LIFEPAC®

Consumer Math

Student Book

Unit **9**

Alpha Omega Publications®

CONSUMER MATHEMATICS 9
OCCUPATIONAL DIAGRAMS

CONTENTS

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Alpha Omega Publications®

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OCCUPATIONAL DIAGRAMS

If you were asked what the following occupations had in common—land surveyor, architect, design engineer, clothes designer, cartographer, machinist, electrician, navigator, and draftsman—you would probably come up with several answers that would apply to most of these occupations. However, you would probably have a hard time finding a single common characteristic.

The answer is that all these occupations require the ability to read and interpret a diagram. The land surveyor should be able to read a topographical map; the architect, a blueprint; the design engineer, an engineering drawing; the clothes designer, a pattern; the cartographer, a map; the machinist, a shop drawing; the electrician, a wiring diagram; the navigator, an oceanographic or aerial map; and the draftsman, a mechanical drawing.

This LIFEPAC will enable you to understand and interpret the most common diagrams used in these occupations. The LIFEPAC will also help you understand the symbols, the purpose, and the techniques for preparation in these occupations.

OBJECTIVES

Read these objectives. The objectives tell you what you will be able to do when you have successfully completed this LIFEPAC.

When you have finished this LIFEPAC, you should be able

1. To calculate and employ fractions, ratios, and proportions used in scaled diagrams;
2. To convert the dimensions of an object to scale for representation in various occupational diagrams;
3. To read a map using the grid coordinate system;
4. To interpret contour lines used on a map;
5. To interpret and show critical dimensions employed with occupational diagrams;
6. To draw angles of given sizes and verify their magnitudes;
7. To construct various polygons and calculate their critical dimensions;
8. To inscribe regular polygons in circles;
9. To answer questions about scale diagrams used in house plans;

10. To answer questions about floor plans including placement of furnishings; and

11. To calculate costs associated with furnishing a house.

Survey the LIFEPAC. Ask yourself some questions about this study. Write your questions here.

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I. SCALE DRAWINGS

OBJECTIVES

1. To calculate and employ fractions, ratios, and proportions used in scaled diagrams.
2. To convert the dimensions of an object to scale for representation in various occupational diagrams.
3. To read a map using the grid coordinate system.
4. To interpret contour lines used on a map.
5. To interpret and show critical dimensions employed with occupational diagrams.

So that diagrams used in various occupations may be accurate representations of the objects' dimensions and orientation, the principles of scale drawing need to be learned and applied. A review of some of the basic mathematical skills needed will be helpful.

REVIEWING MATHEMATICAL OPERATIONS

Before working with scale drawings, a few mathematical operations need to be reviewed since they are basic to converting dimensions to different scales. The first operation has to do with fractions, and the second operation has to do with ratios and proportions.

A fraction is a number that is not a whole number. The number $\frac{5}{8}$ is a fraction. On the other hand, $\frac{4}{2}$ may be written in fractional form, but since it reduces to a whole number, 2, it is not a fraction. In the fraction $\frac{5}{8}$, the numeral below the line is the denominator, and the numeral above the line is the numerator. The denominator, or 8 in this case, tells us into how many parts the unit is divided. The numerator, 5 in this case, indicates how many of these parts are taken. Thus, if we were using a ruler, and each eighth were equivalent to $\frac{1}{8}$ inch, $\frac{5}{8}$ would be equivalent to $\frac{5}{8}$ inch.

A fraction is normally reduced to its lowest terms. A fraction is reduced when the numerator and the denominator have no common factor other than 1.

Model: Reduce $\frac{10}{15}$.

Since the common factor or divisor of both numerals is 5, we divide both the numerator and the denominator by 5.

$$\frac{10}{15} = \frac{\frac{10}{5}}{\frac{15}{5}} = \frac{2}{3}$$

When you add or subtract fractions, change all the denominators into what is called the lowest common denominator. Finding the lowest common denominator is finding the smallest (lowest) number into which all the denominators can be divided evenly without a remainder.

Model: Find the lowest common denominator of the fractions $\frac{1}{4}$, $\frac{1}{12}$, and $\frac{1}{6}$ and add these fractions.

The lowest common denominator is 12. The equivalent of $\frac{1}{4}$ is $\frac{3}{12}$, $\frac{1}{12}$ does not have to be converted, and the equivalent of $\frac{1}{6}$ is $\frac{2}{12}$. Adding, $\frac{3}{12} + \frac{1}{12} + \frac{2}{12} = \frac{6}{12}$. Reducing, $\frac{6}{12} = \frac{1}{2}$.

A method of stating the relationship of one number to another number is the calculation of a *ratio*. A ratio includes two numbers. If a field has a length of 100 yards and a width of 25 yards, the ratio of the length to the width is expressed as $\frac{100}{25}$ or 100:25. Both expressions have the same meaning.

As with fractions, ratios are reduced to lowest terms. The ratio $\frac{100}{25}$, therefore, should be reduced to $\frac{4}{1}$, or 4:1.

We could also have found the ratio of the width to the length: $\frac{25}{100}$ or 25:100. Reducing, we obtain the ratio of the width to the length as $\frac{1}{4}$, or 1:4

Model: A blueprint is drawn in the ratio of $\frac{1}{2}$ inch to 1 foot. Each $\frac{1}{2}$ inch represents 1 foot of the actual object being represented. Converting 1 foot into 12 inches, the ratio is $\frac{1}{2}$:12. Multiplying by 2, the ratio $\frac{1}{2}$:12 becomes 1:24. Suppose an object depicted in the blueprint actually measures 6 feet in length. How long will it appear in the blueprint?

