522.24
346	2 x 8 x 20 ft	9,227	185.50	1,711.61
87	2 x 6 x 14 ft	1,218	170.00	207.06
44	2 x 4 x 12 ft	352	170.00	59.84
Totals 862		15,933		$2,849.57

B.4

10 inch d.i.b. board feet $= \left(\frac{10 - 4}{4}\right)^2 (16 \text{ ft})$

$= \left(\frac{6}{4}\right)^2 (16 \text{ ft})$

$= \left(\frac{36}{16}\right) (16 \text{ ft})$

$= 36$ board feet

20 inch d.i.b. board feet $= \left(\frac{20 - 4}{4}\right)^2 (16 \text{ ft})$

$= (16)(16 \text{ ft})$

$= 256$ board feet

40 in d.i.b. board feet $= \left(\frac{40 - 4}{4}\right)^2 (16 \text{ ft})$

$= (81)(16 \text{ ft})$

$= 1,296$ board feet

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

FRACTIONS — FOREST PRODUCTS

A. Problem with Solution

1. Nominal 2" timber now has an actual thickness of 1 5/8". It is being proposed that this be reduced to 1 1/2" thickness. What is the actual reduction in thickness which is being proposed?

Solution:

$$1\ 5/8" - 1\ 1/2" = 1\ 5/8" - 1\ 4/8" = 1/8 \text{ in}$$

B. Problem with Separate Solution

2. A wood products company is experimenting with reducing their 8 ply laminated beams to 7 ply without changing the overall dimensions. This would amount to a significant reduction in the amount of glue needed to produce the beam. State the thickness for each ply first in 8 ply and then in 7 ply laminated beams whose overall thickness is to be:

a) 14" b) 16"

Solution:

C. Problems without Solutions

3. A No. 2 grade plank may have a split equal in length to 1 1/2 times the width of the board. What length of a split is allowed for a 2 x 8 plank which is 12 feet long?

Definition: No. 2 grade -- quality classification of lumber
2 x 8 plank -- a board 2 inches thick and 8 inches wide

Solution:

C. Problems without Solutions (continued)

4. The pine products industry usually describes the thickness of its products in "quarters" or 1/4 inch specifications. Thus a board which is 1 inch in nominal thickness would be described as a four quarter board. How would the pine industry describe boards of the following nominal thicknesses?

a) 3/4 in

b) 1/2 in

c) 1 1/4 in

d) 3 in

e) 2 1/2 in

Solution:

Solution to B problems

B.2

a) For 8 ply

$$\frac{14"}{8 \text{ ply}} = 1\ 3/4 \text{ in per ply}$$

For 7 ply

$$\frac{14"}{7 \text{ ply}} = 2 \text{ in per ply}$$

b) For 8 ply

$$\frac{16"}{8 \text{ ply}} = 2 \text{ in per ply}$$

For 7 ply

$$\frac{16"}{7 \text{ ply}} = 2\ 2/7 \text{ in per ply}$$

OREGON VQ-TECH MATH PROJECT

EVALUATION PACKAGE

RATIO AND PROPORTION — FOREST PRODUCTS

A. Problems with Solutions

1. If 6 men can plant 10,000 fir seedlings in 5 days with a density of 400 plants per acre, how many acres can 24 men plant in 35 days?

Solution:

$$\text{Number of plants per day} = \frac{10{,}000 \text{ plants}}{5 \text{ days}} = 2{,}000 \text{ plants/day}$$

$$\text{Number of plants per man per day} = \frac{2{,}000 \text{ plants per day}}{6 \text{ men}}$$

$$= 333 \text{ plants per man per day}$$

Number of acres planted per man per day

$$\frac{333 \text{ plants/man per day}}{400 \text{ plants/acre}} = \frac{(333 \text{ plants/man per day})(\text{acres})}{400 \text{ plants}}$$

$$= 0.833 \text{ acres per man per day}$$

Number of acres for 24 men per day

$$\frac{(0.833 \text{ acres})}{(\text{day})(\text{man})}(24 \text{ men}) = 20 \text{ acres/day}$$

Number of acres planted by 24 men in 35 days

$$(20 \text{ acres/day})(35 \text{ days}) = \underline{700 \text{ acres}}.$$

2. A line was measured with a 100 ft chain and found to be 813.67 ft long. Later the chain was found to be 99.91 ft long. What was the corrected length of the line? Round your answer to the nearest 0.01 ft.

Solution:

x = corrected length of the line

$$\frac{813.67 \text{ ft}}{100 \text{ ft}} = \frac{x}{99.91 \text{ ft}}$$

$$100x = 81{,}294 \text{ ft}$$

$$x = 812.94 \text{ ft}$$

B. Problems with Separate Solutions

3. A man uses the shadow method to estimate the height of a tree. The man is 6 feet tall and his shadow measures 7 1/2 feet when the length of the shadow cast by the tree is 227 feet. Both shadows are on level ground. Determine the height of the tree.

Solution:

4. A stream has an average width of 3.4 mm on an aerial photo with a scale of 1 to 12,000. How many inches wide would the stream appear on a print which had a scale of 1 in = 300 ft.
(1 inch = 25.4 mm)

Solution:

C. Problems without Solutions

5. A forester decides to 10% cruise an area in strips one chain wide. The total distance traveled during the sample is 230 lineal chains. The volume obtained by the sample is 225 million board feet (M.B.F.). There are 10 square chains in one acre.

Determine:

a) The average timber volume per acre
b) The total volume of the tract based on the cruise
c) The total number of acres in the tract

Solution:

C. Problems without Solutions (continued)

6. Aerial application of DDT mixed with diesel fuel has been used to control past infestations of the tussock moth. Each gallon of the mixture contains 11/16 pounds of DDT and weighs 7 15/16 pounds. Determine the number of pounds of DDT in a 20,000 pound plane load of the solution.

Solution:

7. A spur road in a logging area is 500 ft long and leads to a landing which is circular in shape and 300 ft in diameter. On an aerial photo with a scale of 1:20,000 what would be the size of these images? i.e., the 'length of the road' and the 'diameter of the landing'

Solution:

Solution to B problems

B.3

$$\frac{\text{Man's height}}{\text{Man's shadow}} = \frac{\text{Tree's height}}{\text{Tree's shadow}}$$

h is the height of the tree

$$\frac{6 \text{ ft}}{7.5 \text{ ft}} = \frac{h}{227 \text{ ft}}$$

$$(7.5)h = 1{,}362 \text{ ft}$$

$$h = 181.6 \text{ ft}$$

Solutions to B problems (continued)

B.4

$$\text{Width of stream} = \frac{(12{,}000)(3.4\ \text{mm})}{(25.4\ \text{mm/in})(12\ \text{in/ft})}$$

$$= \frac{40{,}800 \times \text{ft}}{304.8}$$

$$= 133.86\ \text{ft}$$

$$\text{Width on print} = \frac{133.86\ \text{ft}}{300\ \text{ft/in}}$$

$$= 0.446\ \text{in}$$

Solutions to C problems

C.7

(6 employees)($8,500/employee) = $51,000

(2 employees)($10,500/employee) = $21,000

(2 employees)($11,000/employee) = $22,000

remaining employees = 15 employees - 6 employees - 2 employees - 2 employees

= 5 employees

(5 employees)($9,800/employee) = $49,000

Total annual salaries = $51,000 + $21,000 + $22,000 + $49,000

= $143,000

$$\text{Average Salaries} = \frac{\text{Total Salaries}}{\text{15 employees}}$$

$$= \frac{\$143,000}{\text{15 employees}}$$

= $9,533.33 per employee

C.8

acres in sample = (1/5)(Total area)

= (1/5)(40 acres)

= 8 acres

C.9

Total Annual Business Cost

$ 443
706
1,190
300
240
500
4,250
100
600
1,800
+ 250
$10,379

Solutions to C problems (continued)

C.9 (continued)

$$\text{Business Cost per Hours of operation} = \frac{\text{Annual Cost}}{(10 \text{ hrs/day})(120 \text{ days})}$$

$$= \frac{\text{Cost}}{1{,}200 \text{ hrs}}$$

$$= \frac{\$10{,}379}{1{,}200 \text{ hrs}}$$

$$= \$8.65 \text{ per hour}$$

C.10

a) $$\text{Average acres burned per fire} = \frac{14{,}641 \text{ acres}}{1{,}057 \text{ fires}}$$

$$= 14 \text{ acres per fire}$$

b) $$\text{Average per acre cost} = \frac{\$674{,}000}{14{,}641 \text{ acres}}$$

$$= \$4.60 \text{ per acre}$$

C.11

Log#	Net Scale
1	660
2	30
3	600
4	110
5	100
6	540
7	2,040
8	430
9	450
10	290
Total	5,250

	Gross Scale	Deductions
Total	6,230	980

Cross-check of Net Scale Total
6,230 - 980 = 5,250

Solutions to C problems

C.5

$$\text{cross-sectional area, sq ft} = \frac{\pi \left(\frac{\text{d.i.b.}}{2}\right)^2}{144 \text{ sq in/sq ft}}$$

$b = 2.2$ sq ft
$B_t = 2.4$ sq ft
$B = 2.6$ sq ft

Huber's Volume = (2.4 sq ft)(16 ft) = 38.4 cu ft

Smalian's Volume = $\left(\frac{2.2 \text{ sq ft} + 2.6 \text{ sq ft}}{2}\right)$(16 ft) = 38.4 cu ft

Newton's Volume = $\left[2.6 \text{ sq ft} + 4(2.4 \text{ sq ft}) + 2.2 \text{ sq ft}\right]\left(\frac{16 \text{ ft}}{6}\right)$

= 38.4 cu ft

C.6

10 inches $(0.8)(10 - 1)^2 - 10/2 = (0.8)(81) - 5$

$= 64.8 - 5$
$= 59.8$ board feet

20 inches $(0.8)(20 - 1)^2 - 20/2 = (0.8)(361) - 10$

$= 288.8 - 10$

$= 278.8$ board feet

40 inches $(0.8)(40 - 1)^2 - 40/2 = (0.8)(1,521) - 20$

$= 1,216.8 - 20$

$= 1,196.8$ board feet

C.7

	Total	
Ponderosa Pine	$38,545.10	
Spruce	13,550.00	
Douglas Fir	25,530.00	
Oak	780.00	
	$78,405.10	Grand Total

Solutions to C problems

C.3

split allowance = (1 1/2)(width)

= (1 1/2)(8")

= (3/2)(8")

= 12 in

C.4

a) 3/4 = (3)(1/4)(= 3 quarters

b) 1/2 = 2/4 = (2)(1/4) = 2 quarters

c) 1 1/4 = 5/4 = (5)(1/4) = 5 quarters

d) 3 = 12/4 = (12)(1/4) = 12 quarters

e) 2 1/2 = 5/2 = 10/4 = (10)(1/4) = 10 quarters

Solutions to C problems

C.5

a) Number of acres cruised $= \frac{(230 \text{ chains})(1 \text{ chain})}{10 \text{ sq chains/acre}}$

$= 23$ acres

Average timber volume per acre $= \frac{\text{volume cruised}}{\text{acres cruised}}$

$= \frac{225 \text{ M.B.F.}}{23 \text{ acres}}$

$= 9.8$ M.B.F. per acre

b) Total volume of tract $= \frac{\text{timber volume}}{\text{fraction of total area cruised}}$

$= \frac{225 \text{ M.B.F.}}{0.10}$

$= 2,250$ M.B.F.

c) Total acres in the tract $= \frac{\text{acres cruised}}{\text{fraction of total area cruised}}$

$= \frac{23 \text{ acres}}{0.10}$

$= 230$ acres

C.6

$x =$ lbs of DDT

$\frac{11/16 \text{ lb}}{7\ 15/16 \text{ lb}} = \frac{x}{20,000 \text{ lb}}$

$x = \frac{(20,000 \text{ lb})(11/16)}{7\ 15/16}$

$x = 1,732$ lb

Solutions to C problems

C.7

a) $$\frac{\text{length of road, ft}}{500 \text{ ft}} = \frac{1}{20{,}000}$$

$$\text{length of road} = \frac{500 \text{ ft}}{20{,}000}$$

$$= \left(\frac{1}{40} \text{ ft}\right)(12 \text{ in/ft})$$

$$= 12/40 \text{ in}$$

$$= 0.3 \text{ in}$$

b) $$\frac{\text{diameter of landing, ft}}{300 \text{ ft}} = \frac{1}{20{,}000}$$

$$= \frac{300 \text{ ft}}{20{,}000}$$

$$= (0.015 \text{ ft})(12 \text{ in/ft})$$

$$= 0.18 \text{ in}$$

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

WHOLE NUMBERS — MACHINE TOOLS

A. Problems with Solutions

1. The Machine Shop ordered 25 bars of C.R.S. (cold rolled steel) #1020, 5/8" in diameter; 18 bars 1" in diameter; 18 bars 1 1/4". in diameter; 5 bars 2" in diameter; and 1 bar 3" in diameter. How many bars did they order?

   Solution:

   number of bars = 25 bars + 18 bars + 18 bars + 5 bars + 1 bar

   = 67 bars

2. For metal fitting (also known as metal bench work) a boy is told to cut a piece of flat steel stock 1/8" x 2" into pieces 17", 23", 9", 32" and 15". How long a piece of flat steel does he need?

   Solution:

   length of steel bar = 17" + 23" + 9" + 32" + 15"

   = 96 in = 8 ft

3. A machine shop buys 876 lbs of 1/2" diameter steel; 1567 lbs of 1" diameter steel; 675 lbs of 3" diameter steel; 5743 lbs of flat stock rectangular shape 1" x 2"; 250 lbs 1/8" x 2'; and 365 lbs 1/2" square. How many pounds were purchased?

