

Summer 1985

Self-Instructional Units for Mastery Learning in Drafting

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ABSTRACT

SELF-INSTRUCTIONAL UNITS
FOR MASTERY LEARNING
IN DRAFTING

by

Grant J. Quesnell

July, 1985

Most teachers would like to provide more help and individualized instruction for their students. The implementation of mastery learning in the classroom can help accomplish this. Use of the mastery learning technique may also reduce the high level of predictability in student achievement. All students should be able to experience some degree of success.

The materials in this project are designed to allow students to progress at a pace they set for themselves, and to achieve mastery of all units covered.

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CHAPTER I

STATEMENT OF THE PROBLEM

Throughout history, teachers have struggled with the problem of how to make instruction more appropriate for students. Teachers know that different students learn in different ways. One approach to teaching will not be appropriate for all students.

Most teachers would like to provide more help and individualized instruction for their students. The demands of the classroom environment make the individualization of instruction difficult to accomplish. When attending to the individual needs of one student, the needs of the twenty-nine other students are temporarily left unattended, making disruptions more likely to occur.

There tends to be a high level of predictability concerning student achievement. Those students who are high achievers in the third grade tend to continue to be high achievers throughout high school. Those who are not high achievers by the third grade rarely experience a large amount of success during the rest of their school years.

Experiencing success in school is vital. When successful in learning, students develop a sense of pride and satisfaction. They feel good about themselves and may find that their attitudes toward school in general improve. They also gain confidence and lose inhibitions toward future learning activities.

Most children's learning potential is much greater than is normally found under group instructional conditions. If we truly

The mastery approach to learning cannot offer a solution to all of the problems teachers face. It does, however, provide some practical techniques which teachers can use to help more of their students achieve success in learning, and the benefits that accompany that success. Teachers influence what their students learn, and play an important role in shaping students' attitudes toward learning and toward themselves as learners.

DEFINITION OF TERMS

For the purpose of this study, the following terms will be defined as follows:

Drafting curriculum: The beginning drafting curriculum includes instruction in the areas of equipment usage, lettering, shape description, and size description.

Equipment usage: Instruction in the identification of and the proper use of drafting equipment.

Feedback: Information given to a student concerning his progress.

Lettering: Instruction in the proper formation of letters used in mechanical drafting.

Mastery: The ability to attain a score of eighty percent or above when tested on the material.

Mastery learning: An instructional process, developed by Benjamin Bloom. It involves organizing instruction, providing students with regular feedback on learning progress, giving guidance and direction to help students correct individual learning difficulties, and providing an extra challenge for those students who have

mastered the material.

Predictability: The ability to predict the degree of student achievement and success.

Shape description: Instruction in the proper selection of views in correct perspective and location.

Size description: Instruction in the proper dimensioning techniques.

CHAPTER II

REVIEW OF RELATED LITERATURE

Historically, Benjamin Bloom was the developer of the concept of mastery learning. It was developed to help provide a higher quality of instruction for more students. "Mastery learning provides students with regular feedback on their learning progress to help them correct their individual learning difficulties. Through the careful use of feedback and corrective procedures, Bloom believed that eighty percent of the students in a class could attain the same high level of achievement that only twenty percent attain under more traditional instructional methods." (Implementing Mastery Learning, 1985).

"It seems that those students who are not mastering the fundamentals are the ones who should have the first priority attention of teachers." (Teaching School, 1981). With mastery learning being used in the beginning drafting curriculum, not only will the highly advanced be required to master the basics, but also the lower achiever. The only difference would be the amount of time the individual needed to spend on the given material. "Bloom hypothesized that if aptitude was predictive of the amount of time needed to learn, but not of the level of achievement (degree of learning), it should be possible to set the expected level of achievement at mastery. Then by matching the opportunity to learn (time) and the quality of instruction, teachers should be able to ensure mastery of each student." (Learning and Teaching Concepts, 1980).

In Gusky's book, Implementing Mastery Learning, he discusses teachers using a formative test to provide immediate feedback to students and to teachers. "The main purpose of this kind of testing is not to place or to evaluate students, but rather to provide very specific information on students' learning progress." (Implementing Mastery Learning, 1985). By implementing a post/pre test with every filmstrip/cassette presentation in the Beginning Drafting I series, (Barr Films), this will indeed provide students with immediate feedback and a precise idea as to what their learning needs are.

Students will be required to attain eighty percent accuracy on the post test before being allowed to move on to the next unit. Eighty percent accuracy on the pretest is required if the student should wish to skip the worksheet and post test of that particular unit. According to Thomas R. Gusky, "The most typical standard employed by the majority of teachers using mastery learning is that which a student would receive a high "B" or "A" grade, usually eighty-five percent correct on the test. Some teachers prefer a standard of ninety percent correct, while others are satisfied with eighty percent." (Implementing Mastery Learning, 1985).

With regard to students contracting for grades on their task assignments, Block and Anderson state, "Hopefully the performance of most of your students will be indicative of mastery and most will receive "A"'s. If the outcome of some is not indicative of mastery, then we believe you should give no grade at all, or a grade of incomplete. If you cannot do this, set out some non-mastery performance standards which are indicative of "B" work, "C" work, "D" work, and "F" work. (Mastery Learning in Classroom

Instruction, 1975).

Students need to feel successful and they also need to feel a part of their learning experience. "Bloom's basic message is that while differences in intelligence and aptitude do exist in every classroom, teachers can adjust the quality of instruction and the time allowed for each student so that more students can succeed."

(Implementing Mastery Learning, 1985).

CHAPTER III

PROCEDURES OF THE PROJECT

Upon previewing the filmstrip/cassette materials covering equipment usage, lettering, shape description, and size description, (Barr Films, Beginning Drafting I), it was noted that mastery of this material was needed by all students in beginning high school drafting.

The first step in the preparation of the project was to construct a worksheet which would accompany each of the four filmstrips/cassettes. The worksheets cover the terms, steps, and technically important information, in the order that it is presented in the filmstrips/cassettes.

The second step was to prepare pretests using the information from the worksheets. Several different pretests were made to accompany each worksheet, each covering different information from the worksheet, or having a different format and covering the same information.

The third step involved developing several post tests to cover all the information given in the worksheet. Each post test either covers different information from the worksheet, or presents the same information in a format different from the previous post test.

The last step in the process included selecting various assignments associated with some of the units to be studied. These were lettering, shape description, and size description. The student is to be allowed to choose from the listed assignments. It is in this

aspect that the student is given the opportunity to contract for his or her grade. A minimum requirement of assignments to be completed was established.

CHAPTER IV
RESULTS OF THE PROJECT

Implementing mastery learning into the drafting curriculum will follow a procedure of pre-testing, worksheet assignments, student-chosen work assignments taken from the textbook, and post-testing. All aspects are associated with the cassette and filmstrip presentation, Beginning Drafting I, published by Barr Films, Pasadena, CA.

The curriculum of the beginning drafting program includes pretests, worksheets, post tests, and assignments for each of the four areas to be covered--equipment usage, lettering, shape description, and size description. Should the student pass the pretest of a given area with eighty percent accuracy, he or she would be allowed to skip the worksheet and post test associated with that area. Those who are unable to "master" the pretest, would be required to complete the worksheet and take the post test. No limit has been set on the amount of attempts a student may have to complete the post test. This is the reason for the several different formats of some of the post tests. After the student has passed the post test, and has completed the minimum amount of assignments, he or she will be allowed to progress to the next level of drafting, whether it be lettering, size, or shape description.

With regard to the grading procedure in beginning high school drafting, each student will be graded according to the degree of difficulty at which he or she wishes to work at. The grading requirements will be explained to all students. Each student will be expected to complete all four post tests (or pretests) with eighty percent accuracy.

This will be averaged in with the student's grade on the assignments.

By requiring each student to "master" the material covered in the filmstrip/cassette presentation of each of the four areas listed, the student will gain a broad knowledge of the subject matter. In other words, the student will have a mastered knowledge, but has yet to encounter the actual work involved with each aspect. It will be the student's responsibility to determine the level of work and the grade he or she wishes to work toward.

THE PROJECT

The following drafting materials were developed to assist teachers wishing to implement mastery learning into the drafting curriculum.