Since the ratio is 1:24, and 6 feet convert to 72 inches, then $\frac{72}{24} = 3$, and $3 \times 1 = 3$ inches on the blueprint.

A *proportion* is a statement of equality between ratios. Therefore, 3:4 = 6:8 is a proportion. Another way of stating this relationship is "three is to four as six is to eight." A different method of writing the proportional form is 3:4::6:8. In this method the double colon in the middle is the same as the equal sign. The fractional of the proportion is expressed as $\frac{3}{4} = \frac{6}{8}$.

In any proportion the first and last terms are called the *extremes*. The second and third terms are called the *means*. If any three of the four numbers are known, then the fourth number can be determined, because the product of the means equals the product of the extremes.

Model: What is m in the proportion $2:5 = m:10$? Using the relationship of extremes and means, the product of the extremes, 2×10, equals the product of the means, $5 \times m$. Solving for m, we obtain $m = \frac{2 \times 10}{5} = 4$.

[redacted] Solve the following problems.

1.1 Reduce $\frac{14}{21}$. ______________________

1.2 Add $\frac{2}{3}$, $\frac{5}{6}$, and $\frac{10}{18}$. ______________________

1.3 A box measures 6" in length and 4" in width. What is the ratio of its length to its width? ______________________

1.4 Given: $6:4::C:8$
Find C. ______________________

[redacted] Match these items.

1.5 ____ fraction

1.6 ____ reduced to lowest terms

1.7 ____ includes two numbers

1.8 ____ statement of equality between ratios

1.9 ____ first and last terms

a. numerator and denominator have no common factor other than 1

b. not a whole number

c. extremes

d. proportion

e. ratio

f. greatest common multiple

CHOOSING SCALES

The following definition of a scale will help you as you read this section.

> DEFINITION
>
> A *scale* is the size of a plan, a map, a drawing, or a model compared with what it represents.

The scale varies with the function of the drawing being employed. For example, an architect might use a scale of $\frac{1}{4}$ inch = 1 foot, and a *cartographer* (a person who makes maps) might use a scale of 1 inch = 50 miles.

The use of an appropriate scale permits the drawer to convert the actual dimensions of an object to a scale convenient to the size of the drawing he wishes to make without distortion.

Model 1: A house measures 60 feet in length and 25 feet in width. If a scale of $\frac{1}{4}$ inch = 1 foot is used, what are the dimensions of a scale drawing of the house?

Since $\frac{1}{4}$ inch = 1 foot, multiplying by 4, 1 inch = 4 feet. Therefore, $\frac{60}{4}$ = 15 inches and $\frac{25}{4}$ = $6\frac{1}{4}$ inches. The house on the scale drawing will measure 15 inches in length and $6\frac{1}{4}$ in width.

Model 2: A box constructed in a metal shop measures 16" long, 12" wide, and 4" deep. The shop foreman instructs you to make a scale drawing of the box. What scale will you use, and what will the dimensions of the box be?

To select an appropriate scale, you should consider convenience not only to yourself in terms of drawing a scalar representations, but also to whoever is going to read the drawing. If you choose a scale of $\frac{1}{4}$" = 1", the box length will be $\frac{16}{4}$ = 4"; the box width will be $\frac{12}{4}$ = 3"; and the box depth will be $\frac{4}{4}$ = 1".

These measurements are satisfactory because they are small enough to fit on a sheet of paper, and yet large enough to give the necessary detail of the box.

Since maps generally cover large distances and enclose large areas (states, cities, or even countries), scales on maps involve large number conversion. Scales of 1 inch = 1,000 feet, 1 inch = 5 miles, or 1 inch = 100 miles are more appropriate for large distances and areas than scales of 1 inch = 1 foot or 1 inch = 1 mile would be.

Model 1: You are looking at a city map. You see in the map's legend that 1" = 1,000'. If the city limits are included in a map distance measuring 36" wide (west-east direction) and 24" high (south-north direction), how many miles, approximately, do the city limits actually cover?

Since 1" = 1,000', 36" = 36,000'; but 5,280 feet = 1 mile. Therefore, dividing 36,000 by 5,280, we obtain 6.8 miles as the approximate distance from west to east. Dividing 24,000 by 5,280, we obtain 4.5 miles as the approximate distance from south to north.

Model 2: You intend to drive from Jones City to Jackson Heights. On the road map you have you measure the map distance to be about $3\frac{1}{2}$ inches. Looking at the the map scale, you find that 1 inch = 5 miles. How many miles is Jones City from Jackson Heights?

$$1 \text{ inch} : 5 \text{ miles} = 3.5 \text{ inches} : m \text{ miles}$$
$$5 \times 3.5 = m$$
$$17.5 \text{ or } 17\tfrac{1}{2} = m$$

The distance from Jones City to Jackson Heights is $17\frac{1}{2}$ miles.

[redacted] Solve the following problems.

1.10 Given a map scale of 1 inch = 50 miles, find the map distance between two cities 75 miles apart. ________________

1.11 Given the map scale of 1 inch = 10 km, find the distance between two mountains that measure $1\frac{1}{4}$ in. apart on the map. ________________

1.12 The scale of a blueprint is $\frac{1}{4}$" = 1'. If a house has 1 bedroom measuring 10'6" by 11', a living room measuring 25' by 18'8", a kitchen measuring 13'6" by 8', and a dining room measuring 12' x 10', what are the respective scale dimensions of the

a. bedroom ________________

b. living room ________________

c. kitchen, and ________________

d. dining room? ________________

READING MAPS

So far we have discussed scale in one form, as it is used in maps. However, map scales may be represented in other forms.