   Solution:

   total weight = 876 lbs + 1567 lbs + 675 lbs + 5743 lbs +

   250 lbs + 365 lbs = 9476 lbs

B. Problems with Separate Solutions

4. A group of castings are made from patterns for a lathe. The base weighs 432 lbs; the tail stock weighs 35 lbs; the head stock weighs 63 lbs; the face plate weighs 3 lbs; the bed weighs 217 lbs; and the pulley weighs 13 lbs. What is the total weight of the parts?

   Solution:

B. Problems with Separate Solutions (continued)

5. A casting weighs 473 lbs and 117 lbs are removed by a shaper during the finishing processes. How much does the casting weigh when finished?

Solution:

6. In the pattern shop, 67 screws 3/4 #10 F.B.H. (Flat Bright-Headed) were used from a box containing one gross(144). How many were left?

Solution:

C. Problems without Solutions

7. A machinist has a bar of steel 3" in diameter, weighing 364 lbs. If 176 lbs are used for making die stocks, how many pounds are left?

Solution:

8. A power hack saw operates at 126 strokes per minute. It works continuously for 420 minutes(7 hrs). How many strokes does it make on the job?

Solution:

C. Problems without Solutions (continued)

9. In the Northwestern Machine Shop there are: 16 lathes each weighing 2145 lbs; four milling machines each weighing approximately 2460 lbs; two drill presses each weighing 450 lbs. What is the entire weight of these machines on the floor?

Solution:

10. One dozen metal drills 11/32" diameter costs $18.00. How much does one-half dozen cost?

Solution:

Solutions to B problems

B.4

total weight = 432 lbs + 35 lbs + 63 lbs + 3 lbs + 217 lbs + 13 lbs

= 763 lbs

B.5

weight left = 473 lbs - 117 lbs = 356 lbs

B.6

number of screws left in box = 144 screws - 67 screws

= 77 screws

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

DECIMALS — MACHINE TOOLS

A. Problems with Solutions

1. In the following figure, find the following information:

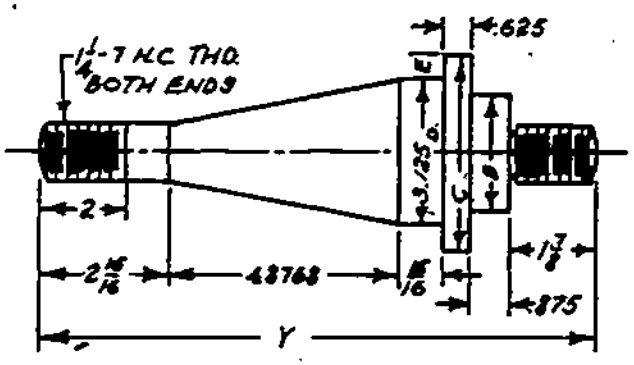
   a) Find total length of Y

   b) If E = .250", what is the diameter of C

   c) If B = 2.0625" and C = 3.625", how much is taken off C on the lathe to make C = B?

   d) If the "rough side" of C = 3.625", how much of a "finished cut" would have to be taken from C to make it 3 9/16"?

   e) E = .250. If the difference between diameter 3.125 and B is 4 times E, what is the value of B?



Solution:

   a) Find sum of individual parts

   Y = Total Length = 2 15/16" + 4.8768" + 15/16" + .625" + .875" + 1 7/8"

   Y = 2.9375" + 4.8768" + .9375" + .625" + .875" + 1.875"

   Y = 12.1268 in

   b) Need sum of smaller diameter plus twice E

   C = 3.125" + 2(.250") = 3.125" + .5" = 3.625 in

   c) Need to find difference between C and B

   C - B = 3.625" - 2.0625" = 1.5625 in

A. Problems with Solutions (continued)

1. Solution: (continued)

d) Find difference between rough cut and finish cut. Need to change 9/16 to.3 decimal places

difference = 3.625" - 3 9/16"

= 3.625" - 3.563"

= .062 in

e) Need difference between larger diameter and 4 times E

B = 3.125" - 4(.250") = 3.125" - 1"

= 2.125 in

2. If 17 holes are each 1.125" apart from center line to center line, what is the distance from the center of the first hole to the center of the last hole?

Solution:

There will be one less space between center line than the number of holes. We need the product of distance between center line and number of spaces.

Total distance = (16 spaces)(1.125 in/space)

= 18 in

3. A broach has 40 teeth. Each tooth cuts .015". How much material does the entire broach remove?

Solution:

find product of number of teeth and amount each tooth cuts

Total cut = (40 teeth)(.015 in/tooth)

= .6 in

B. Problems with Separate Solutions

4. A laminated shim is made up of 30 pieces of material. Each lamination is 0.002" thick. What is the thickness of the shim?

Solution:

5. A draftsman is to draw 11 national course screw threads per inch on a piece of material 4" long. What is the distance between any two threads?

Solution:

6. How many cuts would be needed to turn down 1.460" stock to 1" on a lathe, each cut being 0.023" deep?

Solution:

C. Problems without Solutions

7. A drill makes 280 rpm and drills a hole 2.125" deep in 0.800 minutes. What is the feed?

(Feed is the distance the drill advances with each revolution)

Solution:

C. Problems without Solutions (continued)

8. A machine shop makes a drill press which requires a round leather belt 3/16" diameter. The belting costs $0.08 per ft. Each drill press uses 38" of belt. If 76 drill presses are made, what will be the belting cost?

Solution:

9. The machine shop orders 18 second cut 10" hand files. Each one costs $0.69. What is the total cost?

Solution:

10. The metal fitting shop uses 1 oz of parting compound per day per class. If there are 9 classes per day and 88 school days per term, how much will this compound cost at $0.0425 per lb? (16 oz = 1 lb)

Solution:

Solution to B problems

B.4

Total thickness = (30 shims)(.002 in /shim)

= .06 in

Solutions to B problems (continued)

B.5

11 threads per inch means 1/11" between threads, spread this over 4 inches and there would be 4/11 inch between threads

i.e. $4(1/11 \text{ in}) = 4/11 \text{ in}$

B.6

find difference between stock and finished product, then divide by depth of each cut

$1.460" - 1.000" = 0.460 \text{ in}$

$$\frac{0.460 \text{ in}}{0.023 \text{ in/cut}} = \frac{0.460 \text{ in} \times \text{cut}}{0.023 \text{ in}} = 20 \text{ cuts}$$

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

FRACTIONS — MACHINE TOOLS

A. Problems with Solutions

1. A machine shop has a job which requires drilling 3 holes for a fixture. It is 12 11/16" from the center line of the first hole to the center line of the second; 9 5/8" from the center line of the second hole to the center line of the third; and it is 12 11/16" from the center line of the first and third hole to the ends of the fixture. What length of stock does he need for the job?

Solution:

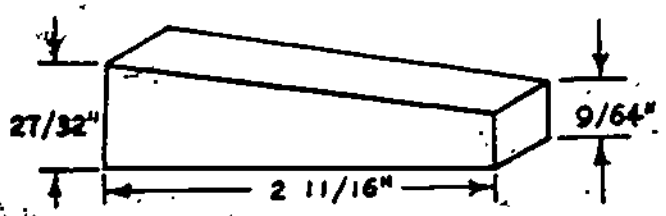
Need sum of distances between center lines and twice distance from center line of first and third hole to edge

Length of stock = 2(12 11/16") + 12 11/16" + 9 5/8"

= 24 22/16" + 12 11/16" + 9 10/16"

= 45 43/16" = 47 11/16 in

2. What is the difference between the ends of the key?



Solution:

Need to subtract the low end from the high end

End difference = $\frac{27"}{32} - \frac{9"}{64} = \frac{54"}{64} - \frac{9"}{64} = \frac{45}{64}$ in

B. Problems with Separate Solutions

3. If it takes 47 minutes to set up a job and cut the teeth on a gear blank, how many hours will be required to complete a job of 29 different diameter gear blanks? (60 minutes equals one hour)

Solution:

B. Problems with Separate Solutions (continued)

4. In a machine shop class of 36 boys, each makes a drill blank on the lathe. Each drill blank requires a piece of rough material 5 3/4" long. How many feet are used by the class?

Solution:

C. Problems without Solutions

5. In a metal bench work class of 42 boys, each is allowed 7 1/2" of wire solder for his work. How many feet of wire solder does the class use?

Solution:

6. A machinist is making a square detail for a jig. The allowed over all distance on the jig is 9 5/8". If 8 teeth are to be cut, how far apart are the teeth?

Solution:

C. Problems without Solutions (continued)

7. In metal bench work a boy is to tap two holes 1 1/16" apart in a cast iron "T" block. One hole is 3/8 x 16 N.C. and the other hole is 1/2 x 13 N.C. The "T" block is 2 5/8" long. How far from the edge is the center line of each tapped hole?

Def: 3/8 x 16 N.C. means

3/8 -- diameter of bolt or thread

16 -- number of threads per inch

N.C. -- National Course

Solution:

Solutions to B problems

B.3

(47 min/blank)(29 blanks) = 1363 min = 22 43/60 hrs

B.4

$$\text{Length of stock} = \frac{(36 \text{ boys})(5\ 3/4 \text{ in per boy})}{12 \text{ in/ft}}$$

$$= \frac{180\ 108/4 \text{ in} \times \text{ft}}{12 \text{ in}}$$

$$= 15\ 9/4 \text{ ft}$$

$$= 17\ 1/4 \text{ ft}$$

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

RATIO AND PROPORTION — MACHINE TOOLS

A. Problems with Solutions

1. A lathe operator turns 9 brass bushings in 2 hrs 15 min. At the same rate, how many can be finished in an 8 hour day?

Solution:

x = number of bushings

$$\frac{x}{9 \text{ bushings}} = \frac{8 \text{ hrs}}{2.25 \text{ hrs}}$$

$$(2.25)x = 72 \text{ bushings}$$

$$x = 32 \text{ bushings}$$

Note: Compare like quanities, and compare large to small in both fractions or compare small to large in both fractions.

Def: Ratio - comparison of two terms
Proportion - equality between two ratios
Means - second and third terms (b and c)
Extremes - first and fourth terms (a and d)

Ex. $\frac{a}{b} = \frac{c}{d}$

2. A piece of 1 3/4" round stock is required to mill a hexagonal bar 1 1/2" across the flats. What size stock is needed for a bar 2 1/2" across the flats? (stock is available in 1/4" sizes)

Solution:

x = size of stock needed

$$\frac{x}{1\ 3/4 \text{ in}} = \frac{2\ 1/2 \text{ in}}{1\ 1/2 \text{ in}}$$

$$(1.5)x = (2.5)(1.75 \text{ in})$$

$$(1.5)x = 4.375 \text{ in}$$

$$x = 2.92 \text{ in}$$ therefore, 3 inch stock is needed

B. Problems with Separate Solutions

3. A 9" pulley on a drill press makes 1350 rpm. It is belted to a 5" pulley on a motor. Find the rpm of the motor.

Solution:

4. A workman desires to run a grinder at 1200 rpm. The shaft is belted to a 5" pulley on a motor running at 1800 rpm. How large a pulley should be installed on the grinder shaft?

Solution:

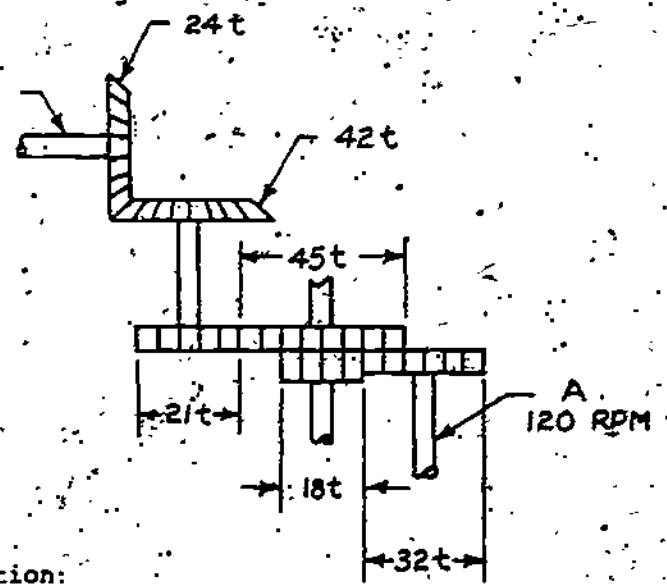
C. Problems without Solutions

5. What is the cost of 6 reamers if 8 reamers cost $35.40?

Solution:

C. Problems without Solutions (continued)

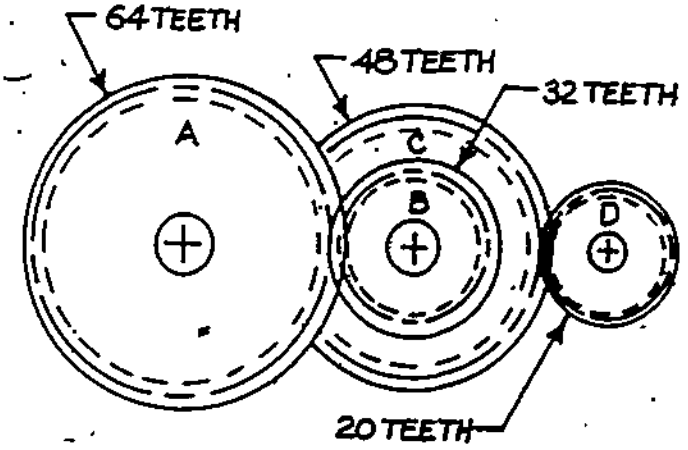
6. A machinist desires to increase the speed of shaft B to 1000 rpm by changing the 32-tooth gear. How many teeth must the new gear have?