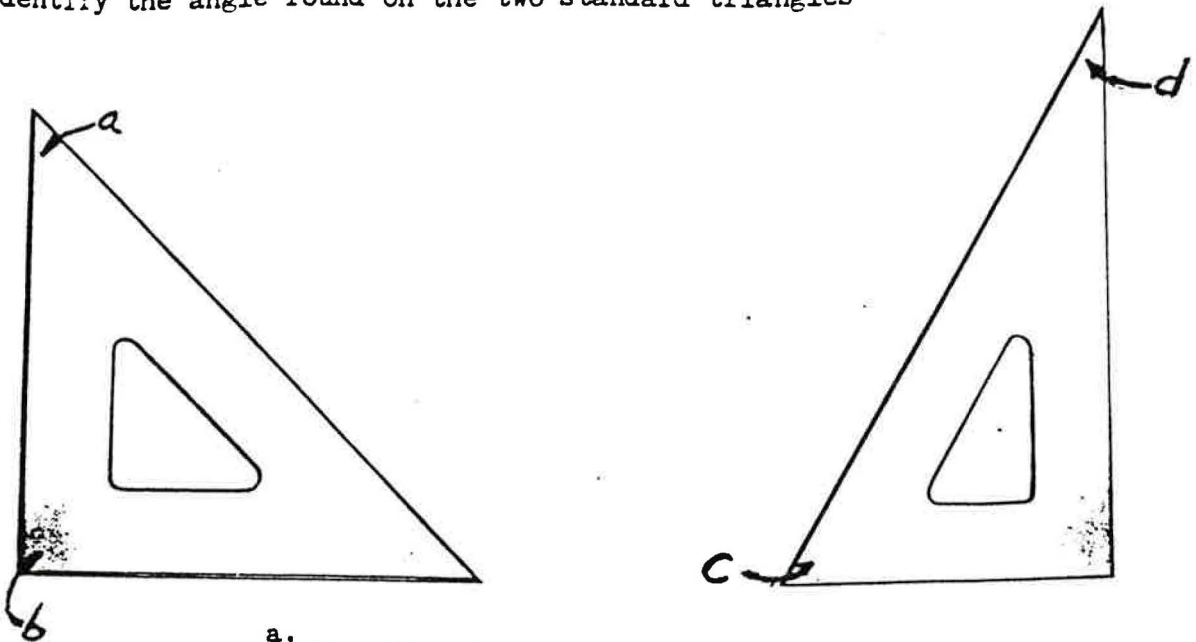
EQUIPMENT USAGE

PRETESTS

1. _____ A metal plate with various slots and openings used to protect linework when a portion of the drawing is to be erased.
 2. _____ An instrument used to measure the length of a line.
 3. _____ A covering used to protect drawings and equipment when not in use.
 4. _____ An instrument used to lay out guidelines for lettering.
 5. _____ A sharpening device for mechanical pencils.
 6. _____ An instrument used to measure angles.
 7. _____ An instrument used to transfer dimensions.
 8. _____ An instrument used to draw circles and arcs.
 9. _____ An instrument consisting of a thin, flat right angled piece of plastic or metal with acute angles of 30° , 45° , and 60° .
 10. _____ A metal holder in which leads of various hardness can be inserted.
 11. _____ An instrument used to lay out any non-circular curve.
 12. _____ A thin, flat, plastic tool with various size openings of different shapes used to expedite the drawing of standard features.
 13. _____ A tool used to brush loose graphite and eraser filings from the drawing.
 14. _____ A loosely woven bag of ground art gum eraser filings used to remove loose graphite from the drawing.
 15. _____ A device used to remove pencil lines and graphite smudges from the drawing.
 16. _____ A specially prepared tape that does not harm the surface of the table or the drawing media.
 17. _____ Composed of mainly carbon in colloidal suspension and gum. The fine particles of carbon give the deep, dark, black, appearance to the ink, and the gum makes it quick to dry and waterproof.
- A. Triangle
 - B. Lettering Guide
 - C. Compass
 - D. Divider
 - E. Dusting Brush
 - F. Erasing Shield
 - G. Lead Pointer
 - H. Mechanical Lead Holder
 - I. Scale
 - J. Dust Cover
 - K. Irregular Curve
 - L. Protractor
 - M. Template
 - N. Cleaning Pad
 - O. Lead Cleaner
 - P. Eraser
 - Q. Lead
 - R. Lead
 - S. Plastic Lead
 - T. Ink
 - U. Drafting Tape

- | | | | |
|-----|----------|--|---------------------------|
| 1. | <u>F</u> | A metal plate with various slots and openings used to protect linework when a portion of the drawing is to be erased. | A. Triangle |
| 2. | <u>I</u> | An instrument used to measure the length of a line. | B. Lettering Guide |
| 3. | <u>J</u> | A covering used to protect drawings and equipment when not in use. | C. Compass |
| 4. | <u>B</u> | An instrument used to lay out guidelines for lettering. | D. Divider |
| 5. | <u>G</u> | A sharpening device for mechanical pencils. | E. Dusting Brush |
| 6. | <u>L</u> | An instrument used to measure angles. | F. Erasing Shield |
| 7. | <u>D</u> | An instrument used to transfer dimensions. | G. Lead Pointer |
| 8. | <u>C</u> | An instrument used to draw circles and arcs. | H. Mechanical Lead Holder |
| 9. | <u>A</u> | An instrument consisting of a thin, flat right angled piece of plastic or metal with acute angles of 30° , 45° , and 60° . | I. Scale |
| 10. | <u>H</u> | A metal holder in which leads of various hardness can be inserted. | J. Dust Cover |
| 11. | <u>K</u> | An instrument used to lay out any non-circular curve. | K. Irregular Curve |
| 12. | <u>M</u> | A thin, flat, plastic tool with various size openings of different shapes used to expedite the drawing of standard features. | L. Protractor |
| 13. | <u>E</u> | A tool used to brush loose graphite and eraser filings from the drawing. | M. Template |
| 14. | <u>N</u> | A loosely woven bag of ground art gum eraser filings used to remove loose graphite from the drawing. | N. Cleaning Pad |
| 15. | <u>P</u> | A device used to remove pencil lines and graphite smudges from the drawing. | O. Lead Cleaner |
| 16. | <u>U</u> | A specially prepared tape that does not harm the surface of the table or the drawing media. | P. Eraser |
| 17. | <u>T</u> | Composed of mainly carbon in colloidal suspension and gum. The fine particles of carbon give the deep, dark, black, appearance to the ink, and the gum makes it quick to dry and waterproof. | Q. Lead |
| | | | R. Lead |
| | | | S. Plastic Lead |
| | | | T. Ink |
| | | | U. Drafting Tape |

1. Identify the angle found on the two standard triangles



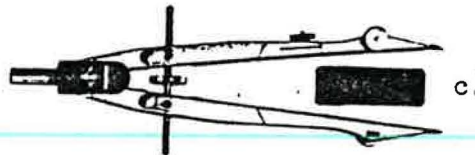
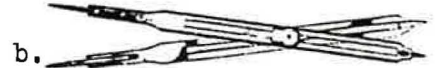
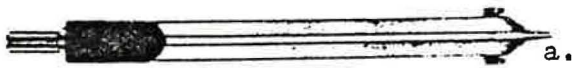
- a. _____
- b. _____
- c. _____
- d. _____

2. State the purpose for using a standard triangle.

3. List the three types of compasses used.

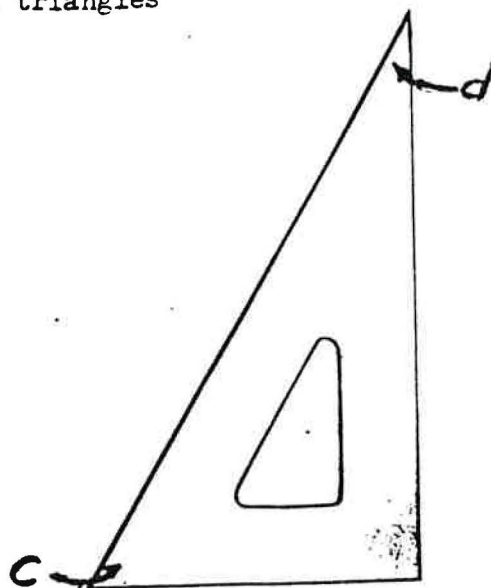
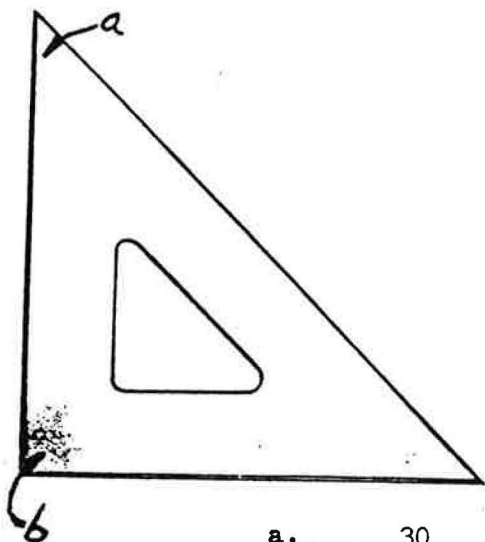
- a. _____
- b. _____
- c. _____

4. Identify the three types of dividers shown below



- a. _____
- b. _____
- c. _____

1. Identify the angle found on the two standard triangles



- a. 30
- b. 90
- c. 60
- d. 45

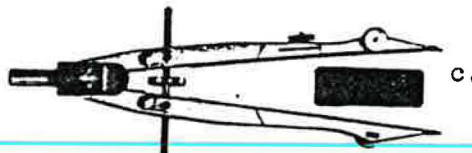
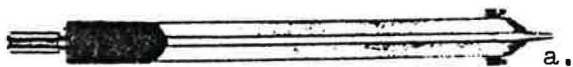
2. State the purpose for using a standard triangle.

To provide a straight edge for drawing vertical or inclined lines and any angle of 15° increments.

3. List the three types of compasses used.

- a. friction
- b. bow
- c. beam

4. Identify the three types of dividers shown below

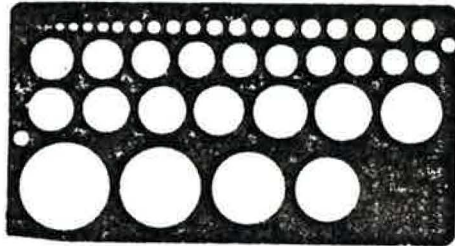


a. friction

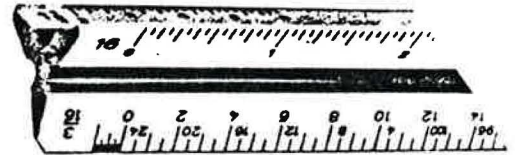
b. bow

c. proportional

1. Identify the tools shown that are used by industrial drafting companies.



a. _____



b. _____



c. _____



d. _____

2. List the three types of compasses.

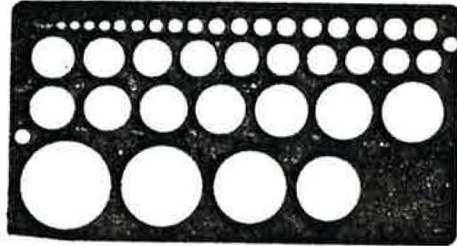
a. _____

b. _____

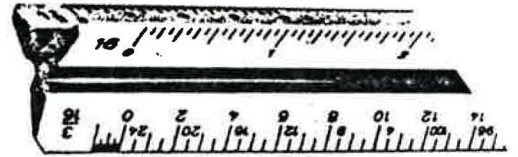
c. _____

3. List the 9 different leads that are available for use by the drafter. Start with the softest and lead up to the hardest.

1. Identify the tools shown that are used by industrial drafting companies.



a. circle template



b. scale



c. _____



d. dusting brush

2. List the three types of compasses.

a. friction

b. bow

c. beam

3. List the 9 different leads that are available for use by the drafter. Start with the softest and lead up to the hardest.

- | | | | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <u>8B</u> | <u>7B</u> | <u>6B</u> | <u>5B</u> | <u>4B</u> | <u>3B</u> | <u>2B</u> | <u>HB</u> | <u>F</u> |
| <u>H</u> | <u>2H</u> | <u>3H</u> | <u>4H</u> | <u>5H</u> | <u>6H</u> | <u>7H</u> | <u>8H</u> | <u>9H</u> |

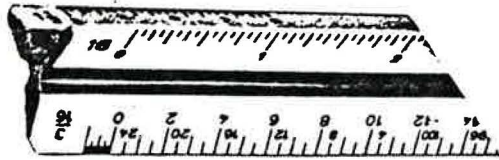
EQUIPMENT USAGE

WORKSHEET

1. In almost every kind of work _____ is used.
2. Give 2 examples of other occupations and how they use this form of representation.
 - A.
 - B.
3. In drafting _____ and _____ are used to convey precise information of industry.
4. Match the following:

_____ Drafting board or table	A. Used to remove erasing filings.
_____ Drafting brush	B. Is the ultimate in manually operated drafting equipment.
_____ Protractor	C. Used to determine a given angle.
_____ Drafting console	D. A non-glare surface that holds the drafting paper.
_____ Erasing shield	E. Used over the line that needs to be erased and for tight areas if removal is necessary.
5. Describe how to sharpen the lead in a 6" bow compass.
6. Describe what dividers are used for.
7. Explain how to fasten a piece of paper to the drawing surface using a T-square.
8. Drafting pencils come in several grades, but the most common ones used by industry range from _____ to _____.

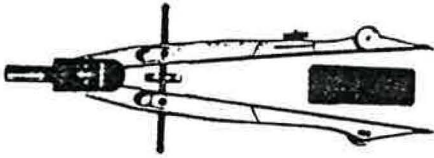
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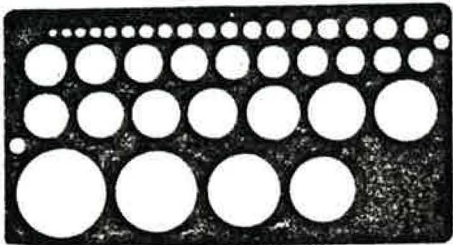
A. _____



C. _____



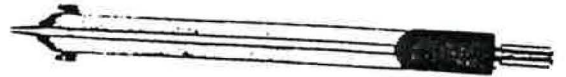
E. _____



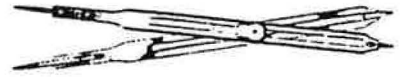
G. _____



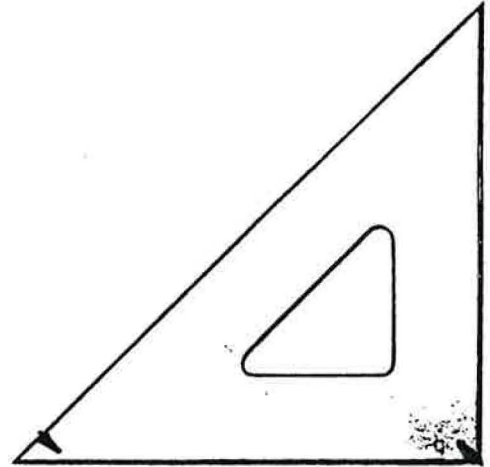
I. _____



B. _____



D. _____



F. _____



H. _____



J. _____

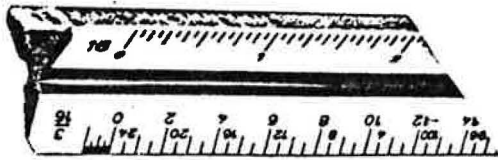
1. In almost every kind of work graphic representation is used.
2. Give 2 examples of other occupations and how they use this form of representation.
 - A. coaches - giving alternate plays
 - B. doctors - diagrams of the human body

(answers may vary)
3. In drafting symbols and lines are used to convey precise information of industry.
4. Match the following:

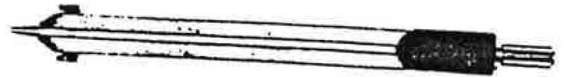
<u>D</u> Drafting board or table	A. Used to remove erasing filings.
<u>A</u> Drafting brush	B. Is the ultimate in manually operated drafting equipment.
<u>C</u> Protractor	C. Used to determine a given angle.
<u>B</u> Drafting console	D. A non-glare surface that holds the drafting paper.
<u>E</u> Erasing shield	E. Used over the line that needs to be erased and for tight areas if removal is necessary.
5. Describe how to sharpen the lead in a 6" bow compass.
Using a small portion of fine grit sandpaper, rub the compass back and forth until the lead is sharpened to the desired point.
6. Describe what dividers are used for.
To transfer a dimension from the scale to the drawing or from the drawing to the scale to check for correct size.
7. Explain how to fasten a piece of paper to the drawing surface using a T-square.
 1. Align the T square with the edge of the board.
 2. Align the paper (top or bottom) with the top edge of the T square.
8. Drafting pencils come in several grades, but the most common ones used by industry range from B to 4H.

(continued...)

Identify each of the following:



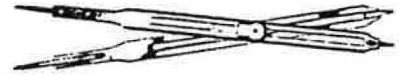
A. scale



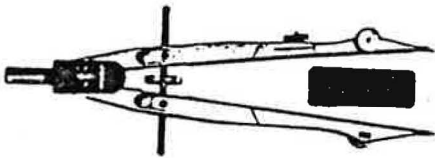
B. friction divider



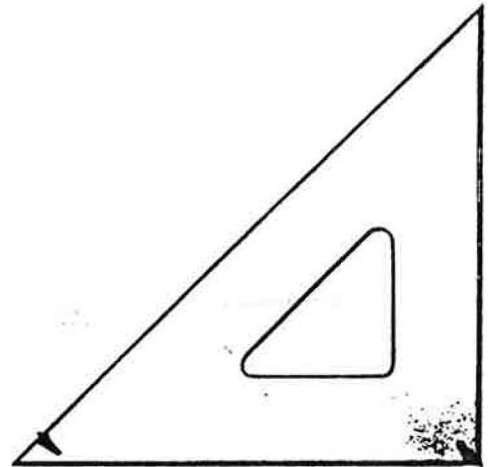
C. _____



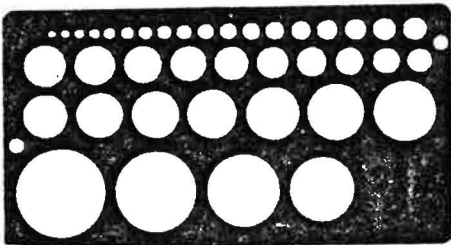
D. _____



E. bow compass



F. 45/90 triangle



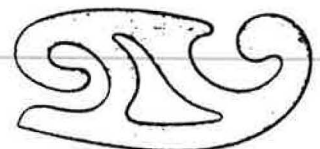
G. circle template



H. _____



I. dusting brush



J. French curve

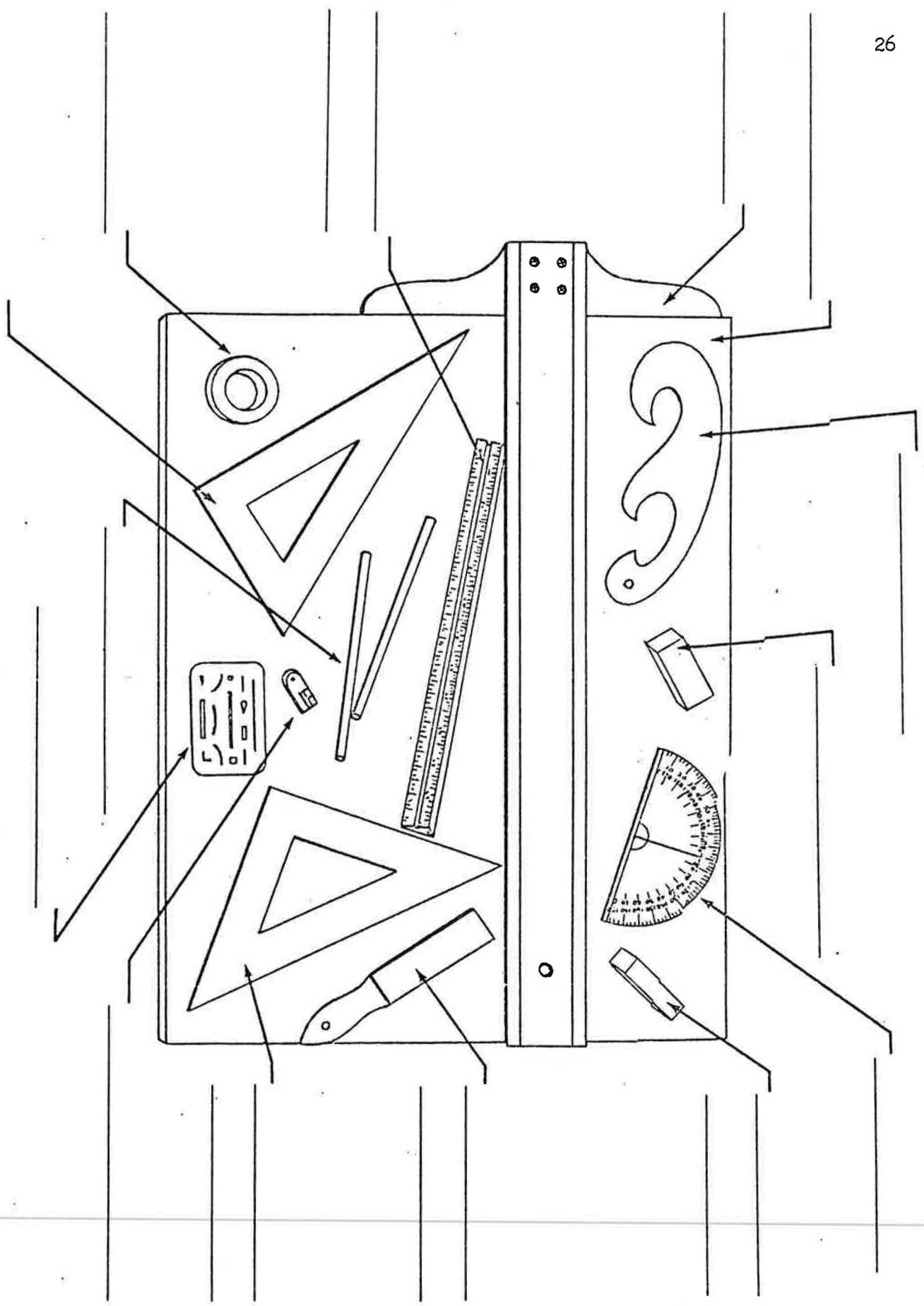
EQUIPMENT USAGE

POST TEST

1. Explain how to fasten a piece of paper to the drawing surface using a T-square.
2. Drafting pencils come in several grades, but the most common ones used by industry range from _____ to _____.
3. In drafting, _____ and _____ are used to convey precise information of industry.
4. Match the following:

_____ Drafting board or table	A. Used to remove erasing filings.
_____ Drafting brush	B. Is the ultimate in manually operated drafting equipment.
_____ Protractor	C. Used to determine a given angle.
_____ Drafting console	D. A non-glare surface that holds the drafting paper.
_____ Erasing shield	E. Used over the line that needs to be erased and for tight areas where removal is necessary.
5. In almost every kind of work _____ is used.
6. Give 2 examples of other occupations and how they use this form of representation.
 - A.
 - B.
7. Describe how to sharpen the lead in a 6" bow compass.
8. Describe what dividers are used for.
9. Identify the drafting equipment shown on the following page.