A figure such as 1:50,000 is called a *representative fraction*. This figure means that for every unit on a certain map, 50,000 of these same units are on the ground. The figure also means that approximately $1\frac{1}{4}$ inches equal one mile.

Model: Given a map scale of 1:50,000, what is the ground distance expressed in miles between two towns that are 6" apart on the given map?

$$1{:}50{,}000 = 6{:}d$$
$$1d = 300{,}000$$

(Remember, product of extremes = product of means.) $\frac{300{,}000}{5{,}280 \times 12} = \frac{300{,}000}{63{,}360}$
Therefore, ground distance = 4.7 miles.

Scales may also be represented by a graphic line scale such as the following one.

In this scale 1 inch = 16 miles. The alternate black and white segments are ¼ inch long and, hence, are equivalent to 4 miles each.

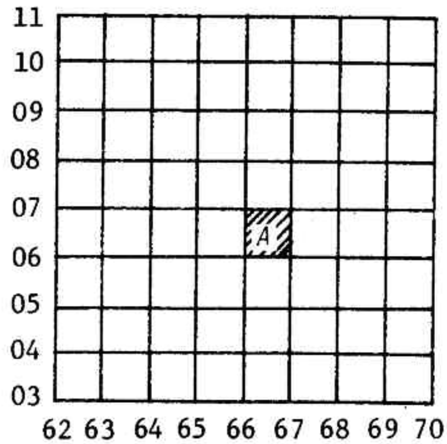
On maps a system of evenly spaced lines forming a lattice is used as an aid to locate objects. This system is referred to as a *grid*. From a single point of reference in the National Grid System, all maps are divided into a series of grids based on their distance from this common center.

Grid lines are at kilometer intervals and are numbered according to the following procedure.

PROCEDURE

A *map grid system* is composed of vertical lines called *Eastings* that are numbered in the top and bottom margins of the map, and of horizontal lines called *Northings* that are numbered at the sides of the map. These numbers are always quoted in pairs and are used to designate any single kilometer square on the map. For any square the number of the line that corresponds to its West boundary is quoted first, and the number that corresponds to the lower boundary of the square is quoted second.

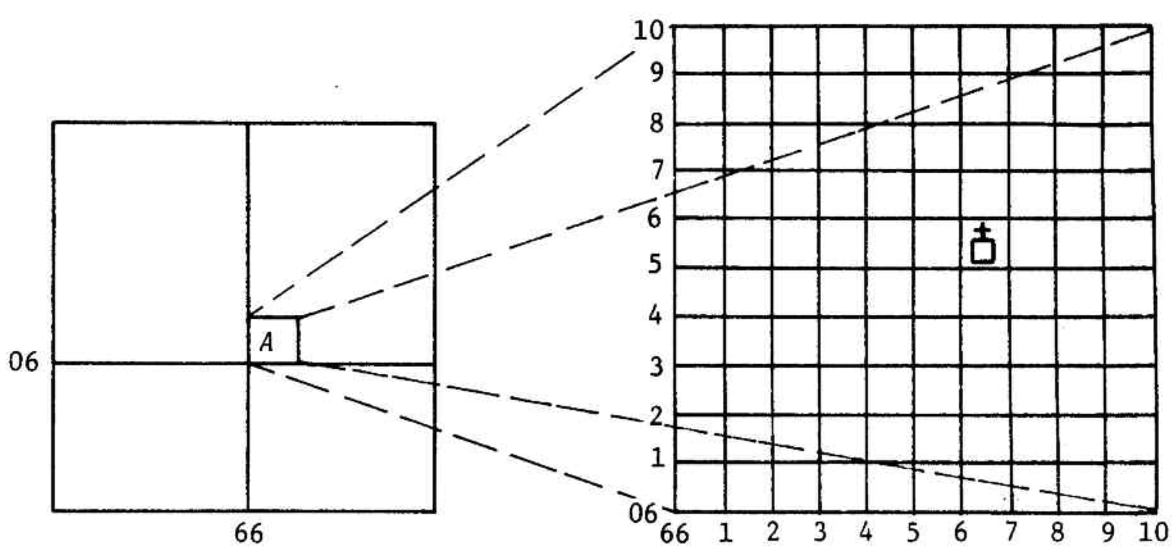
Model: Given the following grid, how will you designate square *A*?



The lower left-hand corner of square *A* is read along the Eastings and Northings margins, reading the Eastings number first. The Eastings number is 66. The Northings number is 06. Therefore, square *A* is designated by 6606 on the map.

This particular square can be further divided into hundred meter squares permitting you to designate a particular terrain feature (such as a church) by a six-digit grid reference number.

For ease of viewing this latter technique, square *A* has been expanded and a symbol placed within the square representing a church.