Solution:

C. Problems without Solutions (continued)

7. A machinist wishes to replace gear D with a gear that will make 960 rpm. How many teeth must the new gear have? (rpm of gear A is 320)



Solution:

Solutions to B problems

B.3

$$\frac{5 \text{ in}}{9 \text{ in}} = \frac{x}{1350 \text{ rpm}}$$ x = rpm of motor

$9x = 6750$ rpm

$x = 750$ rpm

B.4

$$\frac{x}{5 \text{ in}} = \frac{1200 \text{ rpm}}{1800 \text{ rpm}}$$ x = size of pulley on grinder shaft

$1800x = 6000$ in

$x = 3.33$ in

Solutions to C problems.

C.7

weight left = 364 lbs - 176 lbs = 188 lbs

C.8

number of strokes = (126 strokes/min)(420 min)

= 52,920 strokes

C.9

Lathes	(16 machines)(2,145 lbs/machine) =	34,320 lbs
Milling machines	(4 machines)(2,460 lbs/machine) =	9,840 lbs
Drill press	(2 machines)(450 lbs/machine) =	900 lbs
	total weight of machines	45,060 lbs

C.10

$$\text{cost per drill} = \frac{\$18.00}{6 \text{ drills}} = \$3.00 \text{ per drill}$$

Solution to C problems

C.7

$$\text{Number of revolutions} = (280 \text{ rev/min})(.800 \text{ min})$$

$$= 224 \text{ rev}$$

$$\text{Cut per revolution} = \frac{2.125 \text{ in}}{224 \text{ rev}} = .0095 \text{ inches per revolution}$$

C.8

$$\text{Total length of belt} = (76 \text{ presses})(38 \text{ in/press})$$

$$= 2888 \text{ in} = 240.76 \text{ ft}$$

$$\text{Total cost of belt} = (240.67 \text{ ft})(\$0.08/\text{ft})$$

$$= \$19.25$$

C.9

$$\text{Total cost} = (18 \text{ files})(\$0.69/\text{file})$$

$$= \$12.42$$

C.10

$$\text{Total cost} = \left(\frac{(1 \text{ oz/day/class})(9 \text{ classes})(88 \text{ days})}{16 \text{ oz}} \right) (\$0.0425)$$

$$= \left(\frac{792}{16}\right)(\$0.0425) = (49.5)(\$0.0425) = \$2.10$$

Solutions to C problems

C.5

$$\text{Total length of solder} = \frac{(42 \text{ boys})(7\ 1/2 \text{ in per boy})}{12 \text{ in/ft}}$$

$$= \frac{294\ 42/2 \text{ in} \times \text{ft}}{12 \text{ in}}$$

$$= \frac{315 \text{ ft}}{12} = 26\ 1/4 \text{ ft}$$

C.6

$$\text{Length between teeth} = \frac{9\ 5/8"}{8} = \left(\frac{77"}{8}\right)\left(\frac{1}{8}\right) = \frac{77"}{64} = 1\ 13/64 \text{ in}$$

C.7

$$\text{Distance from edge to center line} = \frac{2\ 5/8" - 1\ 1/16"}{2}$$

$$= \frac{2\ 10/16" - 1\ 1/16"}{2}$$

$$= \frac{1\ 9/16"}{2}$$

$$= \left(\frac{25"}{16}\right)\left(\frac{1}{2}\right) = \frac{25}{32} \text{ in}$$

Solutions to C problems

C.5

x = cost of 6 reamers

$$\frac{6 \text{ reamers}}{8 \text{ reamers}} = \frac{x}{\$35.40}$$

$$8x = \$212.40$$

$$x = \$26.55$$

C.6

A = number of teeth in new gear

$$\frac{120 \text{ rpm}}{1000 \text{ rpm}} = \frac{(24 \text{ teeth})(21 \text{ teeth})(18 \text{ teeth})}{(42 \text{ teeth})(45 \text{ teeth})(A)}$$

$$120A = \frac{(24)(21)(18 \text{ teeth})(1000)}{(42)(45)}$$

$$A = \frac{9{,}072{,}000 \text{ teeth}}{(1890)(120)}$$

$$A = \frac{9{,}072{,}000 \text{ teeth}}{226{,}800}$$

$$A = 40 \text{ teeth}$$

C.7

$$\frac{B}{320 \text{ rpm}} = \frac{64 \text{ teeth}}{32 \text{ teeth}}$$

$$32B = 20{,}480 \text{ rpm}$$

$$b = 640 \text{ rpm}$$

$$\frac{960 \text{ rpm}}{640 \text{ rpm}} = \frac{48 \text{ teeth}}{D}$$

$$960D = 30{,}720 \text{ teeth}$$

$$D = 32 \text{ teeth}$$

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

WHOLE NUMBERS — MARKETING

A. Problems with Solutions

1. A grocer buys a crate of strawberries (16 quarts) for $5.40. At what price per quart should he sell the berries so that his gross profit on the entire lot will be $1.80?

Solution:

He bought the berries for $5.40 and wants to make $1.80,, therefore he must take in $5.40 + $1.80 = $7.20.

$$\frac{\$7.20}{16 \text{ quarts}} = \$0.45 \text{ per quart}$$

2. A merchant in one year had sales of $25,608. The inventory of the goods on hand at the beginning of the year was $5,682; and at the end of the year was $3,169. He purchased merchandise during the year at a cost of $12,468. If his selling expenses for the year were $6,829 and in addition he spent $1,026 for advertising, did he gain or lose and how much?

Solution:

His expenses during the year were:

$$\begin{array}{rr} \$5,682 - \$3,168 = & \$\ 2,513 \\ & 12,468 \\ & 6,829 \\ & +\ 1,026 \\ \hline & \$22,836 \end{array}$$

His sales were larger than his expenses, therefore he had a a gain or gross profit. The difference between his sales and expenses tells us how much he gained.

$$\$25,608 - \$22,836 = \$2,772$$

A. Problems with Solutions (continued)

3. An appliance manufacturer sold 56,583 refrigerators during the first quarter of the year. Second quarter sales were 65,325. What were the average sales per month for the first half of the year?

Solution:

two quarters make a half

$$\begin{array}{r} 56{,}583 \text{ refrigerators} \\ +\ 65{,}325 \text{ refrigerators} \\ \hline 121{,}908 \text{ refrigerators} \end{array}$$

To find average we divide by the number of months per half year

$$\frac{121{,}908 \text{ refrigerators}}{6 \text{ months}} = 20{,}318 \text{ refrigerators per month}$$

B. Problems with Separate Solutions

4. A retail furniture dealer buys a studio couch for $125. At what price should he sell it if he desires a gross profit of $95?

Solution:

5. Irwin Miller is the owner of Miller's Paint Store. His inventory on October 1 showed a stock of merchandise amounting to $11,984. His purchases in October amounted to $2,842; and his sales totaled $4,173. His inventory on October 31 was $12,189.

a) Find the cost of the goods sold during the month.

b) Find the gross profit for the month.

Solution:

B. Problems with Separate Solutions (continued)

6. The packing department of Ajax Industry is required to keep records of the shipping weight, net weight and packing weight of all items shipped. The following form must be completed and turned into the records department.

	Shipping Weight	Net Weight	Difference
Item A	1,500 lbs	1,343 lbs	
Item B	2,800 lbs	2,551 lbs	
Item C	675 lbs	619 lbs	
Total			

Compute and check*

Solution:

C. Problems without Solutions

7. Sales for the Rockwell Mft. Company amounted to $376,000 last year. During the first 6 months of this year the monthly sales were $37,000; $15,000; $26,500; $37,500; $28,750 and $32,500; respectively. How much must the sales total for the remainder of the year to equal last year's figure?

Solution:

8. Evans Company had 10,700 gear parts in stock. During January 8,978 were sold. How many should be left in stock?

Solution:

C. Problems without Solutions (continued)

9. Last year, the sales of E. I. Hicks were $31,482. His inventory at the beginning of the year was $10,344. His purchases during the year amounted to $21,246. His inventory at the end of the year was $9,868.

   a) Find the cost of the goods sold during the year.

   b) Find the gross profit for the year.

   Solution:

10. Johnson Company began the year with an inventory valued at $41,049. During the year they purchased additional goods for $356,285. At the end of the year the remaining inventory was worth $57,372. What was the value of the goods which were sold?

    Solution:

Solutions to B problems

B.4

Cost + Profit = Selling Price

$125 + $95 = $220

Solutions to B problems (continued)

B.5

a) Inventory on October 1 + Purchases = Cost of Goods Available

$11,984 + $2,842 = $14,826

Cost of Goods Available - Inventory on October 31 = Cost of Goods Sold

$14,826 - $12,189 = $2,637

b) Gross Profit = Sales - Cost of Goods Sold

Gross Profit = $4,173 - $2,637

= $1,536

B.6

As a check the sum of the differences should equal the difference of the sums

Item A 1,500 lbs - 1,343 lbs = 157 lbs

Item B 2,800 lbs - 2,551 lbs = 249 lbs

Item C 675 lbs - 619 lbs = 56 lbs

	Shipping Weight	Net Weight	Difference
	1,500 lbs	1,343 lbs	157 lbs
	2,800 lbs	2,551 lbs	249 lbs
	+ 675 lbs	+ 619 lbs	+ 56 lbs
Totals	4,975 lbs	4,513 lbs	462 lbs

Total Shipping Weight minus Total Net Weight should equal Total Difference inorder to make sure that the totals cross check.

4,975 lbs - 4,513 lbs = 462 lbs which cross checks

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

DECIMALS MARKETING

A: Problems with Solutions

1. Chet's Chicken Inn sells chicken dinners at $1.95 per serving. If there is $421.20 in the register at the end of the day, how many dinners were served that day?

Solution:

$$\frac{\$421.20}{\$1.95/\text{dinner}} = \frac{\$421.20 \times \text{dinner}}{\$1.95} = 216 \text{ dinners}$$

2. Compute the price of the following stocks:

10 shares of Wolf Oil @ 16 3/8 _____

100 shares of 3rd Nat. Bank @ 52 3/8 _____

150 shares of United Auto @ 12 1/8 _____

TOTAL _____

Solution:

Shares of stock are priced in dollars and eighths of dollars. For example: 12 1/4 means $12.25.

(10 shares)($16.375/share) = $163.75

(100 shares)($52.375/share) = $5,237.50

(150 shares)($12.125/share) = $1,818.75

Total = $163.75 + $5,237.50 + $1,818.75 = $7,220.00

3. Goods valued at $1,800, after being damaged by fire, were sold at a reduction of 0.25. For what were the goods sold?

Solution:

$1,800 - ($1,800 x 0.25) = $1,800 - $450

= $1,350

B. Problems with Separate Solutions

4. A grocery dealer bought potatoes at various times during the year as follows: 3,500# at $7.90 per 100#; 5,000# at $6.83 per 100#; 2,500# at $6.15 per 100#; and 6,500# at $4.70 per 100#. Find the average cost per 100# for all the potatoes bought.

   Solution:

5. Davis Company purchased 2,500 ft of wire at $0.1575 per ft and 5000 bolts at $1.625 per 1000 units. Compute the cost of the purchase and round the final amount to the nearest cent.

   Solution:

6. Find the cost of sending the following shipment of boxes by freight when the rate between the two cities is 82.14¢ per hundred-weight. The boxes weigh as follows: 216 lbs, 429 lbs, 176 lbs, and 314 lbs.

   Solution:

C. Problems without Solutions

7. An article sold for $37.50, yielding a profit of 0.25 of the cost. What is the cost?

   Solution:

C. Problems without Solutions (continued)

8. A merchant buys beans at $16 per hundred pounds and sells them in 4-lb sacks at 95¢ per sack. What is his gain per pound, per hundred pounds?

   Solution:

9. A customer bought 2 7/8 yds of satin priced at $2.75 per yard and 5 1/4 yds of muslin at $1.80 per yard. What should the customer be charged?

   Solution:

10. The Analy Market has 3 cash registers. Sales for each on a particular day during a typical hour were as follows: Register No. 1: $3.04, $0.79, $15.67, $32.50, $1.00, $22.66, $19.65, $0.91, and $10.16; Register No. 2: $37.89, $11.99, $5.60, $11.27, $41.20, $8.86, and $10.01; Register No. 3: $20.06, $52.00, $17.89, $5.89, $6.03, $14.56, $27.16, and $30.09. Find the total sales for each register and the total sales for all three registers.

    Solution:

Solutions to B problems

B.4

(35 hundred lbs)($7.90/hundred lbs) = $ 276.50

(50 hundred lbs)($6.83/hundred lbs) = $ 341.50

(25 hundred lbs)($6.15/hundred lbs) = $ 153.75

(65 hundred lbs)($4.70/hundred lbs) = $ 305.50

TOTAL $1,077.25

To find the average divide by the number of 100$.