DRAFTING EQUIPMENT



1. Explain how to fasten a piece of paper to the drawing surface using a T-square.
Place the T-square firmly against the board's edge and hold in place. Align paper's edge with T-square blade and hold in place. Apply tape to top edges.
2. Drafting pencils come in several grades, but the most common ones used by industry range from B to 4H.
3. In drafting, symbols and lines are used to convey precise information of industry.
4. Match the following:

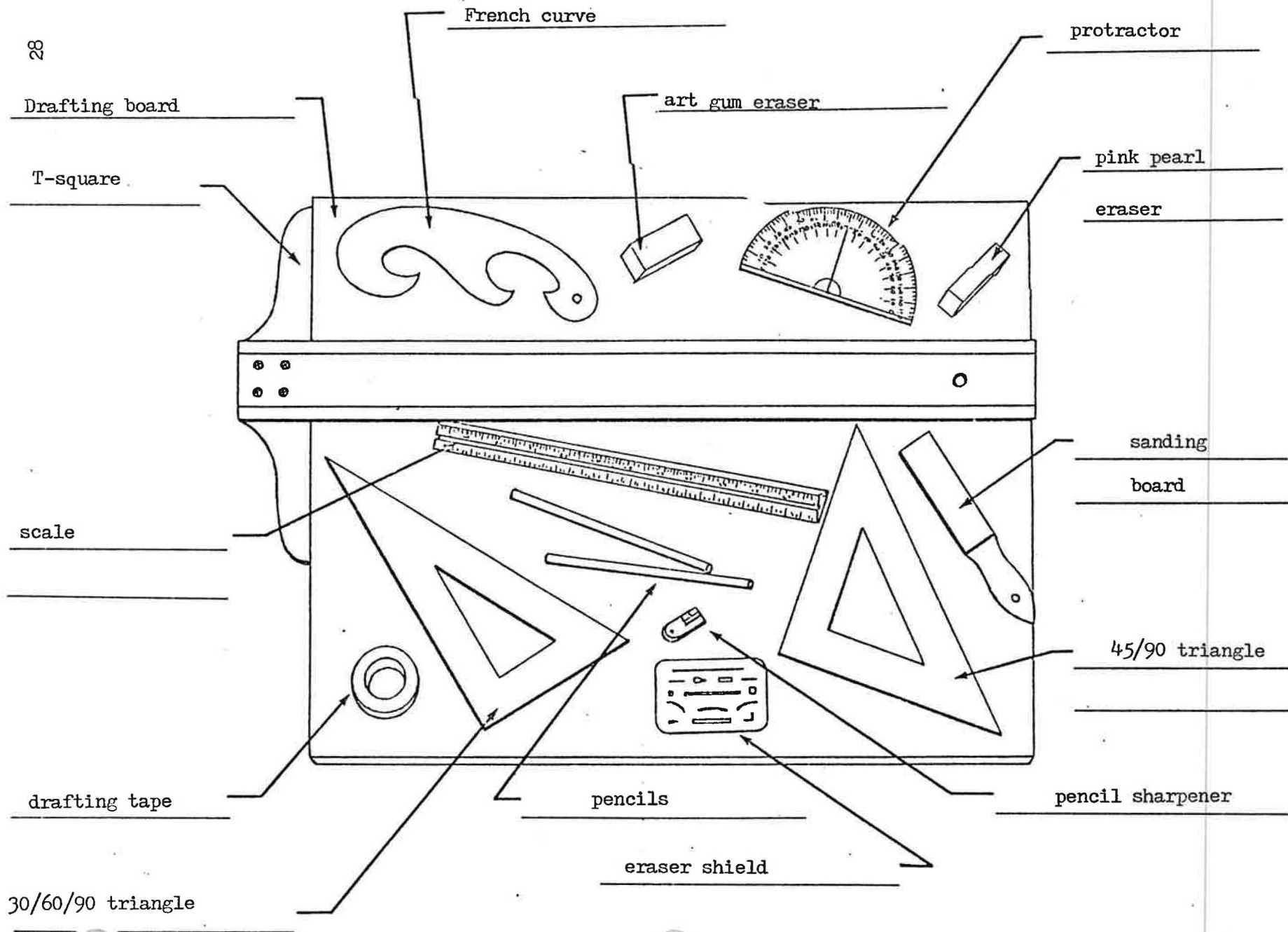
<p><u>D</u> Drafting board or table</p> <p><u>A</u> Drafting brush</p> <p><u>C</u> Protractor</p> <p><u>B</u> Drafting console</p> <p><u>E</u> Erasing shield</p>	<p>A. Used to remove erasing filings.</p> <p>B. Is the ultimate in manually operated drafting equipment.</p> <p>C. Used to determine a given angle.</p> <p>D. A non-glare surface that holds the drafting paper.</p> <p>E. Used over the line that needs to be erased and for tight areas where removal is necessary.</p>
---	---
5. In almost every kind of work GRAPHIC REPRESENTATION is used.
6. Give 2 examples of other occupations and how they use this form of representation.

A. Coaches

(Answers may vary)

B. Doctors
7. Describe how to sharpen the lead in a 6" bow compass.
Using a small portion of fine grit sandpaper, rub the compass back and forth until the lead is sharpened to the desired point.
8. Describe what dividers are used for.
To transfer a dimension from the scale to the drawing or from the drawing to the scale to check for accuracy.
9. Identify the drafting equipment shown on the following page.

DRAFTING EQUIPMENT



LETTERING UNIT

PRETESTS

1. The type of lettering done in drafting is called _____
_____.
2. There are 2 ways these letters can be shaped. Name them.
 - A. _____
 - B. _____
3. When forming letters, most strokes of the pencil are made _____
to _____ for all horizontal strokes, and _____
to _____ for all verticals.
4. The height of all lettering is done at _____" high.
5. List three methods available for laying out guidelines on your paper.
 - A. _____
 - B. _____
 - C. _____
6. Fractions should be made _____" high.
7. On the guidelines given below, vertically print, to the best of your ability, the alphabet.

8. On the given guidelines, vertically print the following, "Kennewick drafting is a 5 segment course."

1. The type of lettering done in drafting is called single
stroke gothic.
2. There are 2 ways these letters can be shaped. Name them.
 - A. vertical
 - B. slanted
3. When forming letters, most strokes of the pencil are made left
to right for all horizontal strokes, and top
to bottom for all verticals.
4. The height of all lettering is done at 5/32 " high.
5. List three methods available for laying out guidelines on your paper.
 - A. Ames lettering guide
 - B. Dividers
 - C. Scale
6. Fractions should be made 5/16 " high.
7. On the guidelines given below, vertically print, to the best of your ability, the alphabet.

8. On the given guidelines, vertically print the following, "Kennewick drafting is a 5 segment course."

LETTERING UNIT

WORKSHEET

1. Lettering must be clearly _____ and _____.
2. The type of lettering done in drafting is called _____. It is easy to _____ and easy to _____.
3. These forms of letters can be formed in two ways.
 - A. _____
 - B. _____
4. Our alphabet is broken down into two basic groups.
 - A. _____ letters
 - B. _____ letters
5. When forming these letters, each one is made to a certain proportion. Tell the correct proportion of the given letters.

M _____ Wide x _____ High	L _____ Wide x _____ High
E _____ Wide x _____ High	H _____ Wide x _____ High
T _____ Wide x _____ High	N _____ Wide x _____ High
B _____ Wide x _____ High	D _____ Wide x _____ High
6. When forming letters, most strokes of the pencil are made _____ to _____ for all horizontal strokes and _____ to _____ for verticals.
7. The height of all letters and numerals when placing guidelines on your paper should be _____" high.
8. Fractions should be made _____" high and none of the numerals should touch the horizontal line that separates the two numerals.
9. Describe the three methods available for laying out guidelines for all lettering.
10. Name the two problems most beginning students have in forming letters/words.
11. Describe the general rule of thumb to follow for spacing of words.
12. All numerals are made to the proportion of _____ Wide x _____ High except for the number 1.

1. Lettering must be clearly legible and easy to reproduce.
2. The type of lettering done in drafting is called single stroke gothic. It is easy to read and easy to reproduce.
3. These forms of letters can be formed in two ways.
 - A. vertically
 - B. slanted
4. Our alphabet is broken down into two basic groups.
 - A. straight line letters
 - B. curved line letters
5. When forming these letters, each one is made to a certain proportion. Tell the correct proportion of the given letters.

M	<u>6</u>	Wide x	<u>6</u>	High	L	<u>5</u>	Wide x	<u>6</u>	High
E	<u>5</u>	Wide x	<u>6</u>	High	H	<u>5</u>	Wide x	<u>6</u>	High
T	<u>5</u>	Wide x	<u>6</u>	High	N	<u>5</u>	Wide x	<u>6</u>	High
B	<u>5</u>	Wide x	<u>6</u>	High	D	<u>5</u>	Wide x	<u>6</u>	High
6. When forming letters, most strokes of the pencil are made left to right for all horizontal strokes and top to bottom for verticals.
7. The height of all letters and numerals when placing guidelines on your paper should be 5/32 " high.
8. Fractions should be made 5/16 " high and none of the numerals should touch the horizontal line that separates the two numerals.
9. Describe the three methods available for laying out guidelines for all lettering.

Ames lettering guide
Dividers
Scale

10. Name the two problems most beginning students have in forming letters/words.
 1. Spacing letters too close to each other
 2. Spacing words too close to each other
11. Describe the general rule of thumb to follow for spacing of words.