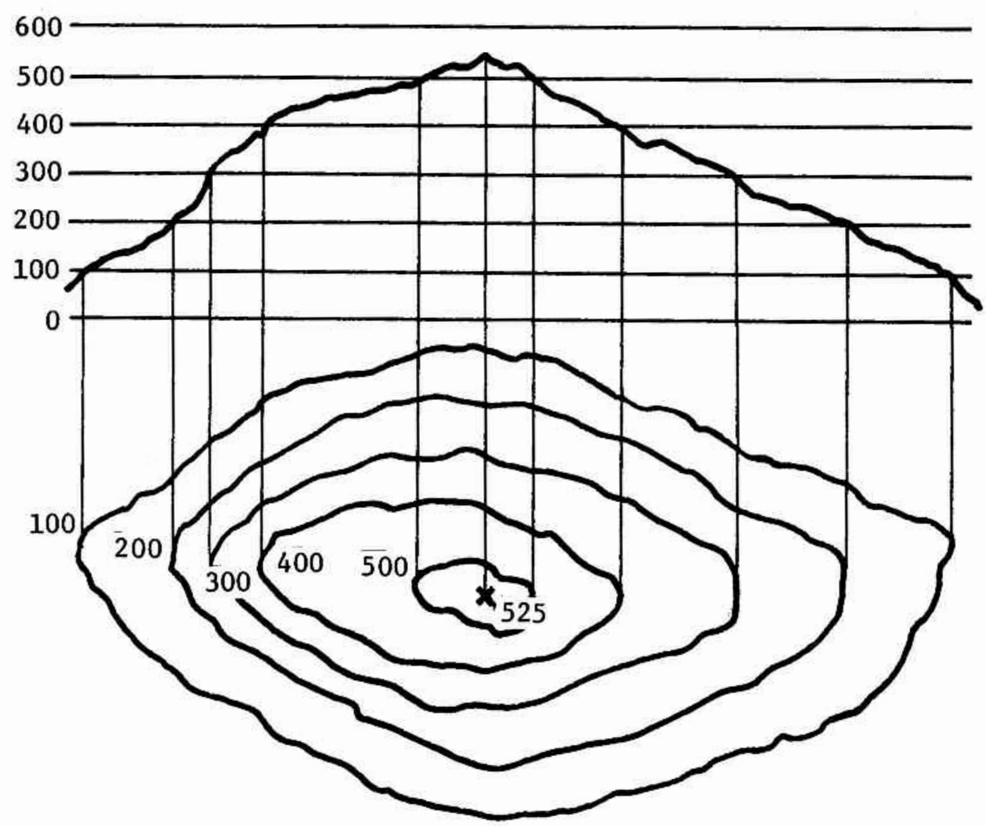


Each row in expanded square *A* represents 10,000 square meters. Since there are 10 sections in each direction the whole square has 1,000,000 square meters, which is one square kilometer.

Again, we read this square *A* as we did before, but we add to each previous number a third number that stands for the $\frac{1}{10}$ distance in an Easting direction and a Northing direction respectively. Thus, for the church depicted, its grid designation in its lower left-hand corner is 6 across and 5 up. The whole designation is 660665.

One other important map feature that is of special interest to the surveyor is the *contour line*. Contour lines are used on topographical maps to indicate places of equal height above sea level. Contour lines are usually light brown in color, are broken at intervals by numbers corresponding to their height in feet, and are usually in hundred-foot intervals.

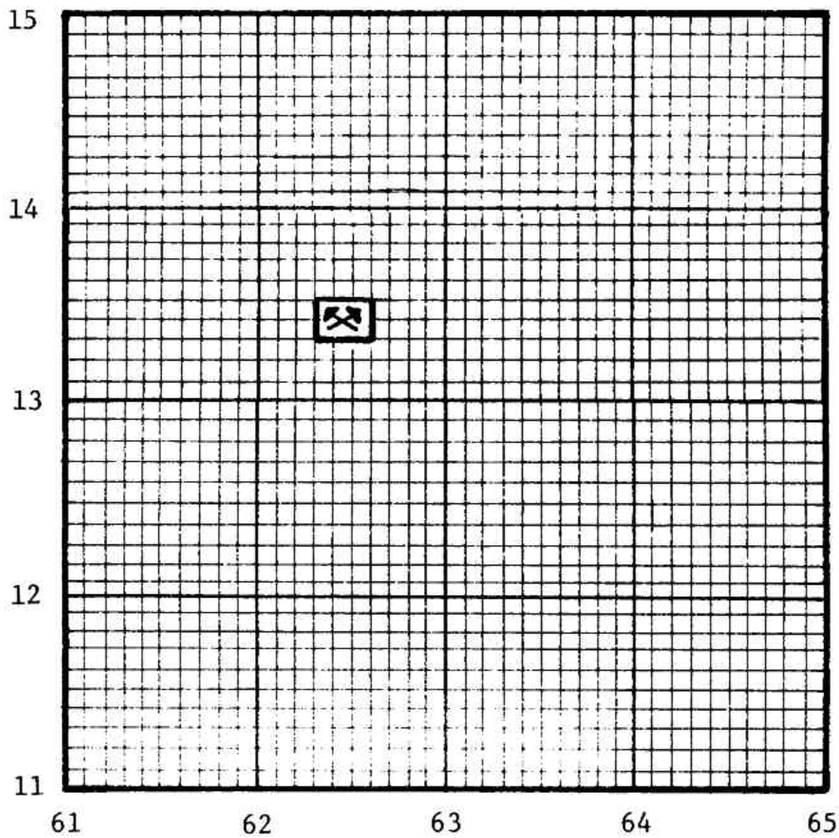
The following figure will help you visualize how a section of terrain actually appears according to its contour lines on the map.



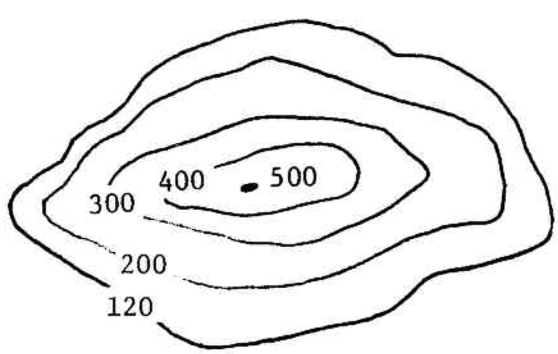
Notice how the left slope is much steeper than the more gently sloping ridge line to the right. Notice also how these slopes are depicted in more closely packed contour lines on the left side and in wider-spaced contours on the right side.