35 hundred lbs + 50 hundred lbs + 25 hundred lbs + 65 hundred lbs =

175 hundred lbs

$\frac{\$1,077.25}{175 \text{ hundred lbs}}$ = $6.16 per hundred lbs

B.5

(2,500 ¢)($0.1575/¢) = $393.75

(5 thousand bolts)($1.625/thousand bolts) = $8.125

Cost = $393.75 + $8.125 = $401.875

To round off the answer the cost is always rounded up,

Cost = $401.88

B.6

Total weight = 216 lbs + 429 lbs + 176 lbs + 314 lbs = 1,135 lbs

Number of hundred lbs = $\frac{1,135}{100}$ = 11.35

Cost = ($0.8214/hundred lbs)(11.35 hundred lbs)

= $9.33

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

FRACTIONS MARKETING

A. Problems with Solutions

1. Stock Gain and Loss

	Price, Jan 31	Price, Feb 28	Change
United Electric	62 5/8	68 3/4	
General Oil	22	20 3/8	
NET			

Compute and check net change during month*

Solution:

United Electric 68 3/4 - 62 5/8 = 68 6/8 - 62 5/8

= 6 1/8 change +6 1/8

General Oil 22 - 20 3/8 = 21 8/8 - 20 3/8

= 1 5/8 change -1 5/8

Net Price Jan 31 = 62 5/8 + 22 = 84 5/8

Net Price Feb 28 = 68 6/8 + 20 3/8 = 89 1/8

Net Price Feb 28 - Net Price Jan 31 should equal change in United Electric + change in General Oil

89 1/8 - 84 5/8 = 6 1/8 + (-1 5/8)

88 9/9 - 84 5/8 = 6 1/8 - 1 5/8

4 4/8 = 4 4/8

A. Problems with Solutions (continued)

2. An inventory count in the yardage department of a retail store indicated that there were 6 rolls of #216 gingham containing 16 1/8, 27 4/8, 36 2/8, 45 3/8, 50 7/8 and 42 5/8 yards, respectively. At $1.76 a yard, what was this stock worth?

Solution:

$$\begin{array}{r} 16\ 1/8 \text{ yards} \\ 27\ 4/8 \text{ yards} \\ 36\ 2/8 \text{ yards} \\ 45\ 3/8 \text{ yards} \\ 50\ 7/8 \text{ yards} \\ +\ 42\ 5/8 \text{ yards} \\ \hline 216\ 22/8 \text{ yards} = 218\ 3/4 \text{ yards} \end{array}$$

Worth = (218 3/4 yards)($1.76/yard)

= (875/4 yards)($1.76/yard)

= $385

3. Mr. Brown owned 3/7 of a store. He sold 1/3 of his share for $13,000. At the same rate, what was the value of the store?

Solution:

He sold 1/3 of 3/7 = (1/3)(3/7) = 1/7

(1/7)x = $13,000 x = value of the store

x = $91,000

B. Problems with Separate Solutions

4. A company packs its cat food in cans containing 13 1/2 oz of cat food. Each can weighs 1 3/4 oz. Two dozen cans are packed in a carton weighing 12 oz. What is the shipping weight of one carton?

Solution:

B. Problems with Separate Solutions (continued)

5. If a merchant raises the price of goods 1/4 and thereby cuts his sales 1/5, does he make less or more or the same profit?

Solution:

6. A profit of $3,160 is to be divided among three employees: Jack, John and Bill in the ratios of 1/2, 1/3, and 1/6, respectively. How much should each receive?

Solution:

C. Problems without Solutions

7. A grocer bought 255 3/4 pounds of bacon which he divided into 1/2 pound packages. How many packages did he have for sale?

Solution:

8. A carton of groceries ready for shipment weighs 22 1/3 lbs. If the carton weighs 2 3/16 lbs, what is the net weight of the contents?

Solution:

C. Problems without Solutions (continued)

9. A man worked the following number of hours each day during a 5-day week: 6 1/2 hours, 7 3/4 hours, 8 1/2 hours, 8 hours and 7 2/3 hours, respectively. How many hours did he work and how much did he earn if he was paid at the rate of $6.20 an hour?

   Solution:

10. Mr. Bradshaw bought 200 used tires for $175 at an auction. He sold 1/4 of them for $60.00; 16 tires at $7.50 each; 51 tires at $10.00 each and junked the rest. How many tires did he throw away? What was his total profit if the cost of handling this transaction amounted to $65.00?

    Solution:

11. Three and five-eighths yards of fabric are required to manufacture a certain type of jacket. How many jackets can be made from 5,000 yards of fabric?

    Solution:

12. Ben's Burger Bar expects to sell 400 hamburgers over the weekend. If each hamburger requires 2/9 lbs of ground beef, how much meat should be ordered? (round to even pounds)

    Solution:

Solutions to B problems

B.4

Total weight of cat food = (13 1/2 oz/can)(24 cans)

= 324 oz

Total weight of cans = (1 3/4 oz/can)(24 cans)

= 42 oz

Total weight = 324 oz + 42 oz + 12 oz = 378 oz

Shipping weight per carton = $\frac{378 \text{ oz}}{16 \text{ oz/lb}}$ = 23 lbs 10 oz

B.5

In the overall situation, he has increased his intake by 1/4 while decreasing his intake by 1/5.

So, it is merely a comparison between the two fractions 1/4 and 1/5. 1/4 = 5/20, 1/5 = 4/20.

1/4 is larger so he is making more profit.

B.6

Jack ($3,160)(1/2) = $1,580

John ($3,160)(1/3) = $1,053.33

Bill ($3,160)(1/6) = $526.67

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

RATIO AND PROPORTION — MARKETING

A. Problems with Solutions

1. Three partners, Able, Baker and Carter have shares in the partnership of 1:2:7 respectively. If there is a profit of $43,120 and it is to be distributed in proportion to share in the partnership, how much would each partner receive?

Solution

Total shares = 10 x = share of profits

Able $\frac{1}{10} = \frac{x}{\$43,120}$

$x = \$4,312$

Baker $\frac{2}{10} = \frac{x}{\$43,120}$

$x = \$8,624$

Carter $\frac{7}{10} = \frac{x}{\$43,120}$

$x = \$30,184$

2. Brown invests $4,400 and Black $5,200 in a partnership. If profits are to be shared in the ratio that each partner's investment bears to the total amount invested, what return should Black receive if Brown's share of the profits is $900?

Solution:

$\frac{\$4,400}{\$5,200} = \frac{\$900}{x}$ x = Black's share of the profits

$(4,400)x = \$4,680,000$

$x = \$1,063.64$

3. Bruce and Sidney are partners. How much does each receive if a profit of $13,000 is divided in a ratio of 7 to 3 in favor of Bruce?

Solution:

Bruce (7/10)($13,000) = $9,100

Sidney (3/10)($13,000) = $3,900

B. Problems with Separate Solutions

4. Current ratio is defined as the ratio of a firm's current assets to current liabilities. Compute the current ratio for Kleq Corp. which has current assets of $126,000 and current liabilities of $91,500.

Solution:

5. The ratio of net income to net worth (stockholder's equity) indicates the percent of return on invested capital. Compute the rate of return on equity for a firm with $4,000 net income and $29,000 stockholder's equity.

Solution:

6. A gain of $32,550 is to be divided between the Company President, Vice President and comptroller in the ratios of 3/8, 1/5 and 17/40, respectively. How much should each receive?

Solution:

C. Problems without Solutions

7. A salted-nut mixture is made up of 3 pounds of cashews to 5 pounds of peanuts. How many pounds of each are needed to make 40 pounds of the mixture?

Solution:

8. Two business partners divide their profits in a 1 to 4 ratio. Find each partner's share of a profit amounting to $8,400.

Solution:

C. Problems without Solutions (continued)

9. A building assessed at $15,000 is billed $475.50 for property taxes. A similar building next door, assessed at $21,000, should be billed how much for taxes?

Solution:

10. The ratio of a firm's net income to net sales gives a measure of the firm's percent of profit on sales. Compute the ratio for a firm with net income of $4,000 and net sales of $90,000.

Solution:

Solutions to B problems

B.4

$$\frac{\$126,000}{\$91,500} = 1.377$$

B.5

$$\frac{\$4,000}{\$29,000} = 0.1379 = 13.79\%$$

B.6

Company President	(3/8)($32,550) = $12,206.25
Vice-President	(1/5)($32,550) = $6,510.00
Comptroller	(17/40)($32,550) = $13,833.75

Solutions to C problems

C.7

$$\begin{array}{r} \$\ 37{,}000 \\ 15{,}000 \\ 26{,}500 \\ 37{,}500 \\ 28{,}750 \\ +\ 32{,}500 \\ \hline \$177{,}250 \end{array}$$ Sales for first half of year

$$\begin{array}{r} \$376{,}000 \\ -\ 177{,}250 \\ \hline \$198{,}750 \end{array}$$ Sales for last half of year

C.8

$$\begin{array}{r} 10{,}700 \text{ gear parts} \\ -\ 8{,}978 \text{ gear parts} \\ \hline 1{,}722 \text{ gear parts left in stock} \end{array}$$

C.9

a) Beginning Inventory + Purchases = Cost of Goods Available

$10,344 + $21,246 = $31,590

Cost of Goods Available - Ending Inventory = Cost of Goods Sold

$31,590 - $9,868 = $21,722

b) Sales - Cost of Goods Sold = Gross Profit

$31,482 - $21,722 = $9,760

C.10

Inventory at beginning of year + Purchases = Cost of Goods Available

$41,049 + $356,285 = $397,334

Cost of Goods Available - Inventory at end of year = Cost of Goods Sold

$397,334 - $57,372 = $339,962

Solutions to C problems

C.7

$37.50 = (1.25)x

x = $30.00

C.8

x = cost per lbs

$$x = \frac{\$16}{100 \text{ lbs}}$$

x = $0.16 per lb

s = selling price per lb

$$s = \frac{\$0.95/\text{sack}}{4 \text{ lb/sack}}$$

$$s = \frac{\$0.95/\text{sack} \times \text{sack}}{4 \text{ lbs}}$$

s = $0.24 per lb

Gain per lb = $0.24 - $0.16 = $0.08

Gain per 100 lbs = ($0.24/lb)(100 lbs) - $16

= $24 - $16

= $8

C.9

(2.875 yards)($2.75/yard) = $7.91

(5.25 yards)($1.80/yard) = $9.45

TOTAL $17.36

C.10

Register No. 1	Register No. 1	Register No. 3
$ 3.04	$ 37.89	$ 20.06
.79	41.20	52.00
15.67	11.99	17.89
32.50	5.60	5.89
1.00	11.27	6.03
22.66	8.86	14.56
19.65	+ 10.01	27.16
10.16	$126.82	+ 30.09
+ .91		$173.69
$106.38		

Total sales = $106.38 + $126.82 + $173.69

= $406.88

Solutions to C problems

C.7

$$\frac{255\ 3/4\ \text{lbs}}{1/2\ \text{lbs/package}} = \frac{1023/4\ \text{lbs} \times \text{package}}{1/2\ \text{lbs}} = \left(\frac{1023\ \text{package}}{4}\right)(2)$$

$$= \frac{1023\ \text{package}}{2}$$

$$= 511\ 1/2\ \text{package}$$

therefore 511 half-pound packages can be sold

C.8

$$22\ 1/3\ \text{lbs} - 2\ 3/16\ \text{lbs} = 22\ 16/48\ \text{lbs} - 2\ 9/48\ \text{lbs}$$

$$= 20\ 7/48\ \text{lbs}$$

C.9

$$6\ 1/2\ \text{hr} + 7\ 3/4\ \text{hr} + 8\ 1/2\ \text{hr} + 8\ \text{hr} + 7\ 2/3\ \text{hr} =$$

$$6\ 6/12\ \text{hr} + 7\ 9/12\ \text{hr} + 8\ 6/12\ \text{hr} + 8\ \text{hr} + 7\ 8/12\ \text{hr} = 37\ 29/12\ \text{hr}$$

$$= 39\ 5/12\ \text{hr}$$

$$\text{Earnings} = (39\ 5/12\ \text{hr})(\$6.20/\text{hr}) = (473/12\ \text{hr})(\$6.20/\text{hr})$$

$$= \$244.39$$

C.10

$(1/4)(200\ \text{tires}) = 50\ \text{tires}$

$50\ \text{tires} + 16\ \text{tires} + 51\ \text{tires} = 117\ \text{tires sold}$

$200\ \text{tires} - 117\ \text{tires} = 83\ \text{tires thrown away}$

$\text{Sales} = \$60.00 + (16\ \text{tires})(\$7.50/\text{tire}) + (51\ \text{tires})(\$10.00/\text{tire})$

$= \$60.00 + \$120.00 + \$510.00$

$= \$690.00$

$\text{Cost} = \$175 + \$65 = \$240$

$\text{Gross Profit} = \$690.00 - \$240.00 = \$450.00$

Solutions to C problems (continued)

C.11

$$\frac{5000 \text{ yards}}{3\ 5/8 \text{ yards/jacket}} = \frac{5000 \text{ yards} \times \text{jacket}}{3\ 5/8 \text{ yards}} = \frac{5000 \text{ jacket}}{29/8}$$

$$= (5000 \text{ jacket})\left(\frac{8}{29}\right)$$

$$= 1{,}379\ 9/29 \text{ jackets}$$

therefore 1,379 jackets can be made

C.12

$$(400 \text{ hamburgers})(2/9 \text{ lbs/hamburger}) = 800/9 \text{ lbs}$$

$$= 88.88 \text{ lbs}$$

therefore 89 lbs should be ordered

Solutions to C problems

C.7

Total parts = 3 + 5 = 8

(3/8 cashews)(40 lbs) = 15 lbs cashews

(5/8 peanuts)(40 lbs) = 25 lbs peanuts

C.8

Total shares = 1 + 4 = 5

(1/5)($8,400) = $1,680

(4/5)($8,400) = $6,720

C.9

x = amount of taxes.

$$\frac{\$475.50}{\$15,000} = \frac{x}{\$21,000}$$

(15,000)x = $9,985,500

x = $665.70

C.10

$$\frac{\$4,000}{\$90,000} = 0.0444 = 4.44\%$$

OREGON VO-TECH MATH PROJECT

Evaluation Package

WHOLE NUMBERS MILLWRIGHT

A. Problems with Solutions

1. In order to construct a certain pipe system, 5 elbows, 7 tees, and 2 couplings are needed. Also needed are 12 pieces of pipe of lengths: 5", 7", 12", 13", 2", 17", 27", 3", 31", 42" and 9". Each elbow costs 27¢, each tee costs 37¢, each coupling costs 17¢, and the pipe costs 12¢ per lineal foot. How much will the material for the system cost?