Allow the letter "o" in between each word

12. All numerals are made to the proportion of 5 Wide x 6 High except for the number 1.

LETTERING UNIT

LETTERING ASSIGNMENT

LETTERING UNIT

Lettering is a critical element in drafting. Industry requires both speed and accurate form from the drafter. But also equally important is the ability of the drafter to be knowledgeable of certain drafting related terms, their proper abbreviation, and their definition.

<u>GRADING</u>	A	7 words per week for a determined length of time.
	B	6 "
	C	5 "
	D	4 "

Each week you can start a new set of words, provided you have passed the previous weeks word exam with 100% accuracy, and NOT UNTIL.

Each set of work is due on Friday at the end of the period and will not be accepted otherwise, unless you have an excused absense.

	<u>WORD</u>	<u>ABBREVIATION</u>	<u>DEFINITION</u>
1.	<u>BRASS</u>	BRS	AN ALLOY OF COPPER AND ZINC
2.	<u>BRINELL</u>	NONE	A METHOD OF TESTING HARDNESS OF METAL
3.	<u>BROACH</u>	BRO	A LONG CUTTING TOOL WITH A SERIES OF TEETH THAT GRADUALLY INCREASE IN SIZE WHICH IS FORCED THROUGH A HOLE OR OVER A SURFACE TO PRODUCE A DESIRED SHAPE.
4.	<u>BRONZE</u>	BRZ	AN ALLOY OF EIGHT OR NINE PARTS OF COPPER AND ONE PART TIN.
5.	<u>BURR</u>	NONE	A JAGGED EDGE ON METAL RESULTING FROM PUNCHING OR CUTTING.
6.	<u>CALIPERS</u>	NONE	INSTRUMENT FOR MEASURING DIAMETERS.
7.	<u>CAM</u>	NONE	A ROTATING MEMBER FOR CHANGING CIRCULAR MOTION TO RECIPROCATING MOTION.
8.	<u>CARBURIZE</u>	CARB	TO HEAT A LOW CARBON STEEL TO APPROXIMATELY 2000° F in CONTACT WITH MATERIAL WHICH ADDS CARBON TO THE SURFACE OF THE STEEL, AND TO COOL SLOWLY IN PREPARATION FOR HEAT TREATMENT.
9.	<u>CAST IRON</u>	CI	IRON MELTED AND POURED INTO MOLDS
10.	<u>CHAMFER</u>	CHAM	A NARROW INCLINED SURFACE ALONG THE INTERSECTION OF TWO SURFACES.
11.	<u>CHILL</u>	NONE	TO HARDEN THE OUTER SURFACE OF CAST IRON BY QUICKLY COOLING, AS IN A METAL MOLD
12.	<u>COLD ROLLED STEEL</u>	CRS	OPEN HEARTH OR BESSEMER STEEL CONTAINING .12% to .20%

<u>WORD</u>	<u>ABBREVIATION</u>	<u>DEFINITION</u>
13. <u>COLLAR</u>	NONE	A ROUND FLANGE OR RING FITTED ON A SHAFT TO PREVENT SLIDING.
14. <u>COTTER PIN</u>	NONE	A SPLIT PIN USED AS A FASTENER, USUALLY TO PREVENT A NUT FROM UNSCREWING.
15. <u>COUNTERBORE</u>	CBORE	TO ENLARGE AN END OF A HOLE CYLINDRICALLY WITH WITH A COUNTERBORE.
16. <u>COUNTERSINK</u>	CSK	TO ENLARGE AN END OF A HOLE CONICALLY, USUALLY WITH A COUNTERSINK.
17. <u>CROWN</u>	NONE	A RAISED CONTOUR, AS ON THE SURFACE OF A PULLEY.
18. <u>DEDENDUM</u>	DED	DISTANCE FROM PITCH CIRCLE TO BOTTOM OF TOOTH SPACE.
19. <u>DEVELOPMENT</u>	NONE	DRAWING OF THE SURFACE OF AN OBJECT UNFOLDED OR ROLLED OUT ON A PLANE.
20. <u>DIAMETRAL PITCH</u>	DP	NUMBER OF GEAR TEETH PER INCH OF PITCH DIAMETER.
21. <u>DIE CASTING</u>	NONE	PROCESS OF FORCING MOLTEN METAL UNDER PRESSURE INTO METAL DIES OR MOLDS, PRODUCING A VERY ACCURATE AND SMOOTH CASTING.
22. <u>DOWEL</u>	DWL	A CYLINDRICAL PIN, COMMONLY USED TO PREVENT SLIDING BETWEEN TWO CONTACTING FLAT SURFACES.
23. <u>DRILL</u>	DR	TO CUT A CYLINDRICAL HOLE WITH A DRILL. A BLIND HOLE DOES NOT GO THROUGH THE PIECE.
24. <u>FINISH ALL OVER</u>	FAO	
25. <u>FEATHER KEY</u>	NONE	A FLAT KEY, WHICH IS PARTLY SUNK IN A SHAFT AND PARTLY IN A HUB TO SLIDE LENGTHWISE OF THE SHAFT.
26. <u>FILLET</u>	FIL	AN INTERIOR ROUNDED INTERSECTION BETWEEN TWO SURFACES.
27. <u>FIT</u>	NONE	DEGREE OF TIGHTNESS OR LOOSENESS BETWEEN TWO MATING PARTS, AS A LOOSE FIT, A SNUG FIT, AND A TIGHT FIT.
28. <u>FLUTE</u>	NONE	GROOVE, AS ON TWIST DRILLS, REAMERS, AND TAPS.
29. <u>GALVANIZE</u>	GALV	TO COVER A SURFACE WITH A THIN LAYER OF MOLTEN ALLOY COMPOSED MAINLY OF ZINC, TO PREVENT RUSTING
30. <u>HARDEN</u>	HDN	TO HEAT STEEL ABOVE A CRITICAL TEMPERATURE AND THEN QUENCH IN WATER OR OIL.
31. <u>HEAT-TREAT</u>	HT TR	TO CHANGE THE PROPERTIES OF METALS BY HEATING AND THEN COOLING.

<u>WORD</u>	<u>ABBREVIATION</u>	<u>DEFINITION</u>
32. <u>HEXAGONAL</u>	HEX	A SIX SIDED FIGURE.
33. <u>HEXAGONAL HEAD</u>	HEX HD	A COMMON SHOP EXPRESSION REFERRING TO SCREWS AND BOLTS WITH HEXAGONAL HEADS.
34. <u>HEXAGONAL SOCKET</u>	HEX SOC	CAP SCREWS AND SETSCREWS HAVING HEXAGONAL SOCKET IN THE HEAD. SUCH SCREWS ARE ADJUSTED BY MEANS OF A HEXAGONAL KEY.
35. <u>INSIDE DIAMETER</u>	ID	WITHIN THE SPACE OF.
36. <u>INTERCHANGEABLE</u>	NONE	REFERS TO A PART MADE TO LIMIT DIMENSIONS SO THAT IT WILL FIT ANY MATING PART SIMILARLY MANUFACTURED.
37. <u>JOURNAL</u>	JNL	PORTION OF A ROTATING SHAFT SUPPORTED BY A BEARING.
38. <u>KNURL</u>	KNRL	TO IMPRESS A PATTERN OF DENTS IN A TURNED SURFACE WITH A KNURLING TOOL TO PRODUCE A BETTER HAND GRIP.
39. <u>KEY</u>	K	A SMALL PIECE OF METAL SUNK PARTLY INTO BOTH SHAFT SHAFT AND HUB TO PREVENT ROTATION.
40. <u>KEYSEAT</u>	KST	A SLOT OR RECESS IN A SHAFT TO HOLD A KEY.
41. <u>KEYWAY</u>	KWY	A SLOT IN A HUB OR PORTION SURROUNDING A SHAFT TO RECEIVE A KEY.
42. <u>LEFT HAND</u>	LH	A SCREW THREAD SO CUT THAT THE BOLT, SCREW, OR NUT HAS TO BE TURNED IN A COUNTERCLOCKWISE MOTION TO ENGAGE OR TIGHTEN IT.
43. <u>LUG</u>	NONE	AN IRREGULAR PROJECTION OF METAL, BUT NOT ROUND AS IN THE CASE OF A BOSS, USUALLY WITH A HOLE IN IT FOR A BOLT OR SCREW.
44. <u>MALLEABLE CASTING</u>	NONE	A CASTING THAT HAS BEEN MADE LESS BRITTLE AND TOUGHER BY THE PROCESS OF ANNEALING.
45. <u>MAXIMUM</u>	MAX.	THE GREATEST QUANTITY DEGREE, OR AMOUNT.
46. <u>MILL</u>	NONE	TO REMOVE MATERIAL BY MEANS OF A ROTATING CUTTER .
47. <u>MINIMUM</u>	MIN	THE LEAST QUANTITY, DEGREE, OR AMOUNT.
48. <u>MACHINERY STEEL</u>	MS	SOMETIMES CALLED MILD STEEL WITH A SMALL PERCENT OF CARBON CONTENT.
49. <u>NOT TO SCALE</u>	NTS	USED WHEN A SPECIFIED PART IS NOT DRAWN TO THE INDICATED SCALE.
50. <u>PAD</u>	NONE	A SLIGHT PROJECTION, USUALLY TO PROVIDE A BEARING SURFACE AROUND ONE OR MORE HOLES.
51. <u>PINION</u>	NONE	THE SMALLER OF TWO MATING GEARS.