[redacted] Perform the following activities.

1.13 Designate the grid reference number for the mine shown.



1.14 Read the elevation for the peak shown.



[redacted] Complete the following sentences.

1.15 A series of light brown lines drawn at intervals of 50 feet to designate their respective heights above sea level are called ______________________.

1.16 When reading a grid reference number corresponding to a grid on a map, you read the pair of numbers corresponding to the ________________ corner of the square.

1.17 Contour lines fairly evenly spaced and relatively far apart denote a more ____________ slope than contour lines unevenly spaced and relatively close together.

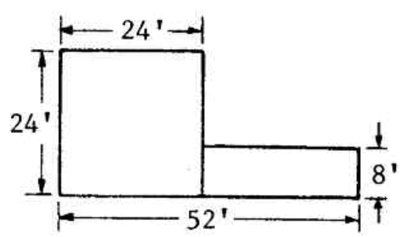
1.18 One square kilometer grids are divided into ______________ to locate objects to the nearest 100 meters.

Teacher check ________________
Initial Date

READING SCALE DRAWINGS

On scale drawings objects are shown by *plane figures* that show key sizes in two dimensions and by *modified plane figures* that represent solids with key sizes in three dimensions. Both types of drawings are drawn to some convenient scale.

Figure 1 represents the top view of an office building and is shown with its scale dimensions.



Scale: 1" = 48'

Figure 1: Top View of Office Building

Note the following features of this view: (1) Key dimensions are shown by arrows indicating the distances being measured and their orientation, with numbers corresponding to actual distances drawn to the appropriate scale. (2) Not all dimensions are shown, just those needed to determine the critical dimensions. For example, you do not need to show that the 52' side is made up of two sections, one 24' in length and the other one 28' in length--the difference between 52' and 24'. Where a small space appears on the scale drawing, such as at the 8-foot end, the number is placed in the interval and the arrows are positioned to show the distance as illustrated.

A front view of this office building looks like Figure 2a and a back view looks like Figure 2b. Note that scale dimensions have been placed on only one figure.

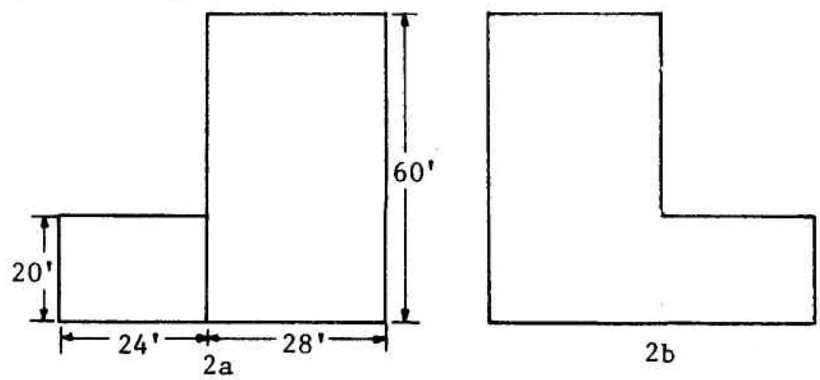


Figure 2: Front and Back Views of Office Building

Another view is an end view. For this building the end view from the left is shown in Figure 3L. The end view from the right is shown in Figure 3R.

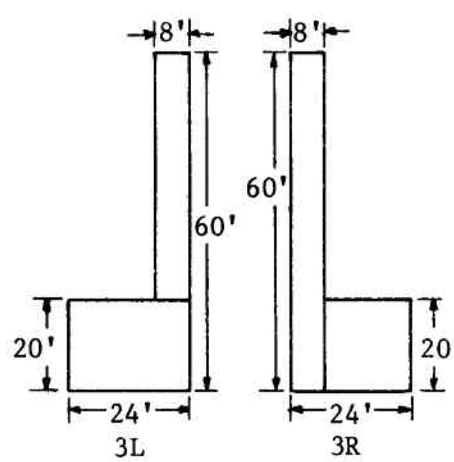


Figure 3: End Views of Office Building

Once again, note that a minimum number of dimensions are shown, and that they are consistent with the designated key distances and orientation.

Finally, although this drawing is not essential to understand the configuration of the building, a perspective view is shown in Figure 4.

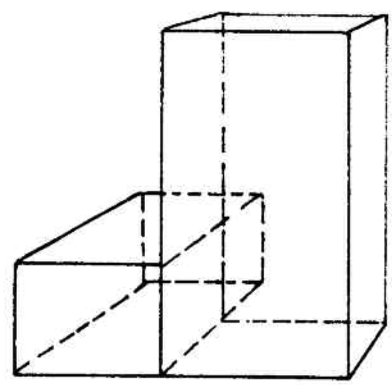


Figure 4: Perspective View of Office Building

Note that the perspective view may not have the dimensions indicated. If the perspective view were critical to understanding the object's layout, then dimensions might be shown for unusual features. However, the preceding perspective gives a sense of a three-dimensional solid figure.

Sometimes we need to know the area and the perimeter of specific geometric figures, such as a rectangular field or an irregularly shaped house lot.

For the perimeter we measure the border of the field. For the area we measure the space enclosed within the field.