Solution:

cost of elbows = (5 elbows)(\$0.27/elbows) = \$1.35

cost of tees = (7 tees)(\$0.37/tee) = \$2.59

cost of couplings = (2 couplings)\$0.17/coupling) = \$0.34

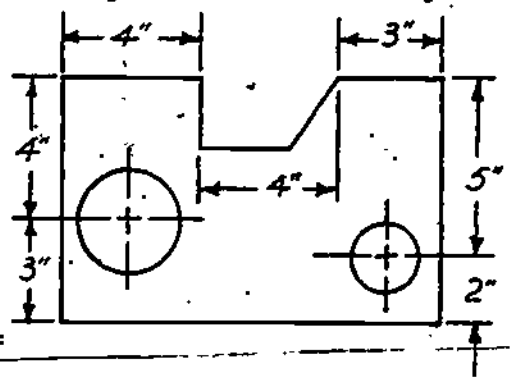
length of pipe = 5" + 7" + 12" + 13" + 2" + 17" + 27"
+ 3" + 31" + 42" + 9" = 168 in

$$168 \text{ in} \left(\frac{1 \text{ ft}}{12 \text{ in}}\right) = 14 \text{ ft}$$

cost of pipe = (14 ft)(\$0.12/ft) = \$1.68

Total cost = \$1.35 + \$2.59 + \$0.34 + \$1.68 = \$5.96

2. A piece of metal is to be cut according to the diagram. What is the overall length and width of the piece?



Solution:

length = 4" + 4" + 3" = 11 in

width = 3" + 4" = 2" + 5" = 7 in

A. Problems with Solutions (continued)

3. A tank of oil contains 450 gallons. 90 gallons are used each day. How many days will it take to use up the oil?

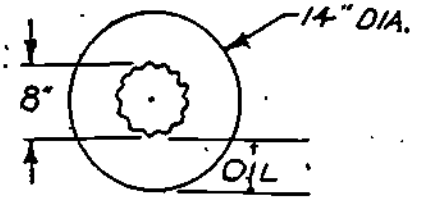
Solution:

$$\text{time to use up oil} = \frac{450 \text{ gals}}{90 \text{ gals/day}} = \frac{450 \text{ gals} \times \text{day}}{90 \text{ gals}} = 5 \text{ days}$$

B. Problems with Separate Solutions

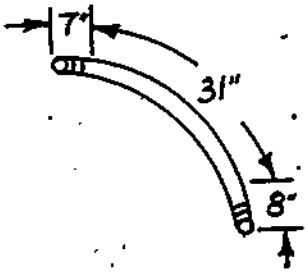
4. A sprocket and chain assembly is enclosed in a circular oil bath as shown in the diagram. The sprocket has a diameter of 8" and the oil bath has a diameter of 14". What must the depth of oil in the bath be to achieve lubrication?

Solution:



5. What length of pipe would be needed to form a bend like the one in the drawing? An extra inch of pipe in needed in order to form the bend.

Solution:



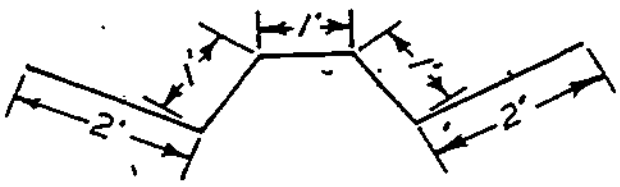
6. A piece of pipe 72" long is to be bent in a 90° arc with a straight portion 3" on each end. How long is the arc?

Solution:

C. Problems without Solutions

7. A steel rod is cut and welded to match the drawing. Approximately how many lineal feet of rod would be needed to make the finished product?

Solution:



8. A pipe fitter is going to place a wrinkle bend in a piece of pipe 2' long. He wants a 45° bend and he wishes to accomplish the bend with 9 wrinkles. How many degrees are there in each wrinkle?

Solution:

9. A circular tank has a volume of 1085 cubic feet. If 1 gallon of liquid occupies approximately 7 cubic feet of space, how many gallons of liquid will the tank hold?

Solution:

10. A gallon of oil has a volume of 231 cubic inches. If a tank held 420 gallons of oil, what is the volume of the tank in cubic inches?

Solution:

C. Problems without Solutions (continued)

11. A spherical tank has a surface area of 351 sq ft. If 1 gallon of a rust-preventative paint will cover 13 sq ft, how many gallons of the paint will be needed to cover the tank?

Solution:

12. From a piece of hexagon stock, 5 pieces are to be cut off. If the pieces are 11", 9", 13", 23" and 15": what is the total length of rod required. Include 1" for rod wasted in making the cuts.

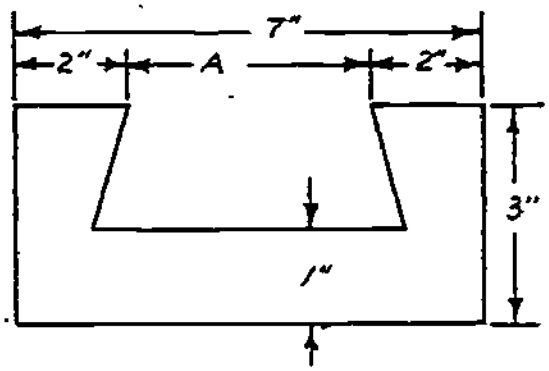
Solution:

13. It is desired to lay out a group of machines in a straight line. If 2' are required between machines and there are 5 machines of 12, 7, 8, 13 and 15 feet lengths, what is the total length of the line?

Solution:

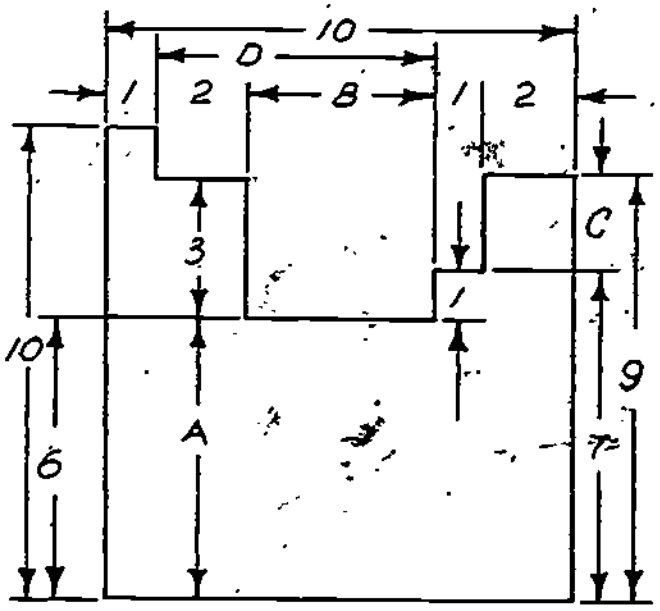
C. Problems without Solutions (continued)

14. Find A and the depth of the dovetail.



Solution:

15. Find A, B, C, and D.
(all dimensions are in inches)



Solution:

C. Problems without Solutions (continued)

16. A foreman was given $2,375.00 to buy tools. Each tool costs $16.00. How many tools did he buy? How much money was left over?

Solution:

17. A bearing of a test machine failed after 467,245,800 cycles were completed. If the machine was operating at 4,200 cycles per minute, after how many minutes did the failure occur?

Solution:

Solution to B problems

B.4

depth must be at least $\frac{14" - 8"}{2} = 3$ in

B.5

length = 7" + 31" + 8" + 1" = 47"

$$47 \text{ in} \left(\frac{1 \text{ ft}}{12 \text{ in}}\right) = 3 \text{ ft } 11 \text{ in}$$

B.6

arc length = 72" - 2(3") = 66"

$$66 \text{ in} \left(\frac{1 \text{ ft}}{12 \text{ in}}\right) = 5 \text{ ft } 6 \text{ in}$$

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

DECIMALS — MILLWRIGHT

A. Problems with Solutions.

1. A piece of pipe 3.4' long is shortened by .7'. How long are the two remaining pieces if the width of the saw cut is .125"?

Solution:

3.4' = 40.8" .7' = 8.4"

40.8" - 8.4" - .125" = 32.275"

The two pieces are .7 ft and 32.275 in

2. A 5/16" bolt weighs .43 lbs. How many bolts are there in a 125 lb keg?

Solution:

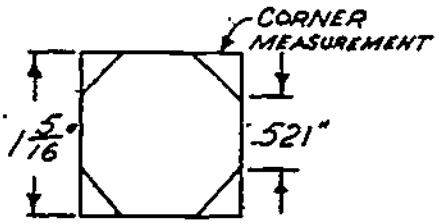
$$\frac{125 \text{ lbs}}{.43 \text{ lbs/ bolt}} = \frac{125 \text{ lbs} \times \text{bolt}}{.43 \text{ lbs}} = 291 \text{ bolts}$$

3. What would be the corner measurement for laying out an octagonal end on a square bar as shown in the diagram below.

Solution:

$$\frac{1\ 5/16" - .521"}{2} = \frac{1.3125" - .521"}{2}$$

$$= \frac{.7915"}{2} = .396 \text{ in}$$



B. Problems with Separate Solutions

4. A piece of steel weighs 162.3 lbs. A piece of aluminum weighs .51 as much as the steel. How much does the aluminum weigh?

Solution:

C. Problems without Solutions (continued)

8. A shaft should be 1.317" in diameter. However, it is 1 3/16" in diameter. How much has it been worn?

Solution:

9. Fifteen equally spaced holes are to be drilled in a piece of metal 27 1/8" long. Allowing 1" on each end, how far will it be, to the nearest thousandth of an inch, from center to center of two consecutive holes?

Solution:

10. Rule of Thumb:

The rim or cutting speed of a cylindrical rod is found by multiplying the circumference by the revolutions per minute. Find the cutting speed of a rod whose circumference is 2.42" turning at 120 rpms.

Solution:

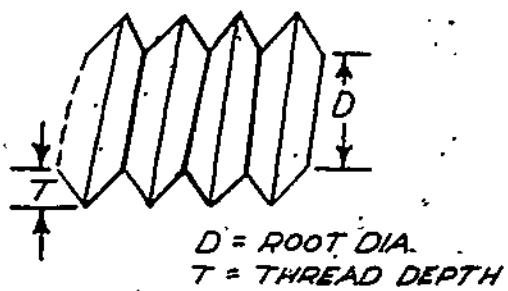
B. Problems with Separate Solutions (continued)

5. If a millwright earns $5.73 an hour and time and a half for overtime based on a 40 hour week, how much will he make in a 55 hour week?

Solution:

6. A bolt is made from a piece of 3/4" stock. The thread depth is .041". What is the root diameter of the bolt? See the drawing.

Solution:



C. Problems without Solutions

7. The actual inside diameter of a pipe is 1.12". The actual outside diameter is 1.316". Find the thickness of the pipe.

Solution:

C. Problems without Solutions (continued)

11. Rule of Thumb:

We can find the length of pipe needed to complete a bend by multiplying three numbers together: the radius of the bend, the degrees in the bend, and the constant .01745. To the nearest thousandth, find the length of pipe needed to complete a 22 1/2° bend with a radius of 13".

Solution:

Solutions to B problems

B.4

.51(162.3 lbs) = about 82.77 lbs

B.5

$40(\$5.73) + 15(1.5)(\$5.73) = \$229.20 + \$128.93$

$= \$358.13$

B.6

$d = 3/4" - 2(0.041")$

$= 0.750" - 0.082"$

$= 0.668$ in

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

FRACTIONS MILLWRIGHT

A. Problems with Solutions

1. A 12" piece of shafting 1 5/8" in diameter is placed in a lathe and one end is turned down to a diameter of 1 1/32". The diameter of the small end is how much smaller than the diameter of the large end?

   Solution:

   1 5/8" - 1 1/32" = 1 20/32" - 1 1/32" = 19/32 in

2. A piece of shafting 11 5/32" long is cut from a piece 37 1/2" long. Will there be enough of the original piece left to make another piece 26 1/4" long if 1/16" of shafting was wasted in making the cut?

   Solution:

   length left = 37 1/2" - 11 5/32" - 1/16"

   = 37 16/32" - 11 5/32" - 2/32"

   = 26 9/32 in

   Yes, since 26 9/32 in is greater than 26 1/4 in

3. From a bar of brass 16 1/2" long the following three pieces are cut: 1 1/8", 3 1/2", and 3 5/32". What is the final length of the bar allowing 3/32" for each cut?

   Solution:

   16 1/2" - 1 1/8" - 3 1/2" - 3 5/32" - 3(3/32")

   = 16 16/32" - 1 4/32" - 3 16/32" - 3 5/32" - 9/32"

   = 16 16/32" - 7 34/32"

   = 16 16/32" - 8 2/32"

   = 8 14/32"

   = 8 7/16 in

B. Problems with Separate Solutions

4. The volume of a rectangular box is found by multiplying the length times the width times the height. What is the volume of a rectangular box if its dimensions are 15 1/4", 12 1/2" and 7 5/32"?