<u>WC</u>	<u>ABBREVIATION</u>	<u>DEFINITION</u>
52. <u>PITCH CIRCLE</u>	PC	AN IMAGINARY CIRCLE CORRESPONDING TO THE CIRCUMFERENCE OF THE FRICTION GEAR FROM WHICH THE SPUR GEAR WAS DERIVED.
53. <u>RACK</u>	NONE	A FLAT BAR WITH GEAR TEETH IN A STRAIGHT LINE TO ENGAGE WITH TEETH IN A GEAR.
54. <u>REAM</u>	RM	TO ENLARGE A FINISHED HOLE SLIGHTLY TO GIVE IT GREATER ACCURACY WITH A REAMER.
55. <u>RIB</u>	NONE	A RELATIVELY THIN FLAT MEMBER ACTING AS A BRACE.
56. <u>RIVIT</u>	RIV	TO CONNECT WITH RIVETS OR TO CLENCH OVER THE END OF A PIN BY HAMMERING.
57. <u>SOCIETY OF AUTOMOTIVE ENGINEERS</u>	SAE	THESE INITIALS, PREFIXED TO THE NAME OF ANY MECHANICAL PART, INDICATE THAT THE ARTICLE IS BUILT IN ACCORDANCE WITH THE STANDARDS LAID DOWN BY THEM.
58. <u>SCLEROSCOPE</u>	NONE	AN INSTRUMENT FOR MEASURING HARDNESS OF METALS.
59. <u>SHIM</u>	NONE	THIN PIECES OF METAL OR OTHER MATERIAL USED TO ADJUST TO PARTS.
60. <u>SOLDER</u>	NONE	TO JOIN WITH SOLDER, USUALLY COMPOSED OF LEAD AND TIN.
61. <u>SPLINE</u>	NONE	A KEYWAY, USUALLY ONE OF A SERIES CUT AROUND A SHAFT OR HALE.
62. <u>SPOTFACE</u>	SF	TO PRODUCE A ROUND SPOT OR BEARING SURFACE AROUND A HOLE, USUALLY WITH A SPOTFACEER.
63. <u>TAP</u>	NONE	TO CUT RELATIVELY SMALL INTERNAL THREADS WITH A TAP.
64. <u>TEMPLATE</u>	NONE	A GUIDE OR PATTERN USED TO MARK OUT THE WORK, GUIDE THE CUTTER, OR TO CHECK THE FINISHED PRODUCT.
65. <u>TOLERANCE</u>	TOL	TOTAL AMOUNT OF VARIATION PERMITTED IN LIMIT DIMENSION OF A PART.
66. <u>TYPICAL</u>	TYP	BELONGING TO A TYPE OR REPRESENTATIVE EXAMPLE
67. <u>UNIFIED NATIONAL COURSE</u>	UNC	COURSE THREAD FORMATION
68. <u>UNIFIED NATIONAL FINE</u>	UNF	FINE THREAD FORMATION
69. <u>UNIFIED NATIONAL EXTRA FINE</u>	UNEF	EXTRA FINE THREAD FORMATION
70. <u>WOODRUFF KEY</u>	NONE	A SEMICIRCULAR FLAT KEY.

LETTERING UNIT

POST TEST

1. Lettering must be clearly _____ and _____.
2. The type of lettering done in drafting is called _____. It is easy to _____ and easy to _____.
3. These forms of letters can be formed in two ways. They are
 - A. _____
 - B. _____
4. Our alphabet is broken down into two basic groups. Name them.
 - A. _____ letters
 - B. _____ letters
5. When forming letters, most strokes of the pencil are made _____ to _____ for all horizontal strokes. Verticals are made _____ to _____.
6. The height of all letters and numerals when placing guidelines on your paper should be _____" high.
7. Fractions should be made _____" high and none of the numerals should touch the horizontal line that separates the two numerals.
8. All numerals are made to the proportion of _____ Wide by _____ High, except for the number 1.
9. Describe the three methods available for laying out guidelines for all lettering.
10. Describe the general rule of thumb to follow for spacing of words.
11. Name the two problems most beginning students have in forming letters and words.

1. Lettering must be clearly legible and easy to reproduce.
2. The type of lettering done in drafting is called single stroke gothic. It is easy to read and easy to reproduce.
3. These forms of letters can be formed in two ways. They are
 - A. vertical
 - B. slanted
4. Our alphabet is broken down into two basic groups. Name them.
 - A. straight line letters
 - B. curved line letters
5. When forming letters, most strokes of the pencil are made left to right for all horizontal strokes. Verticals are made top to bottom.
6. The height of all letters and numerals when placing guidelines on your paper should be 5/32 " high.
7. Fractions should be made 5/16 " high and none of the numerals should touch the horizontal line that separates the two numerals.
8. All numerals are made to the proportion of 5 Wide by 6 High, except for the number 1.
9. Describe the three methods available for laying out guidelines for all lettering.

Dividers
Ames lettering guide
Scale
10. Describe the general rule of thumb to follow for spacing of words.

Allow an "o" between all words
11. Name the two problems most beginning students have in forming letters and words.

Not allowing enough space between letters
Not allowing enough space between words

SHAPE DESCRIPTION

PRETESTS

1. Sketch three views of the given isometric sketch. (Remember to pick your front view with care.)

2. How many views are required to build a spherical object? _____
3. Explain why. _____
4. How many views are required to draw in order to build a gasket of any given thickness? _____
5. Explain why. _____

6. T F Using only the number of views necessary to fully describe the part is all that is required to draw.
7. T F The best recognizable profile view of the object in its natural position is called the right end view.
8. List the six views found in almost every object.
 - A. _____
 - B. _____
 - C. _____
 - D. _____
 - E. _____
 - F. _____

1. Sketch three views of the given isometric sketch. (Remember to pick your front view with care.)

2. How many views are required to build a spherical object? 1 view
3. Explain why. Every side looks the same, all that is required is diameter
4. How many views are required to draw in order to build a gasket of any given thickness? 1 view
5. Explain why. The thickness can be called out in a note. The dimensions required for production are given in one view
6. T F Using only the number of views necessary to fully describe the part is all that is required to draw.
7. T F The best recognizable profile view of the object in its natural position is called the right end view.
8. List the six views found in almost every object.
 - A. top
 - B. front
 - C. right end
 - D. left end
 - E. bottom
 - F. back

1. List the 6 views found in almost every object.

A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

2. Of these six views, only 3 are usually required. List the three.

A. _____

B. _____

C. _____

3. Describe an object which could be built using a 1 - view drawing.

4. Describe an object which could be built using a 2 - view drawing.

5. The front view shows 2 dimensions. List them.

A. _____

B. _____

6. The top view shows 2 dimensions. List them.

A. _____

B. _____

7. The right end view shows 2 dimensions. List them.

A. _____

B. _____

8. The top view and the right view share dimensions. Describe which ones are shared.

1. List the 6 views found in almost every object.
 - A. top
 - B. front
 - C. right end
 - D. left end
 - E. bottom
 - F. back
2. Of these six views, only 3 are usually required. List the three.
 - A. top
 - B. front
 - C. right end
3. Describe an object which could be built using a 1 - view drawing.
gasket, sphere
4. Describe an object which could be built using a 2 - view drawing.
(answers may vary)
5. The front view shows 2 dimensions. List them.
 - A. width
 - B. height
6. The top view shows 2 dimensions. List them.
 - A. width
 - B. thickness
7. The right end view shows 2 dimensions. List them.
 - A. height
 - B. thickness
8. The top view and the right view share dimensions. Describe which ones are shared.
Thickness

1. Most objects have 6 sides, but normally only three are required to draw in order to build the object. What are the three views?
 - A. _____
 - B. _____
 - C. _____

2. Sketch a 2 - view drawing that would contain enough information for me to be able to build it.

3. Sketch a 1 - view drawing that would contain enough information for me to be able to build it.

4. _____ are shown as solid heavy lines.

5. _____ are shown as a series of medium short dashes.

6. When drawing a 3 - view drawing, each of the three views share common dimensions with each other. List the views and the dimensions that are shared.

7. T F Using only the number of views necessary to fully describe the part is all that is required to draw.

8. T F The best recognizable profile view of the object in its natural position is called the front view.

1. Most objects have 6 sides, but normally only three are required to draw in order to build the object. What are the three views?

A. top

B. front

C. right end

2. Sketch a 2 - view drawing that would contain enough information for me to be able to build it.

(answers will vary)

3. Sketch a 1 - view drawing that would contain enough information for me to be able to build it.

Must be either a gasket or a sphere

4. Object lines are shown as solid heavy lines.

5. Hidden lines are shown as a series of medium short dashes.

6. When drawing a 3 - view drawing, each of the three views share common dimensions with each other. List the views and the dimensions that are shared.

Top - shares width with front and thickness with right end

Front - shares width with top and height with right end

Right end - shares thickness with top and height with front

7. F Using only the number of views necessary to fully describe the part is all that is required to draw.

8. F The best recognizable profile view of the object in its natural position is called the front view.

SHAPE DESCRIPTION

WORKSHEET

1. Orthographic projection is a way of showing the _____ of any object.
2. Most objects that we draw have 6 sides. List them.
 - A. _____
 - B. _____
 - C. _____
 - D. _____
 - E. _____
 - F. _____
3. We seldom use all 6 of these views because of repeated views and dimensions, so we use three of the most common. List the three.
 - A. _____
 - B. _____
 - C. _____
4. Give an example (in writing) of a 1 - view drawing.
5. Give an example of a 2 - view drawing, either in writing, or a sketch.
6. T F Using only the number of views necessary to fully describe the part is all that is required to draw.
7. T F The best recognizable profile view of the object in its natural position is called the front view.
8. The front view shows 2 dimensions. List them.
 - A. _____
 - B. _____
9. The top view shows 2 dimensions. List them.
 - A. _____
 - B. _____
10. The right end view shows 2 dimensions. List them.
 - A. _____
 - B. _____

(continued)

11. Explain the shared dimensions of both the top/front views and the right end/top views.

12. _____ are shown as solid heavy lines.

13. _____ are shown as a series of medium weight short dashes about _____" long.

14. There are several ways to describe an object. List the three variables.
 - A. _____
 - B. _____
 - C. _____

15. We need a mechanical working drawing called an _____ to show _____ of a part.

16. In selecting the front view, be careful to select the view that shows the _____ and have it in its natural position.

1. Orthographic projection is a way of showing the true shape of any object.
2. Most objects that we draw have 6 sides. List them.
 - A. top
 - B. front
 - C. right end
 - D. left end
 - E. bottom
 - F. back
3. We seldom use all 6 of these views because of repeated views and dimensions, so we use three of the most common. List the three.
 - A. top
 - B. front
 - C. right end
4. Give an example (in writing) of a 1 - view drawing.
sphere or gasket
5. Give an example of a 2 - view drawing, either in writing, or a sketch.
(answers will vary)
6. F Using only the number of views necessary to fully describe the part is all that is required to draw.
7. F The best recognizable profile view of the object in its natural position is called the front view.
8. The front view shows 2 dimensions. List them.
 - A. width
 - B. height
9. The top view shows 2 dimensions. List them.
 - A. width
 - B. thickness
10. The right end view shows 2 dimensions. List them.
 - A. height
 - B. thickness

(continued)

11. Explain the shared dimensions of both the top/front views and the right end/top views.

top/front - width

right end/top - thickness

12. Object lines are shown as solid heavy lines.
13. Hidden lines are shown as a series of medium weight short dashes about 1/8 " long.
14. There are several ways to describe an object. List the three variables.
- A. Pictorial drawings
- B. words
- C. photos
15. We need a mechanical working drawing called an orthographic projection to show true shape of a part.
16. In selecting the front view, be careful to select the view that shows the front view and have it in its natural position.