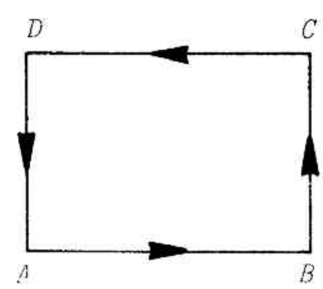


Figure a

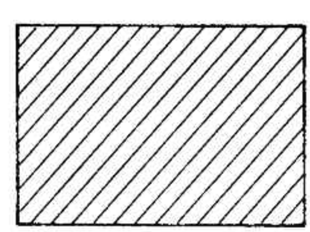


Figure b

Both of the rectangles shown represent the same field. To find the perimeter, imagine that you start walking from corner *A*, and count the paces as you move counter-clockwise completely around the field. The perimeter is the number of paces stepped off from corner *A* to corner *B*, plus the number of paces from corner *B* to corner *C*, plus the number of paces from corner *C* to corner *D*, plus the number of paces from corner *D* and back to the starting point at corner *A*. If your paces were the same and they measured $2\frac{1}{2}$ feet per stride, you can convert the total paces to feet by multiplying the sum of paces by 2.5 feet.

Model: Suppose you walk 100 paces each from corner *A* to corner *B* and from corner *C* to corner *D*, and 30 paces each from corner *B* to corner *C* and from corner *D* to corner *A*. The perimeter will be

$$P = 100 + 30 + 100 + 30 = 260 \text{ paces}$$
$$\text{or } P = 260(2.5') = 650'.$$

For the area computation look at **Figure b**. The area is shown by shading. We can find the area by counting the number of square blocks measuring 1 inch by 1 inch. The rectangle shown has 21 blocks altogether. Since the blocks are 1 square inch each, the area = 21 square inches. The same result can be obtained by counting the blocks along the long side, 7, and multiplying that number by the number of blocks along the short side, 3.

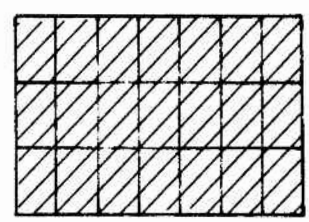


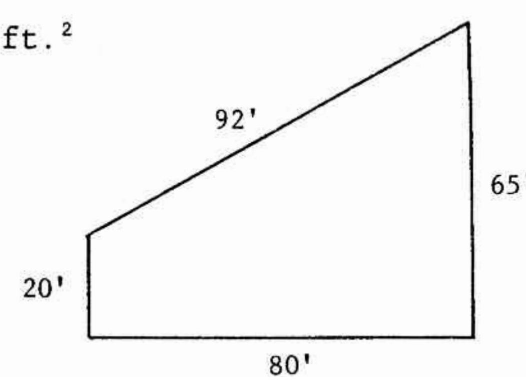
Figure b

$A = (7)(3) = 21$ sq. inches, or 21 in.^{2}

Model: Find the area of a field in the shape of a rectangle that measures 90' on the long side and 25' on the short side.

$$A = (90')(25') = 2{,}250 \text{ ft.}^2$$

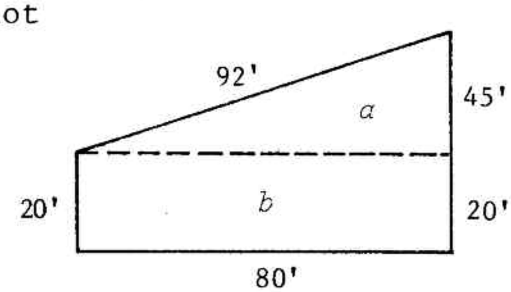
Suppose our lot is shaped like the figure shown.



To find the perimeter, add all of the sides: $P = 65' + 80' + 20' + 92'$. Therefore, the perimeter is equal to 257'.

To compute the area, we have a different situation. The easiest procedure is to divide the area into a system of regular geometric figures for which we have area formulas. Then, we sum all those subareas to arrive at the total area.

For example, we can divide this lot as shown.



By drawing a line parallel to the 80-foot side, we have formed a right triangle, *a*, and a rectangle, *b*.

Note that the right side of the lot is now divided into a 20-foot side and a 45-foot side.

The area of the rectangle is 20 ft. times 80 ft., or 1,600 square feet (or ft.^{2}). The area of the right triangle is $\frac{1}{2}$ times the base times the altitude. The dotted line is perpendicular to the 45-foot line; therefore, it is the altitude of the triangle. Its length is 80 feet. The base is 45 feet, as we already indicated. Therefore, the area of the triangle = $\frac{1}{2}$ x 80 ft. x 45 ft., or 1,800 ft.^{2} Hence, the area of the lot equals the sum of 1,600 ft.^{2} and 1,800 ft.^{2}, or 3,400 ft.^{2}

[redacted] Match the correct items.

1.19 _____ arrows on scale drawing

1.20 _____ top, side, and end views

1.21 _____ perspective view

1.22 _____ scale distance

a. representation of a two-dimensional object

b. distance measured on drawing

c. contain distance number and show orientation

d. normal drawings of an object

e. representation of a three-dimensional object [redacted] Solve these problems.

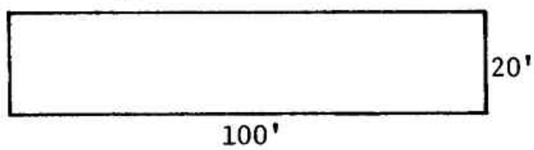
1.23 The sides of a right triangle are 10", 6", and 8". Find the perimeter.