Solution:

5. To find the approximate circumference of a circle we multiply 3 1/7 by the diameter. What is the approximate circumference of a circle whose diameter is 49 1/2"?

Solution:

6. A cubic foot contains approximately 7 1/2 gallons. How many cubic feet are there in a tank which contains 72 1/4 gallons?

Solution:

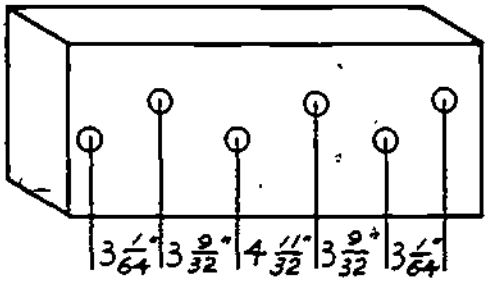
C. Problems without Solutions

7. How many holes spaced 1 7/16" center to center can be drilled in a piece of angle iron 22 5/8" long, allowing 1 1/4" on each end?

Solution:

C. Problems without Solutions (continued)

8. Find the distance between the end holes in the plate pictured.



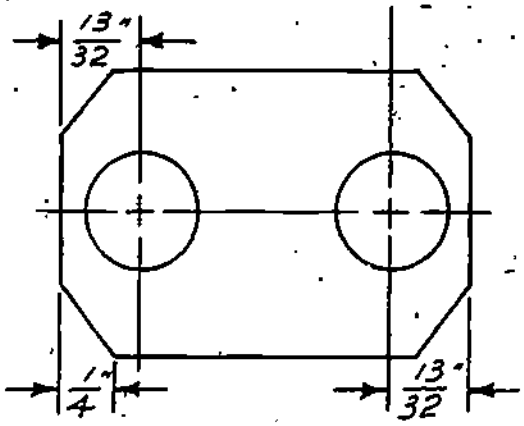
Solution:

9. How long will it take to machine 25 pins if each pin takes 10 1/2 minutes? Allow 1 1/2 minutes per pin for placing stock in the lathe and putting away the finished pin.

Solution:

10. A series of links are to be made like the one illustrated with all measurements the same except for the center to center distance between the holes. Find the length of stock used for each link if 3/16" is allowed for was saw and finishing the ends. The center to center distances are as follows: a) 1 53/64", b) 1 7/16" and c) 1 13/64".

Solution:



C. Problems without Solutions

11. An order of 31 bars of steel were delivered to a machine shop. Each bar was 19' 7 4/32" long. Find the total linear feet in the order.

Solution:

Solutions to B problems

B.4

$$\text{volume} = \left(15\tfrac{1}{4}"\right)\left(12\tfrac{1}{2}"\right)\left(7\tfrac{5}{32}"\right)$$

$$= \left(\frac{61"}{4}\right)\left(\frac{25"}{2}\right)\left(\frac{229"}{32}\right)$$

$$= \frac{349{,}225}{256} \text{ cu in}$$

$$= 1364 \text{ cu in}$$

B.5

$$\text{circumference} = \left(3\tfrac{1}{7}\right)\left(49\tfrac{1}{2}"\right) = \left(\frac{22}{7}\right)\left(\frac{99"}{2}\right) = \frac{2178"}{14} = \text{about } 156 \text{ in}$$

B.6

$$\frac{72\tfrac{1}{4} \text{ gals}}{7\tfrac{1}{2} \text{ gals/cu ft}} = \frac{\frac{289}{4} \cancel{\text{gals}} \times \text{cu ft}}{\frac{15}{2} \cancel{\text{gals}}} = \left(\frac{289}{4} \text{ cu ft}\right)\left(\frac{2}{15}\right)$$

$$= \frac{578}{60} \text{ cu ft or about } 9\tfrac{1}{2} \text{ cu ft}$$

OREGON VO-TECH MATH PROJECT

EVALUATION PROJECT

RATIO AND PROPORTION — MILLWRIGHT

A. Problems with Solutions

1. If 3/8" wire will support a lead of 2,000 lbs, how much would a 9/16" wire support?

Solution:

w = weight supported by 9/16" wire

$$\frac{w}{2{,}000 \text{ lbs}} = \frac{\frac{9}{16}\text{ in}}{\frac{3}{8}\text{ in}}$$

$$\frac{3}{8}w = \frac{9}{16}(2{,}000 \text{ lbs})$$

$$\frac{3}{8}w = \frac{18{,}000}{16} \text{ lbs}$$

$$w = \left(\frac{18{,}000}{16} \text{ lbs}\right)\left(\frac{8}{3}\right)$$

$$w = 3{,}000 \text{ lbs}$$

2. A gear with 72 teeth meshes with a gear with 24 teeth. The larger gear has a speed of 180 rpms. What is the rpms of the smaller gear?

Solution: x = rpms of smaller gear

$$\frac{x}{180 \text{ rpms}} = \frac{72 \text{ teeth}}{24 \text{ teeth}}$$

$$24x = (180 \text{ rpms})(72)$$

$$24x = 12{,}960 \text{ rpms}$$

$$x = \frac{12{,}960 \text{ rpms}}{24}$$

$$x = 540 \text{ rpms}$$

A. Problems with Solutions (continued)

3. If 50 gallons of oil flowed through a feeder pipe in 20 minutes, how long will it take to fill a tank of 1,250 gallon capacity?

Solution: t = time to fill tank

$$\frac{t}{20 \text{ min}} = \frac{1{,}250 \text{ gal}}{50 \text{ gal}}$$

$$50t = (20 \text{ min})(1{,}250)$$

$$50t = 25{,}000 \text{ min}$$

$$t = \frac{25{,}000 \text{ min}}{50}$$

$$t = 500 \text{ min or } 8 \text{ hrs } 20 \text{ min}$$

B. Problems with Separate Solutions

4. A 15.3" shaft has a taper of 0.065", What is the taper in 4"?

Solution:

5. The pressure of water increases with the depth. If the pressure is 6.72 lbs per square inch at a depth of 15', what is the pressure at a depth of 25' 8"?

Solution:

B. Problems with Separate Solutions (continued)

6. Seventeen taps cost $10.50, what would 7 taps cost?

Solution:

C. Problems without Solutions

7. For each 2.5°C increase in water temperature above 20.0°C, a certain thermostatically controlled valve opens 0.035". Find the valve opening at
(a) 62°C
(b) 98°C
(c) What is the water temperature when the valve opening is 0.84"?

Solution:

8. Of two gears in mesh, one turns at a rate of 75 rpms, and the other turns at 50 rpms. What is their gear ratio?

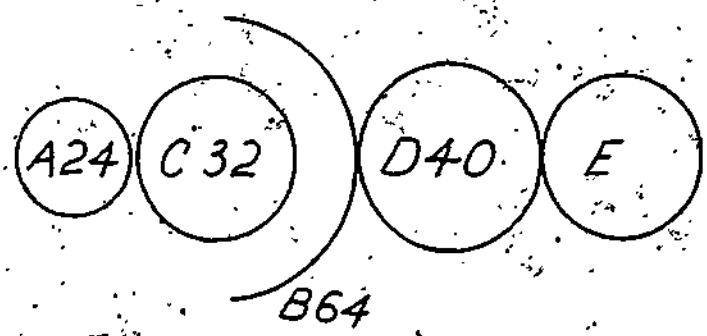
Solution:

C. Problems without Solutions (continued)

9. A step pulley has steps of 3", 3 1/2" and 4" in diameter, and running at 3400 rpms drives another step pulley with steps of 3", 3 1/2" and 4". What speeds can be obtained?

Solution:

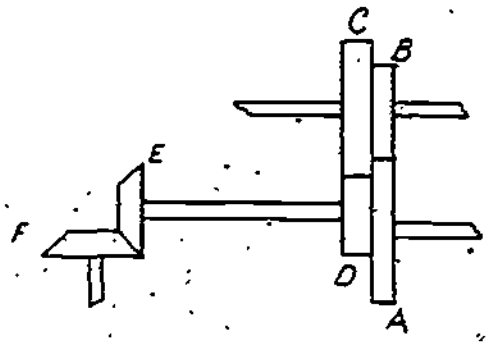
10. Gear E in the figure is required to make 100 rpms while A makes 75 rpms. How many teeth must E have if A has 24; B has 64; C has 32; and D has 40 teeth? (Gears C and B are on the same shaft)



Solution:

C. Problems without Solutions (continued)

11. In the figure how many teeth must F have if it is required to make 320 rpms while A makes 120 rpms and has 72 teeth; B has 24 teeth; C has 40 teeth; D has 36 teeth; and E has 32 teeth? (Gears B and C are on the same shaft. Gear D and E are on the same shaft.)



Solution:

Solutions to B problems

B.4

t = taper in 4"

$$\frac{t}{0.065"} = \frac{4\ in}{15.3\ in}$$

$$15.3t = 4(0.065")$$

$$15.3t = .26"$$

$$t = \frac{.26"}{15.3}$$

$$t = 0.017\ in$$

Solutions to B problems (continued)

B.5

p = pressure at 25' 8", or 25.67'

$$\frac{p}{6.72 \text{ lbs/sq in}} = \frac{25.67 \text{ ft}}{15 \text{ ft}}$$

$$15p = (6.72 \text{ lbs/sq in})(25.67)$$

$$15p = 172.5 \text{ lbs/sq in}$$

$$p = \frac{172.5 \text{ lbs/sq in}}{15}$$

$$p = 11.5 \text{ lbs/sq in}$$

B.6

c = cost of 7 taps

$$\frac{c}{\$10.50} = \frac{7 \text{ taps}}{17 \text{ taps}}$$

$$17c = 7(\$10.50)$$

$$17c = \$73.50$$

$$c = \frac{\$73.50}{17}$$

$$c = \$4.32$$

Solutions to C problems

C.7

length = 2' + 1' + 1' + 1' + 2' = 7 ft

C.8

$$\text{degrees in each wrinkle} = \frac{45^\circ}{9 \text{ wrinkles}} = 5^\circ \text{ per wrinkle}$$

C.9

$$\text{gallons} = \frac{1085 \text{ cu ft}}{7 \text{ cu ft/ gal}} = \frac{1085 \cancel{\text{cu ft}} \times \text{gal}}{7 \cancel{\text{cu ft}}} = 155 \text{ gals}$$

C.10

$$\text{volume} = (420 \cancel{\text{gal}})\left(\frac{231 \text{ cu in}}{\cancel{\text{gal}}}\right) = 97{,}020 \text{ cu in}$$

C.11

$$\text{gallons of paint} = \frac{351 \text{ sq ft}}{13 \text{ sq ft/gal}} = \frac{351 \cancel{\text{sq ft}} \times \text{gal}}{13 \cancel{\text{sq ft}}} = 27 \text{ gals}$$

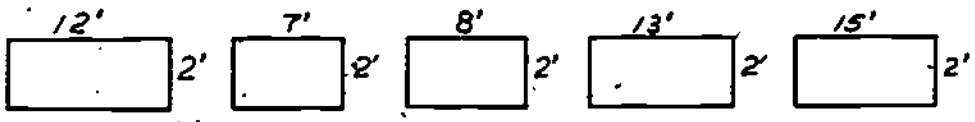
C.12

length = 11" + 9" + 13" + 23" + 15" + 1" = 72"

$$72 \cancel{\text{in}}\left(\frac{1 \text{ ft}}{12 \cancel{\text{in}}}\right) = 6 \text{ ft}$$

C. 13

Length of line = 12' + 7' + 8' + 13' + 15' + 4(2')= 63'



Solutions to C problems (continued)

C.14

A = 7" - 2" - 2" = 3 in

depth of dovetail = 3" - 1" = 2"

C.15

A = 6" - 3" = 3 in

C = 9" - 7" = 2 in

D = 10" - 1" - 1" - 2" = 6 in

B = D - 2" = 6" - 2" = 4 in

C.16

number of tools = 148

money left = \$7.00

$$\frac{\$2,375.00}{\$16.00} = 148 + \$7.00$$

C.17

$$\text{minutes of operation} = \frac{467,245,800 \text{ cycles}}{4,200 \text{ cycles/min}} = \frac{467,245,800 \text{ cycles} \times \text{min}}{4,200 \text{ cycles}}$$

$$= 111,249 \text{ min}$$

Solutions to C problems

C.7

$$\text{thickness} = \frac{1.316" - 1.12"}{2} = .098 \text{ in}$$

C.8

$$\text{amount worn} = 1.317" - 1\ 3/16" = 1.317" - 1.1875"$$

$$= 0.1295" \text{ or about } 0.130 \text{ in}$$

C.9

$$\frac{27\ 1/8" - 2(1")}{14} = \frac{25\ 1/8"}{14} = \frac{25.125"}{14} = 1.795 \text{ in}$$

C.10

$$\text{cutting speed} = (2.42 \text{ in})(120. \text{ rpms}) = 290.4 \text{ in/min}$$