SHAPE DESCRIPTION

TEXTBOOK ASSIGNMENTS

Students will "contract" for a grade prior to beginning the unit on shape description. There will be a total of twenty-five assignments, with a possible score of twelve points per assignment. The total number of points the student earns will be compared to the total number of points required for each grade, as follows.

(Total of 25 assignments)	300 points	A+
	275	A
	250	A-
	225	B+
	200	B
	175	B-
	150	C+
	125	C
	100	C-
	75	D+
	50	D
	25	D-

Every student will be allowed to redo any or all of the assignments in order to achieve his or her goal. A minimum of twelve assignments will be required of all students.

The following list contains the twenty-five assignments for the unit on shape description. The assignments were taken from the text, Basic Technical Drawing. (see below*)

Chapter 6

On graph paper, sketch the top, front, rear, and side views of each of the following...

- Figure 6-26 Sketch any 5 out of the 12 given
- Figure 6-27 Sketch any 5 out of the 20 given
- Figure 6-28 Sketch any 5 out of the 15 given
- Figure 6-29 Sketch any 7 out of the 15 given

Chapter 7 (p. 103)

- Draw Figure 7-32
- Figure 7-35
- Figure 7-48

* J.T. Dygdon, H.C. Spencer, Basic Technical Drawing (New York: Macmillan, 1974)

SHAPE DESCRIPTION

POST TESTS

TRUE FALSE

1. T F The front view has the best recognizable profile view of the object the object is in its natural resting position.
2. T F The number of views that are necessary to draw is determined by the minimum amount necessary to build it.
3. T F The top view shows 2 dimensions, the length and the width.

4. Describe the shared dimensions of the top and front views.

5. Describe the shared dimensions of the right and top views.

6. List the six sides that are found in almost all objects.

A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

7. Of the above six, only 3 are usually drawn, which 3 are they?

A. _____

B. _____

C. _____

8. Sketch an example of a 2 view drawing.

9. Sketch an example of a 1 view drawing.

TRUE FALSE

1. T F The front view has the best recognizable profile view of the object the object is in its natural resting position.
2. T F The number of views that are necessary to draw is determined by the minimum amount necessary to build it.
3. T F The top view shows 2 dimensions, the length and the width.

4. Describe the shared dimensions of the top and front views.

width

5. Describe the shared dimensions of the right and top views.

thickness

6. List the six sides that are found in almost all objects.

- A. top
- B. front
- C. right end
- D. left end
- E. bottom
- F. back

7. Of the above six, only 3 are usually drawn, which 3 are they?

- A. top
- B. front
- C. right end

8. Sketch an example of a 2 view drawing.

(answers will vary)

9. Sketch an example of a 1 view drawing.

gasket or a sphere

1. Orthographic projection is a way of showing _____ of any object.
2. We need a mechanical working drawing called an _____ to show _____ of a part.
3. In selecting the front view, be careful to select the view that shows the _____ and have it in its natural position.
4. _____ are shown as solid heavy lines.
5. _____ are shown as a series of medium weight short dashes about _____" high.
6. There are several ways to describe an object. List the three variables.
7. The front view shows 2 dimensions. List them.
8. The top view shows 2 dimensions. List them.
9. The right end view shows 2 dimensions. List them.
10. Explain the shared dimensions of both the top/front views and the right end/top views.
11. Most objects that we draw have six sides. List them.
12. We seldom use all six of these views because of repeated views and dimensions. We use the three most common. List them.
13. T F Using only the number of views necessary to fully describe the part is all that is required to draw.
14. T F The best recognizable profile view of the object in its natural position is called the front view.

1. Orthographic projection is a way of showing true shape of any object.
2. We need a mechanical working drawing called an orthographic projection to show true shape of a part.
3. In selecting the front view, be careful to select the view that shows the front view and have it in its natural position.
4. Object lines are shown as solid heavy lines.
5. Hidden lines are shown as a series of medium weight short dashes about 1/8" high.
6. There are several ways to describe an object. List the three variables.
Pictorial drawings
words
photos
7. The front view shows 2 dimensions. List them.
width
height
8. The top view shows 2 dimensions. List them.
width
thickness
9. The right end view shows 2 dimensions. List them.
height
thickness
10. Explain the shared dimensions of both the top/front views and the right end/top views.
top/front - width right end/top - thickness
11. Most objects that we draw have six sides. List them.
top left end
front back
right end bottom
12. We seldom use all six of these views because of repeated views and dimensions. We use the three most common. List them.
right end
front
top
13. (T) F Using only the number of views necessary to fully describe the part is all that is required to draw.
14. (T) F The best recognizable profile view of the object in its natural position is called the front view.

SIZE DESCRIPTION

PRETESTS

TRUE-FALSE

1. T F Arrowheads are drawn at 1/8" long x 1/16" wide.
2. T F Locate the shortest dimension closest to the object.
3. T F The first dimension line is located 1/2" from the object and all that follow are placed 3/8" from each other.
4. T F It is standard drafting procedure to dimension to hidden lines.

MATCHING

- | | |
|-----------------------|---|
| 5. ___ Center line | A. Shows the distance from one point to another. |
| 6. ___ Dimension line | B. Calls attention to a particular detail. |
| 7. ___ Extension line | C. Locates the centers of curcular parts by locating the line by using a series of long and short dashes. |
| 8. ___ Leader line | D. Projects a line of the object outside the view. |
| | E. None of the above. |

SKETCH THE FOLLOWING LINES

9. Center line
 10. Dimension line
 11. Extension line
 12. Leader line with arrowhead
 13. Arrowhead at proper proportion on a given line.
-





TRUE-FALSE

1. (T) F Arrowheads are drawn at 1/8" long x 1/16" wide.
2. (T) F Locate the shortest dimension closest to the object.
3. (T) F The first dimension line is located 1/2" from the object and all that follow are placed 3/8" from each other.
4. T (F) It is standard drafting procedure to dimension to hidden lines.

MATCHING

- | | |
|----------------------------|---|
| 5. <u>C</u> Center line | A. Shows the distance from one point to another. |
| 6. <u>A</u> Dimension line | B. Calls attention to a particular detail. |
| 7. <u>D</u> Extension line | C. Locates the centers of curcular parts by locating the line by using a series of long and short dashes. |
| 8. <u>B</u> Leader line | D. Projects a line of the object outside the view. |
| | E. None of the above. |

SKETCH THE FOLLOWING LINES

9. Center line 
10. Dimension line 
11. Extension line 
12. Leader line with arrowhead 
13. Arrowhead at proper proportion on a given line.



MATCHING

- | | |
|------------------------|--|
| 1. Center line ____ | A. Calls attention to a particular detail. |
| 2. Dimension line ____ | B. Locates the centers of curcular parts. |
| 3. Extension line ____ | C. A series of short dashes made 1/8" long with 1/16" distance between each. |
| 4. Leader line ____ | D. None of these |
| 5. Hidden line ____ | E. Shows the distance from one point to another. |

TRUE-FALSE

6. T F It is standard procedure to dimension to a hidden line.
7. T F Arrowheads are drawn 1/16" long and 1/16" wide.
8. T F The shortest dimension is located closest to the object and all that follow are placed 3/8" from each other.
9. T F Locate the shortest dimension closest to the object.
10. T F A drafter must always avoid crossing dimension lines.

SKETCHING (Sketch the appropriate line shown)

11. Leader line
12. Dimension line
13. Center line
14. Hidden line

MATCHING

- | | |
|--------------------------------|--|
| 1. Center line <u> B </u> | A. Calls attention to a particular detail. |
| 2. Dimension line <u> E </u> | B. Locates the centers of curcular parts. |
| 3. Extension line <u> D </u> | C. A series of short dashes made 1/8" long with 1/16" distance between each. |
| 4. Leader line <u> A </u> | D. None of these |
| 5. Hidden line <u> C </u> | E. Shows the distance from one point to another. |

TRUE-FALSE

6. T F It is standard procedure to dimension to a hidden line.
7. T F Arrowheads are drawn 1/16" long and 1/16" wide.
8. T F The shortest dimension is located closest to the object and all that follow are placed 3/8" from each other.
9. T F Locate the shortest dimension closest to the object.
10. T F A drafter must always avoid crossing dimension lines.

SKETCHING (Sketch the appropriate line shown)

11. Leader line 

12. Dimension line 

13. Center line 

14. Hidden line 

SKETCHING (Sketch the following)

1. Hidden line
2. Center line
3. Dimension line
4. Leader line with arrowhead
5. Arrowhead at proper proportion






TRUE-FALSE

6. T F Arrowheads are generally drawn at a proportion of 5 to 1.
7. T F It is against all drafting regulations to dimension to a hidden line, (if other possibilities exist).
8. T F The first dimension line is drawn at a minimum of $3/8$ " from the object and all others at a minimum of $1/4$ " from each other.
9. T F Avoid crossing dimension lines at all times.

MATCHING

- | | |
|--------------------------|--|
| 10. Center line _____ | A. Calls attention to a particular detail. |
| 11. Dimension line _____ | B. None of these. |
| 12. Leader line _____ | C. Shows the distance from one point to another. |
| 13. Hidden line _____ | D. Projects a line of the object outside the view. |
| 14. Extension line _____ | E. A series of short dashes made up $1/8$ " long x $1/16$ " distance between each other. |
| | F. Locates the centers of circular parts. |

SKETCHING (Sketch the following)

1. Hidden line 
2. Center line 
3. Dimension line 
4. Leader line with arrowhead 
5. Arrowhead at proper proportion 

TRUE-FALSE

6. T F Arrowheads are generally drawn at a proportion of 5 to 1.
7. T F It is against all drafting regulations to dimension to a hidden line, (if other possibilities exist).
8. T F The first dimension line is drawn at a minimum of 3/8" from the object and all others at a minimum of 1/4" from each other.
9. T F Avoid crossing dimension lines at all times.