____

1.24 For the triangle in Problem 1.23, find the area.

____

1.25 Compute the area of the following rectangle.



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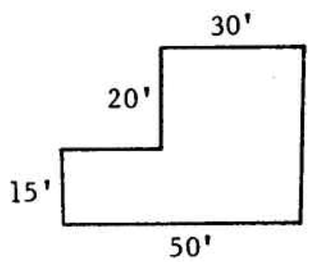
1.26 Find the perimeter of the rectangle shown in Problem 1.25.

____

1.27 Find the perimeter of the following irregular lot.



____

1.28 Find the area of the lot in Problem 1.27.

____

Teacher check ______________
Initial Date

REVIEW

Review the material in this section in preparation for the Self Test. The Self Test will check your mastery of this particular section. The items missed on this Self Test will indicate specific areas where restudy is needed for mastery.

SELF TEST 1

Write the letter of the correct item in the blank (each answer, 2 points).

1.01 A scale is a diagram or ruler marked off conveniently to represent proportionally larger or smaller ______.

a. angles
b. dimensions
c. perpendiculars
d. inches

1.02 When adding or subtracting fractions change all the ______ to the lowest common denominator.

a. denominators
b. numerators
c. reciprocals
d. numerals

1.03 Contour lines are used on topographical maps to indicate places of ______ above sea level.

a. variable height
b. slope height
c. equal height
d. great distances

Write *true* or *false* (each answer, 2 points).

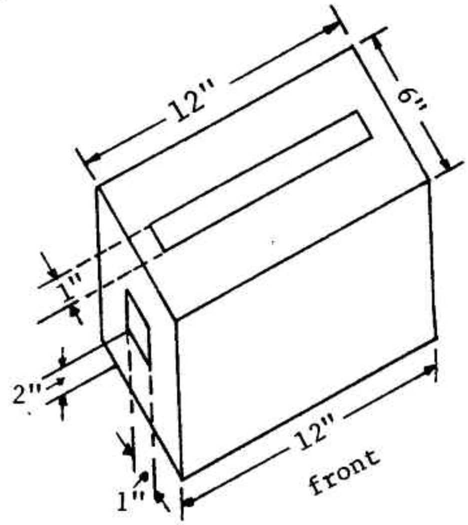
1.04 ______ When you read a grid square, you read the pair of numerals corresponding to the lower left-hand corner.

1.05 ______ A map-grid system is composed of vertical lines called Westings and horizontal lines called Northings.

1.06 ______ A six-digit grid reference number locates an object on a map down to and including a square of 100 meters on a side.

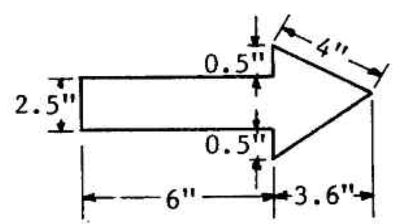
Complete these activities (each problem, 4 points).

1.07 Draw the specified views of the following object.



a. top view b. front view c. end view

1.08 Find the dimensions indicated for the following figure.



a. Perimeter ________________

b. Area ________________

Solve the following problems (each answer, 3 points).

1.09 Reduce the fraction $\frac{15}{45}$. ________________

1.010 Find C in the proportion 14:56::42:C.

____

1.011 The radii of two circles are 15" and 75" respectively. What is the ratio of the radius of the smaller circle to the radius of the larger circle?

____

1.012 The scale of a blueprint is $\frac{1}{4}$ in. = 1 ft. If an object to be drawn actually measures 14 feet long, 6 feet wide, and 2 feet deep, what are its scale dimensions?

a. ____________________

b. ____________________

c. ____________________

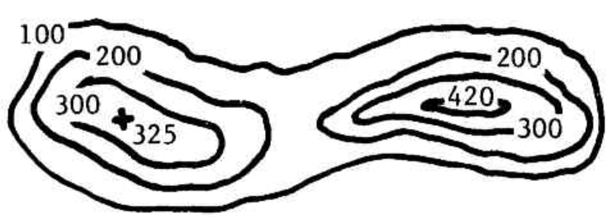
1.013 A certain map scale is 1:100,000. If two towns are 5" apart on the map, what is the actual distance between these two towns to the nearest tenth of a mile?

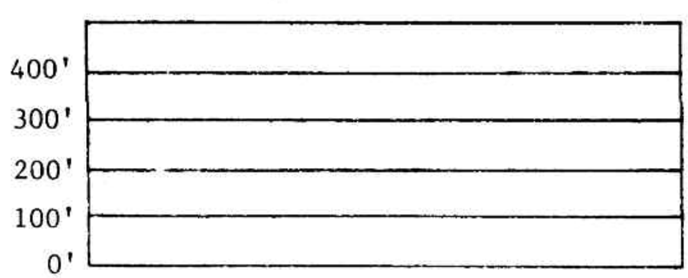
____

1.014 Add $\frac{1}{25}$, $\frac{4}{50}$, $\frac{8}{100}$, and $\frac{3}{25}$. ____________________

Perform the following task (correct diagram, 4 points).

1.015 For the terrain feature shown, sketch a side view representing how the feature will appear.





38/48

Score _____

Teacher check ________________
Initial Date

II. INFORMAL GEOMETRY

OBJECTIVES

6. To draw angles of given sizes and verify their magnitudes.
7. To construct various polygons and calculate their critical dimensions.
8. To inscribe regular polygons in circles.

Geometric figures and relationships are extremely important to the draftsman or the diagrammer. The ability to interpret and to diagram hexagonal and octagonal polygons is necessary for reading shop drawings since most nuts used in machine parts are in one of the two shapes.