C.11

$$\text{length of pipe needed} = (13")(22\ 1/2^{\circ})(.01745)$$

$$= (13")(22.5^{\circ})(.01745)$$

$$= 5.104 \text{ in}$$

Solutions to C problems

C.7

$$\text{number of holes} = \frac{22\frac{5"}{8} - 2\left(1\frac{1"}{4}\right)}{1\frac{7"}{16}} = \frac{22\frac{5"}{8} - 2\frac{1"}{2}}{1\frac{7"}{16}}$$

$$= \frac{20\frac{1"}{8}}{1\frac{7"}{16}} = \frac{\frac{161}{8}\text{ in}}{\frac{23}{16}\text{ in}}$$

$$= \left(\frac{161}{8}\right)\left(\frac{16}{23}\right) = \frac{2576}{184}$$

$$= 14$$

C.8

$$\text{distance} = 3\frac{1"}{64} + 3\frac{9"}{32} + 4\frac{11"}{32} + 3\frac{9"}{32} + 3\frac{1"}{64}$$

$$= 3\frac{1"}{64} + 3\frac{18"}{64} + 4\frac{22"}{64} + 3\frac{18"}{64} + 3\frac{1"}{64}$$

$$= 16\frac{60"}{64}$$

$$= 16\frac{15}{16}\text{ in}$$

C.9

$$(25\text{ pins})\left(10\frac{1}{2}\frac{\text{min}}{\text{pin}}\right) + (25\text{ pins})\left(1\frac{1}{2}\frac{\text{min}}{\text{pin}}\right) = 250\frac{25}{2}\text{ min} + 25\frac{25}{2}\text{ min}$$

$$= 275\frac{50}{2}\text{ min} = 300\text{ min}$$

Solutions to C problems (continued)

C.10

a) $1\frac{53"}{64} + 2\left(\frac{13"}{32}\right) + \frac{3"}{16} = 1\frac{53"}{64} + \frac{52"}{64} + \frac{12"}{64} = 1\frac{117"}{64}$

$= 2\frac{53}{64}$ in

b) $1\frac{7"}{16} + 2\left(\frac{13"}{32}\right) + \frac{3"}{16} = 1\frac{14"}{32} + \frac{26"}{32} + \frac{6"}{32} = 1\frac{46"}{32}$

$= 2\frac{7}{16}$ in

c) $1\frac{13"}{64} + 2\left(\frac{13"}{32}\right) + \frac{3"}{16} = 1\frac{13"}{64} + \frac{52"}{64} + \frac{12"}{64} = 1\frac{77"}{64}$

$= 2\frac{13}{64}$ in

C.11

length $= (31)\left(19' \; 7\frac{4}{32}"\right) = 589' \; 217\frac{124"}{32}$

$= 589' \; 220\frac{28"}{32}$

$= 607' \; 4\frac{28"}{32}$

$= 607$ ft $4\frac{7}{8}$ in

Solutions to C problems

C.7

x = valve opening

a) at 62°C valve is affected by 62°C - 20.0°C = 42°C

$\frac{x}{.035"} = \frac{42^{\circ}C}{2.5^{\circ}C}$ $\quad 2.5x = 42(.035")$

$2.5x = 1.47"$

$x = 0.588$ in

b) at 98°C valve is affected by 98°C - 20.0°C = 78°C

$\frac{x}{.035"} = \frac{78^{\circ}C}{2.5^{\circ}C}$ $\quad 2.5x = 78(.035")$

$2.5x = 2.730"$

$x = 1.092$ in

c) t = temperature producing opening of 0.84"

$\frac{t}{2.5^{\circ}C} = \frac{0.84 \text{ in}}{0.035 \text{ in}}$ $\quad 0.035t = (0.84)(2.5^{\circ}C)$

$0.035t = 2.1^{\circ}C$

$t = 60^{\circ}C$

True temperature is t + 20°C = 80°C

C.8

either 75:50 = 3:2

or 50:75 = 2:3

C.9

Possible combinations are:

r = rpms of driven pulley

3:3 $\frac{r}{3400 \text{ rpms}} = \frac{3 \text{ in}}{3 \text{ in}}$

$\frac{r}{3400 \text{ rpms}} = 1$

$r = 3400$ rpms

3:3 1/2 $\frac{r}{3400 \text{ rpms}} = \frac{3 \text{ in}}{3\ 1/2 \text{ in}}$

$4r = 10{,}200$ rpms

$r = 2{,}914$ rpms

Solutions to C problems (continued)

C.9 (continued)

3:4 $\frac{r}{3400 \text{ rpms}} = \frac{3 \text{ in}}{4 \text{ in}}$

$4r = 10,200 \text{ rpms}$

$r = 2550 \text{ rpms}$

3 1/2:3 $\frac{r}{3400 \text{ rpms}} = \frac{3\ 1/2 \text{ in}}{3 \text{ in}}$

$3r = 11,900 \text{ rpms}$

$r = 3967 \text{ rpms}$

3 1/2:3 1/2 $\frac{r}{3400 \text{ rpms}} = \frac{3\ 1/2 \text{ in}}{3\ 1/2 \text{ in}}$

$r = 3400 \text{ rpms}$

3 1/2:4 $\frac{r}{3400 \text{ rpms}} = \frac{3\ 1/2 \text{ in}}{4 \text{ in}}$

$4r = 11,900 \text{ rpms}$

$r = 2975 \text{ rpms}$

4:3 $\frac{r}{3400 \text{ rpms}} = \frac{4 \text{ in}}{3 \text{ in}}$

$3r = 13,600 \text{ rpms}$

$r = 4533 \text{ rpms}$

4:3 1/2 $\frac{r}{3400 \text{ rpms}} = \frac{4 \text{ in}}{3\ 1/2 \text{ in}}$

$(3\ 1/2)r = 13,600 \text{ rpms}$

$r = 3886 \text{ rpms}$

4:4 $\frac{r}{3400 \text{ rpms}} = \frac{4 \text{ in}}{4 \text{ in}}$

$r = 3400 \text{ rpms}$

C.10

compute the rpms of each gear in succession

rpm of C : $\frac{24 \text{ teeth}}{32 \text{ teeth}} = \frac{C}{75 \text{ rpm}}$ $32C = 1800 \text{ rpm}$

$C = 56.25 \text{ rpm}$

rpm of B = rpm of C since they are on the same shaft

$B = 56.25 \text{ rpm}$

rpm of D : $\frac{64 \text{ teeth}}{40 \text{ teeth}} = \frac{D}{56.25 \text{ rpm}}$ $40D = 3600 \text{ rpm}$

$D = 90 \text{ rpm}$

rpm of E = 100 rpm t = teeth in E

$\frac{t}{40 \text{ teeth}} = \frac{90 \text{ rpm}}{100 \text{ rpm}}$ $100t = 3600 \text{ teeth}$

$t = 36 \text{ teeth}$

Solutions to C problems (continued)

C.11

compute the rpm of each gear in succession

rpm of B : $\frac{B}{120 \text{ rpm}} = \frac{72 \text{ teeth}}{24 \text{ teeth}}$ $24B = 8640 \text{ rpm}$ $B = 360 \text{ rpm}$

rpm of C = rpm of B since they are on the same shaft

rpm of C = 360 rpm

rpm of D : $\frac{D}{360 \text{ rpm}} = \frac{40 \text{ teeth}}{36 \text{ teeth}}$ $36D = 14400 \text{ rpm}$ $D = 400 \text{ rpm}$

rpm of E = rpm of 0 since they are on the same shaft

rpm of E = 400 rpm

t = teeth in F

$\frac{t}{32 \text{ teeth}} = \frac{400 \text{ rpm}}{320 \text{ rpm}}$ $320t = 12800 \text{ teeth}$ $t = 40 \text{ teeth}$

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

DECIMALS WELDING

A. Problems with Solutions

1. A 1" x 1" x 1/8" steel bar will weigh 0.38 pounds per foot. What is the weight of a 20' bar?

Solution:

$$(0.38 \text{ lbs/ft})(20 \text{ ft}) = 7.6 \text{ lbs}$$

2. A stock 20' bar of 7 inch I-beam weighs 306 pounds. What is the weight of a 16' bar?

Solution:

$$\frac{306 \text{ lbs}}{20 \text{ ft.}} = 15.3 \text{ lbs/ft}$$

$$(15.3 \text{ lbs/ft})(16 \text{ ft}) = 244.8 \text{ lbs}$$

3. A stock 8" x 8" H-beam weighs 32.6 lbs per foot. Find the weight of a beam 87 1/4 inches in length.

Solution:

$$\frac{87\ 1/4 \text{ in}}{12 \text{ in/ft}} = \frac{349/4 \text{ in} \times \text{ft}}{12 \text{ in}} = \frac{349 \text{ ft}}{48} = 7.27 \text{ ft}$$

$$(7.27 \text{ ft})(32.6 \text{ lbs/ft}) = 237 \text{ lbs}$$

B. Problems with Separate Solutions

4. A 1/2 ton pickup has a load capacity of 4500 pounds. How many sheets of galvanized 60" x 144" 24 guage could be carried if the estimated weight per sheet is 69.4 pounds?

Solution:

B. Problems with Separate Solutions (continued)

5. Convert each of the following measurements to feet in decimals:

a) 4' 6" b) 6' 3"

c) 1/4" d) 9' 10 5/8"

e) 7" f) 27"

g) 103 1/2" h) 1/4"

Solution:

6. If a welder receives an hourly wage of $6.38 with time and one-half being paid for any hours over 40 during a given week, find his gross pay for a week in which he puts in 56 hours?

Solution:

C. Problems without Solutions

7. A stock 20' length of 3-inch channel weighs 82 lbs and costs $0.265 per pound. What is the cost of 116 inches of 3-inch channel?

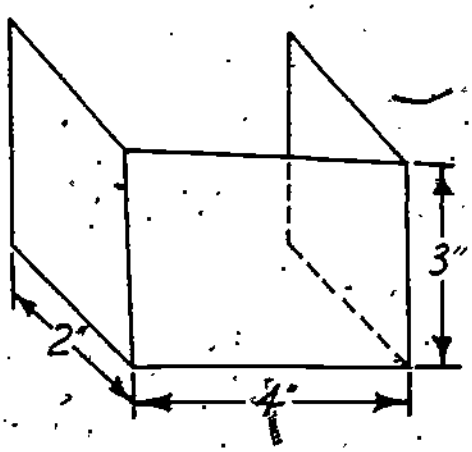
Solution:

C. Problems without Solutions (continued)

8. Find the cost of 1/8" electrodes if there is 12.5 feet to be welded with two Stringer passes and if each electrode will weld 8". The cost of the electrodes is $0.76 per lb and there are 12.6 electrodes per pound.

Solution:

9. Eight pieces as pictured are to be constructed from 1/4" x 3" F.B. whose weight is 2.55 lbs per foot and whose cost is $0.235 per pound. Find the cost of the steel.



Solution:

C. Problems without Solutions (continued)

10. If you receive an hourly wage of $7.14 with time and one-half being paid for any hours over 40 during a given week, compute your gross pay for the week whose time card reads as follows:

Monday	9 hrs	Thrusday	9 hrs
Tuesday	10 hrs	Friday	10 hrs
Wednesday	8 hrs	Saturday	4 hrs

Solution:

11. Convert each of the following measurements to feet and inches rounding to the nearest 1/4".

a) 6.3'

b) 4.27'

c) .39'

d) 1.09'

e) .088'

f) 4.11'

g) .89"

h) 2.33"

0" or greater but less than .125" rounds to 0"
.125" or greater but less than .375" rounds to 1/4"
.375" or greater but less than .625" rounds to 1/2"
.625" or greater but less than .875" rounds to 3/4"
.875" or greater rounds to 1"

Solution:

Solutions to B problems

B.4

$$\frac{4500 \text{ lbs}}{69.4 \text{ lbs/sheet}} = \frac{4500 \text{ lbs} \times \text{sheet}}{69.4 \text{ lbs}} = 64.84 \text{ sheets}$$

therefore 64 sheets could be carried

B.5

a) 4' 6" = 4 6/12 ft = 4.5 ft

b) 6' 3" = 6 3/12 ft = 6.25 ft

c) 2' 4 1/4" = $2 \frac{4\ 1/4}{12}$ ft = $2 \frac{17}{48}$ ft = 2.35 ft

d) 9' 10 5/8" = $9 \frac{10\ 5/8}{12}$ ft = $9 \frac{85}{96}$ ft = 9.89 ft

e) 7" = 7/12 ft = 0.58 ft

f) 27" = 27/12 ft = 2.25 ft

g) 103 1/2" = $\frac{103\ 1/2}{12}$ ft = $\frac{207}{24}$ ft = 8.63 ft

h) 1/4" = $\frac{1/4}{12}$ ft = $\frac{1}{48}$ ft = 0.021 ft

B.6

regular pay	(40 hrs)($6.38/hr) =	$255.20
overtime pay	(16 hrs)($6.38/hr)(1.5) =	153.12
	Gross Pay	$408.32

OREGON VO-TECH MATH PROJECT

EVALUATION PACKAGE

FRACTIONS WELDING

A. Problems with Solutions

1. Find the total amount of each type of steel needed: (Do not consider any waste)

Type	Lengths needed
a) [	4' 3"; 4' 8"; and 7' 2"
b) L	5' 6 1/2"; 8'; and 12' 2 1/2"
c) ∅	11 3/4"; 4' 2 3/4"; 8' 9 1/4"; and 5' 3 3/4"
d) I	2' 4 1/8"; 7' 3 3/4"; 9 1/2"; and 6' 8 5/8"
e) ⊥	6"; 5' 7 1/3"; 4' 3 1/2"; and 5' 3 7/8"