MATCHING

- | | |
|---------------------------------|--|
| 10. Center line <u> F </u> | A. Calls attention to a particular detail. |
| 11. Dimension line <u> C </u> | B. None of these. |
| 12. Leader line <u> A </u> | C. Shows the distance from one point to another. |
| 13. Hidden line <u> E </u> | D. Projects a line of the object outside the view. |
| 14. Extension line <u> D </u> | E. A series of short dashes made up 1/8" long x 1/16" distance between each other. |
| | F. Locates the centers of circular parts. |

SIZE DESCRIPTION

WORKSHEET

1. Dimensioning a drawing is not difficult, it is simply a matter of showing _____ and _____ to make the object.
2. A drawing is correct when the _____ and _____ of all the details are shown.
3. Individual shapes are shown by giving _____.
4. _____ dimensions show the _____ of each individual shape.
5. There are 3 responsibilities an industrial drafter has. List them.
 - A.
 - B.
 - C.
6. The 2 types of lines that are used to describe the shape of an object are...
 - A.
 - B.
7. Describe briefly each of the above types of lines.
8. Match the following.

_____ Center line _____ Extension line _____ Leader line _____ Dimension line	A. Calls attention to a particular detail B. Locates centers of circular parts by using long and short dashes C. Shows the distance from one point to another D. Projects a line of the object outside the view
--	--
9. Describe what each of the above lines is supposed to look like.
10. T F Locate dimensions to the profile shape of the detail.
 T F Locate the shortest dimension closest to the object.
 T F Locate the first dimension line $\frac{1}{2}$ " from the object, others at $\frac{1}{4}$ ".
 T F Avoid dimensions that lead to hidden lines.
 T F Avoid crossing dimension lines.
 T F The tip of the arrowhead must touch the extension line.

(continued) .

T F Arrowheads are drawn approximately 1/8" long x 1/16" wide.

11. Intersecting center lines are used to locate _____ and _____. The shortest dashes should cross at the center.
12. When the center line passes completely through a view, the part is assumed to be _____.
13. Define the term symmetrical.

14. A _____ can be used as an _____ line.
15. Leader lines are used to call _____ to and _____ a particular detail.
16. Leader lines are usually drawn at _____°, _____°, and _____°.
17. Explain why they are drawn at these angles.

18. The shoulder on a leader is approximately _____" long.

1. Dimensioning a drawing is not difficult, it is simply a matter of showing SIZE and LOCATION to make the object.
2. A drawing is correct when the size and location of all the details are shown.
3. Individual shapes are shown by giving size dimensions.
4. Location dimensions show the position of each individual shape.
5. There are 3 responsibilities an industrial drafter has. List them.
 - A. shape (show)
 - B. size of material
 - C. degree of accuracy
6. The 2 types of lines that are used to describe the shape of an object are...
 - A. object lines
 - B. hidden lines
7. Describe briefly each of the above types of lines.
8. Match the following.

<u>B</u> Center line	A. Calls attention to a particular detail
<u>D</u> Extension line	B. Locates centers of circular parts by using long and short dashes
<u>A</u> Leader line	C. Shows the distance from one point to another
<u>C</u> Dimension line	D. Projects a line of the object outside the view
9. Describe what each of the above lines is supposed to look like.
10. F Locate dimensions to the profile shape of the detail.
 F Locate the shortest dimension closest to the object.
 F Locate the first dimension line $\frac{1}{2}$ " from the object, others at $\frac{1}{4}$ ".
 F Avoid dimensions that lead to hidden lines.
 F Avoid crossing dimension lines.
 F The tip of the arrowhead must touch the extension line.

(continued)

(T) F Arrowheads are drawn approximately 1/8" long x 1/16" wide.

11. Intersecting center lines are used to locate CIRCULAR PARTS
and holes. The shortest dashes should cross at the center.

12. When the center line passes completely through a view, the part is
assumed to be symmetrical.

13. Define the term symmetrical.

That which can be divided into similar halves by a plane passing
through the center.

14. A center line can be used as an extension line.

15. Leader lines are used to call attention to and dimension
a particular detail.

16. Leader lines are usually drawn at 30°, 45°, and 90°.

17. Explain why they are drawn at these angles.

To avoid confusion with object lines and dimension lines.

18. The shoulder on a leader is approximately 1/4" long.

SIZE DESCRIPTION

TEXTBOOK ASSIGNMENTS

TEXTBOOK ASSIGNMENTS

Students will "contract" for a grade prior to beginning the unit on size description. There is a total of fourteen assignments. Twelve points will be possible for each assignment. The total number of points the student earns will be compared to the total number of points required for each grade, as follows.

(Total of 14 assignments)	168	points A+
	154	A
	140	A-
	126	B+
	112	B
	98	B-
	84	C+
	70	C
	56	C-
	42	D+
	28	D
	14	D-

Every student will be allowed to redo any or all of the assignments in order to achieve his or her goal. A minimum of ten of the fourteen assignments are to be completed. The following list contains the fourteen assignments for the unit on size description. The assignments were taken from the text, Basic Technical Drawing. (see note below*)

Figure 6-23 (p. 96) Sketch the given three views of all six objects, each on separate paper. Do not draw the isometric view that is shown. Sketch in the dimensions necessary to build the part. Scale in text is at $\frac{1}{4}" = 1"$. Sketch objects at full scale.

Using instruments, draw and dimension the following...

Figure 9-39 #1
Figure 9-40 #1 and #5
Figure 9-41 #7

Choose any 4 objects from Figures 9-40 and 9-41 that have not been done previously, and draw and dimension them using your instruments.

* J.T. Dygdon, H.C. Spencer, Basic Technical Drawing (New York: MacMillan, 1974).

SIZE DESCRIPTION

POST TESTS

TRUE-FALSE

1. T F Dimensions that lead to hidden lines are acceptable.
2. T F Locate the shortest dimensions closest to the object.
3. T F Locate dimensions to the profile shape of the detail.
4. T F The tip of the arrowhead does not have to touch the extension line.
5. T F Arrowheads are drawn at a proportion of 2 to 1.
6. T F The first dimension line is located a minimum of 3/8" from the object, and all remaining will follow at a minimum of 1/4" from each other.

FILL IN THE BLANK

7. Leader lines are usually drawn at _____°, _____°, and _____°.
8. Leader lines are used to call _____ to and _____ a particular detail.
9. Intersecting center lines are used to locate _____ and _____. The shortest dashes should cross at the center.
10. When the center line passes completely through a part, it is assumed to be _____.
11. List the three responsibilities of an industrial drafter.
12. The two types of lines that are used to describe the shape of an object are...
13. Sketch and label the two lines that are listed in number 12.
14. When drawing leader lines, why is it important to draw the angle of the leader at angles other than straight up and down and straight across?
15. The shoulder of the leader is to be drawn approximately _____" long.

TRUE-FALSE

- 1. T F Dimensions that lead to hidden lines are acceptable.
- 2. T F Locate the shortest dimensions closest to the object.
- 3. T F Locate dimensions to the profile shape of the detail.
- 4. T F The tip of the arrowhead does not have to touch the extension line.
- 5. T F Arrowheads are drawn at a proportion of 2 to 1.
- 6. T F The first dimension line is located a minimum of 3/8" from the object, and all remaining will follow at a minimum of 1/4" from each other.

FILL IN THE BLANK

- 7. Leader lines are usually drawn at 30 °, 45 °, and 90 °.
- 8. Leader lines are used to call attention to and dimension a particular detail.
- 9. Intersecting center lines are used to locate circular parts and holes. The shortest dashes should cross at the center.
- 10. When the center line passes completely through a part, it is assumed to be symmetrical.
- 11. List the three responsibilities of an industrial drafter.
 Show correct shape
 Show size of material
 Draw to a degree of accuracy
- 12. The two types of lines that are used to describe the shape of an object are...
 Object lines
 Hidden lines
- 13. Sketch and label the two lines that are listed in number 12.
 Object
 Hidden
- 14. When drawing leader lines, why is it important to draw the angle of the leader at angles other than straight up and down and straight across?
 To avoid confusion with the object lines, and dimension lines
- 15. The shoulder of the leader is to be drawn approximately 1/4 " long.

TRUE-FALSE

- (T) F Locate dimensions to the profile shape of the detail.
- (T) F Locate the shortest dimension closest to the object.
- (T) F Locate the first dimension line $\frac{1}{2}$ " from the object and all others will follow at $\frac{1}{4}$ ".
- (T) F Avoid dimensions that lead to hidden lines.
- (T) F Avoid crossing dimension lines.
- (T) F The tip of the arrowhead must touch the extension line.
- (T) F Arrowheads are drawn approximately $\frac{1}{8}$ " long x $\frac{1}{16}$ " wide.

MATCHING

- | | |
|-------------------------|--|
| <u>B</u> Center line | A. Calls attention to a particular detail |
| <u>D</u> Extension line | B. Locates centers of circular parts by using long and short dashes. |
| <u>C</u> Leader line | C. Shows the distance from one point to another. |
| <u>A</u> Dimension line | D. Projects a line of the object outside the view. |

FILL IN THE BLANK

Describe what each of the above lines are supposed to look like. (see matching)

Individual shapes are shown by giving size dimensions.

Location dimensions show the position of each of the individual shapes.

There are 3 responsibilities an industrial drafter has. List them.

Show correct shape Show size of material Draw to accuracy

The two types of lines that are used to describe the shape of an object are...
object and hidden

Describe briefly each of the above types of lines.

Dimensioning a drawing is not difficult, it is simply a matter of showing size and location to make the object.

CHAPTER V

SUMMARY

It is the intent of this project that all students who enter into the beginning high school drafting program and complete the course will have indeed mastered the material presented. Although the coursework may have been mastered, a letter grade of an "A" may not be received. This is due to the fact that psychomotor work associated with each task will be required.

CONCLUSIONS

Knowledge of the material is as vital to the draftsman as is being able to draw a mechanically sound drawing. The fact that students completing the drafting program will have mastered a certain amount of work, will also help to improve their self-esteem and self-confidence, both of which are important to everyday living.

RECOMMENDATIONS

It is recommended that high school drafting teachers use and test this project on a sample of students enrolled in beginning drafting.

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