ANGLES

Angles are basic to geometric figures. The three kinds of angles are acute angles, right angles, and obtuse angles. Acute angles are angles that are less than 90°. Right angles are angles that are equal to 90°. Obtuse angles are angles that are greater than 90°.

Draftsmen and architects often use a protractor to draw and measure angles. The following figure represents a standard protractor. You will note that it is in the form of a semicircle marked off in a counterclockwise direction (right to left) from 0 to 180 on the outside row of numbers. It is marked off in a clockwise direction (left to right) from 0 to 180 on the inside row of numbers.

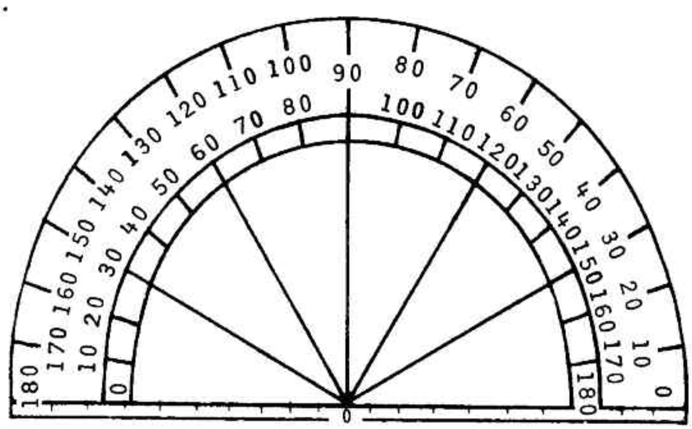


Figure 1: Protractor

Note also that, at the center of the base line, the protractor has an index point labeled 0.

When an angle of given magnitude (of a certain number of degrees) is to be drawn, line up the protractor so that the base line coincides with, or is directly on, an arbitrary line drawn on paper. Then using the 0-index point as a reference point, move along the outside row of numbers at the right until you reach the number corresponding to the size, or magnitude, of the angle to be drawn.

Assume the angle desired is 40°. At the place marked 40 on the protractor (remember: use the outside row only), make a pencil dot. Draw a straight line connecting the two points. The angle formed by the base line on the diagram and the new line is 40° (see the following figure for clarification).

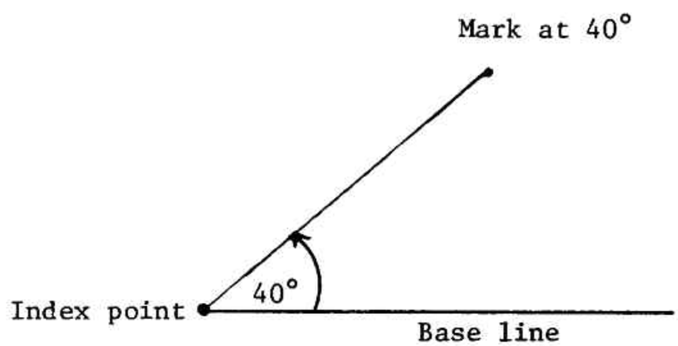
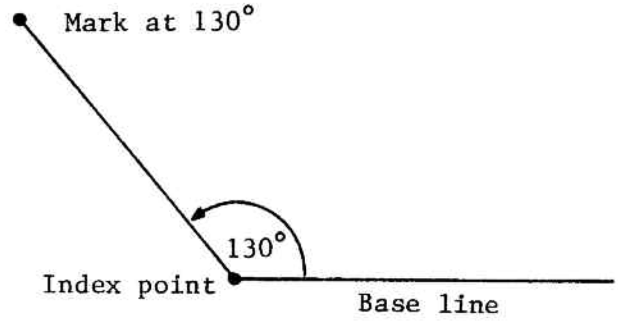


Figure 2: Drawing Given Angle

The angle is labeled with "40°" as shown to indicate to anyone who reads the diagram that the angle has a magnitude of 40°.

Proceeding in the same manner, an angle greater than 90° but less than, or equal to, 180° can be drawn.

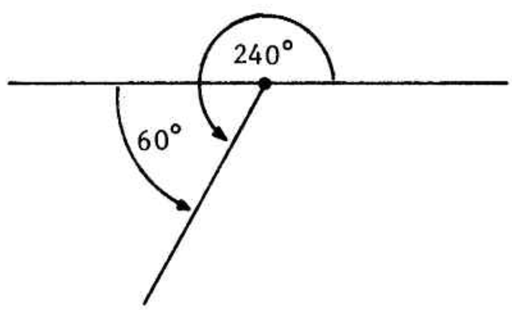
Model: Draw an angle of 130°.



For angles greater than 180° the protractor is placed along the base line, but inverted so that the semicircle points down. For a reading between 180° and 360°, first determine how many degrees more than 180° the angle has and locate the angle on the protractor that corresponds with that amount.

Model: You wish to draw an angle of 240°. How do you proceed?

First, draw a base line with a straightedge. Now draw a dot for the index point in the middle of the line. Invert the protractor so that it points down. Since 240° is 60° more than 180°, make a mark at 60° on your paper. Now draw a line from the index point to the 60° mark. This angle is a 240° angle.



You will note that two different angle magnitudes were included. The 240° angle is made up of a 180° angle and a 60° angle.

Sometimes an angle is already drawn and your task is to construct an angle exactly like the one drawn.

Of course, you could use a protractor, measure the given angle, and then proceed as in the previous paragraph to draw the angle.

However, another procedure involves the use of a compass.

The procedure is best demonstrated in the following six steps.

Step 1. You are given angle XOY. Draw base line $\overleftrightarrow{O'Y'}$ to the side of the given angle XOY.