Solution:

a) 4 ft 3 in + 4 ft 8 in + 7 ft 2 in = 15 ft 13 in = 16 ft 1 in

b) 5 ft 6 1/2 in + 8 ft + 12 ft 2 1/2 in = 25 ft 9 in

c) 11 3/4 in + 4 ft 2 3/4 in + 8 ft 9 1/4 in + 5 ft 3 3/4 in =

17 ft 25 10/4 in = 17 ft 27 1/2 in = 19 ft 3 1/2 in

d) 2 ft 4 1/8 in + 7 ft 3 3/4 in + 9 1/2 in + 6 ft 8 5/8 in =

15 ft 24 16/8 in = 17 ft 2 in

e) 6 in + 5 ft 7 1/3 in + 4 ft 3 1/2 in + 5 ft 3 7/8 in =

14 ft 19 41/24 in = 14 ft 20 17/24 in = 15 ft 8 17/24 in

A. Problems with Solutions (continued)

2. Find the total amount of each type of steel needed: (Do not consider any waste)

	Type	Lengths needed
a)	[	4 pieces 5' 2" in length
b)	L	7 pieces 8' 5" in length
c)	⌀	22 pieces 7 3/4" in length
d)	I	3 pieces 5' 7 3/8" in length
e)	R	2 pieces 7' 8 1/2" in length and 9 pieces 6' 8 3/4" in length

Solution:

a) (4)(5 2/12 ft) = (4)(62/12 ft) = 248/12 ft
= 20 ft 8 in

b) (7)(8 5/12 ft) = (7)(101/12 ft) = 707/12 ft
= 58 ft 11 in

c) (22)(7 3/4 in) = (22)(31/4 in) = 682/4 in
= 170 1/2 in
= 14 ft 2 1/2 in

d) (3)(5 ft 7 3/8 in) = (3)(5 ft) + (3)(7 3/8 in)
= 15 ft + (3)(59/8 in)
= 15 ft + 177/8 in
= 15 ft + 22 1/8 in
= 16 ft 10 1/8 in

e) (2)(7 ft 8 1/2 in) = (2)(7 ft) + (2)(8 1/2 in)
= 14 ft + (2)(17/2 in)
= 14 ft + 34/2 in
= 14 ft + 17 in = 15 ft 5 in

A. Problems with Solutions (continued)

2. Solution: (continued)

e) $(9)(6 \text{ ft } 8\ 3/4 \text{ in}) = (9)(6 \text{ ft}) + (9)(8\ 3/4 \text{ in})$

$= 54 \text{ ft} + (9)(35/4 \text{ in})$

$= 54 \text{ ft} + 315/4 \text{ in}$

$= 54 \text{ ft} + 78\ 3/4 \text{ in}$

$= 60 \text{ ft } 6\ 3/4 \text{ in}$

total length $= 60 \text{ ft } 6\ 3/4 \text{ in} + 15 \text{ ft } 5 \text{ in}$

$= 75 \text{ ft } 11\ 3/4 \text{ in}$

B. Problems with Separate Solutions

3. How many pieces of 10 5/16" bar can be cut from a stock 20' bar. The material is to be torch cut and an allowance of a 3/16" kerf is to be made.

Solution:

4. A 39" piece of flat bar is to have 11 equally spaced holes drilled on the center line of the bar. The two end holes are to be 1 3/4" from the end of the bar. What will the distance be between each consecutive hole?

Solution:

C. Problems without Solutions

5. If an I-beam is to be cut into sections with the given tolerance, find the longest and shortest acceptable lengths:

	Length of Section	Tolerance
a)	22 1/2"	± 1/4"
b)	2' 7"	± 1/2"
c)	13'	± 1 1/2"
d)	23 3/4"	+ 1/8"; - 1/2"
e)	2' 1/8"	+ 1/4"; - 3/16"
f)	10'	+ 1/16"; - 1/8"

Solution:

6. The center points of two holes drilled in a piece of P.B. are 18-3/4" apart. Two more holes are to be equally spaced between these two holes, Locate the center point of each of the remaining holes.

Solution:

C. Problems without Solutions (continued)

7. An inventory of all stock on hand shows:

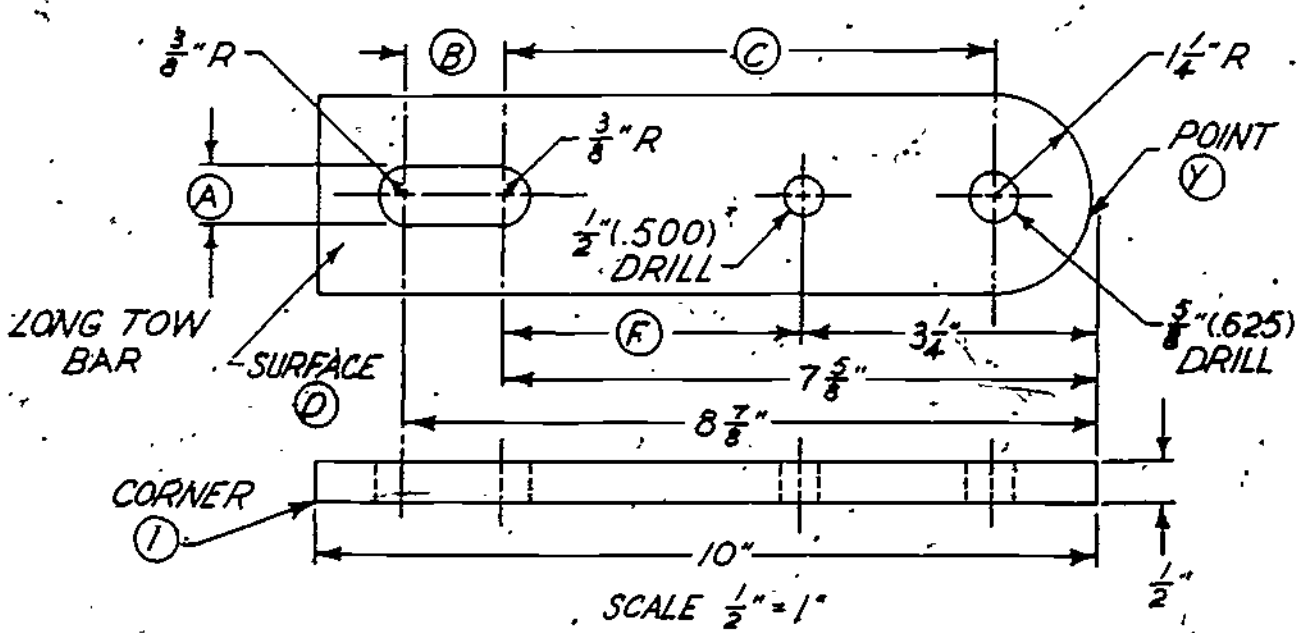
Flat Bar	16 ea.	1/4" X 3" X 20'
	8 ea.	1/2" X 4" X 10'
	20 ea.	3/4" X 6" X 15'
Steel Plate	2 ea.	1/2" X 4' X 12'
	5 ea.	5/16" X 3' X 9'
	1 ea.	3/4" X 4' X 8'
Round Stock	2 ea.	1/2" X 20'
	1 ea.	3/4" X 20'
	2 ea.	5/8" X 15'

Find the total weight of all the steel. The weight of steel can be found by the formula: thickness x width x length x .2835 (the measurements must be in inches)

Solution:

C. Problems without Solutions (continued)

8. Find the distances A, B, C, and F on the given blueprint.



Solution:

Solutions to B problems

B.3

10 5/16" + 3/16" = 10 8/16" = 10.5 in

20 ft = 240 in

$\frac{240 \text{ in}}{10.5 \text{ in}} = 22.86$ therefore 22 pieces can be cut

Solutions to B problems (continued)

B.4

$$39" - 1\ 3/4" - 1\ 3/4" = 39" - 3\ 1/2" = 35\ 1/2\ in$$

$$\frac{35\ 1/2\ in}{10} = \frac{72/2\ in}{10} = \left(\frac{72}{2}\ in\right)\left(\frac{1}{10}\right) = \frac{72}{20}\ in = 3\ 11/20\ in$$

Solutions to C problems

C.5

	Longest	Shortest
a)	22 1/2" + 1/4" = 22 3/4 in	22 1/2" - 1/4" = 22 1/4"
b)	2' 7" + 1/2" = 2 ft 7 1/2 in	2' 7" - 1/2" = 2 ft 6 1/2 in
c)	13' + 1 1/2" = 13 ft 1 1/2 in	13' - 1 1/2" = 12 ft 10 1/2 in
d)	23 3/4" + 1/8" = 23 7/8 in	23 3/4" - 1/2" = 23 1/4 in
e)	2' 1/8" + 1/4" = 2 ft 3/8 in	2' 1/8" - 3/16" = 1 ft 15/16 in
f)	10' + 1/16" = 10 ft 1/16 in	10' - 1/8" = 9 ft 7/8 in

C.6

$$\frac{18\ 3/4\ \text{in}}{3} = \frac{75/4\ \text{in}}{3} = \left(\frac{75}{4}\ \text{in}\right)\left(\frac{1}{3}\right) = \frac{75}{12}\ \text{in} = 6\ 1/4\ \text{in}$$

C.7

Flat Bar	(16) (1/4) (3) (240) (.2835) =	816.48
	(8) (1/2) (4) (120) (.2835) =	544.32
	(20) (3/4) (6) (180) (.2835) =	4,592.70
Steel Plate	(2) (1/2) (48) (144) (.2835) =	1,959.55
	(5) (5/16) (36) (108) (.2835) =	1,722.26
	(1) (3/4) (48) (96) (.2835) =	979.78
Round Stock	(2) (1/2) (240) (.2835) =	68.04
	(1) (3/4) (240) (.2835) =	51.03
	(2) (5/8) (180) (.2835) =	63.79
	Total weight of steel	10,797.95 lbs

C.8

A = 3/8" + 3/8" = 6/8" = 3/4 in

B = 8 7/8" - 7 5/8" = 1 2/8" = 1 1/4 in

C = 7 5/8" - 1 1/4" = 7 5/8" - 1 2/8" = 6 3/8 in

F = 7 5/8" - 3 1/4" = 7 5/8" - 3 2/8" = 4 3/8 in

Solutions to C problems

C.7

$$\frac{116 \text{ in}}{12 \text{ in/ft}} = \frac{116 \text{ in} \times \text{ft}}{12 \text{ in}} = 9.67 \text{ ft}$$

$$\frac{82 \text{ lbs}}{20 \text{ ft}} = 4.1 \text{ lbs/ft}$$

$$(9.67 \text{ ft})(4.1 \text{ lbs/ft}) = 39.65 \text{ lbs}$$

$$(39.65 \text{ lbs})(\$0.265/\text{lb}) = \$10.51$$

C.8

$$\frac{12.5 \text{ ft}}{0.67 \text{ ft/electrode}} = \frac{12.5 \text{ ft} \times \text{electrode}}{0.67 \text{ ft}} = 18.66 \text{ electrodes}$$

$$= 19 \text{ electrodes}$$

$$\frac{\$0.76/\text{lb}}{12.6 \text{ electrodes/lb}} = \frac{\$0.76/\text{lb} \times \text{lb}}{12.6 \text{ electrodes}} = \$0.06/\text{electrode}$$

$$(19 \text{ electrodes})(\$0.06/\text{electrode})(2) = \$2.28$$

C.9

Total length = 8 (2" + 4" + 3") = 72" = 6 ft

Total weight = (6 ft)(2.55 lbs/ft) = 15.3 lbs

Total cost = (15.3 lbs)($0.235/lb) = $3.60

C.10

9 hr + 10 hr + 8 hr + 9 hr + 10 hr + 4 hr = 50 hrs

50 hr - 40 hr = 10 hrs overtime

regular pay	(40 hrs)($7.14/hr) =	$285.60
overtime pay	(10 hr)($7.14/hr)(1.5) =	107.10
	Gross Pay	$392.70

Solutions to C problems (continued)

C.11

a) (0.3 ft)(12 in/ft) = 3.6 in, therefore 6.3' = 6 ft 3 1/2 in

b) (0.27 ft)(12 in/ft) = 3.24 in, therefore 4.27' = 4 ft 3 1/4 in

c) (0.39 ft)(12 in/ft) = 4.68 in, therefore 0.39' = 4 3/4 in

d) (0.09 ft)(12 in/ft) = 1.08 in, therefore 1.09' = 1 ft 1 in

e) (0.088 ft)(12 in/ft) = 1.056 in, therefore 0.088' = 1 in

f) (0.11 ft)(12 in/ft) = 1.32 in, therefore 4.11' = 4 ft 1 1/4 in

g) 0.89" = 1 in

h) 2.33" = 2 1/4 in

OREGON VO-TECH MATH PROJECT

LEARNING PACKAGE EVALUATION SHEET

Please check the most appropriate box or boxes.

1. Learning package indentification _____.

2. The problems in this package were:

   too easy ☐ about right ☐ too difficult ☐

3. How long did it take you to complete this problem package?

   1 class period ☐ 2 class periods ☐

   more than 2 class periods ☐

4. How could the material in this package be improved?

   more instruction sheets ☐ more instructor help ☐

   packages explaining math concepts ☐ group discussions ☐

   work experience ☐ more lectures ☐

5. Were you able to solve the problems in sections B and C of this package?

   yes ☐ no ☐

   If not, please comment:

   _____

   _____

6. Would you like to see more problems of this type used in your math class?

   yes ☐ no ☐

7. Other comments:

   _____

   _____

   _____

OREGON VO-TECH MATH PROJECT

LEARNING PACKAGE EVALUATION SHEET

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   If not, please comment:

   _____

   _____

6. Would you like to see more problems of this type used in your math class?

   yes ☐ no ☐

7. Other comments:

   _____

   _____

   _____

OREGON VO-TECH MATH PROJECT

LEARNING PACKAGE EVALUATION SHEET

INSTRUCTOR

Learning Package Identification_____

1. What difficulties did your students encounter in using this package?

2. What revisions, modifications, deletions, or additions to this learning package would help your students?

3. What corrections are necessary?