Math Series
Measurement

Measuring Lengths and Distances

*career*tech

RCCTA Resource Center for
CareerTech Advancement

Measuring Lengths and Distances

How tall are you? How wide is your bedroom? How far is your workplace from your home? These are just a few examples of lengths and distances that people measure every day.

You may wonder why it is important to understand these measurements. Suppose you want to paint your living room. How much paint will you need? In order to determine this, you must know the height and width of your living room walls. Suppose you want to ride your bike to work instead of driving or taking the bus. How long will it take you to get there? Knowing the distance from your home to your workplace will help you make that calculation.

You use different tools to measure lengths and distances every day. You are probably already familiar with rulers and yardsticks. (This unit will give you more practice in reading rulers.) You have probably watched, or participated in, sporting events such as swimming and track and field, where distances are measured in meters. In addition to these, the odometer in your vehicle indicates the distance traveled by the vehicle. A pedometer measures the number of steps you take as you walk. Other tools are used to measure length and distance on the job.

For example: a STEEL TAPE allows carpenters to measure regular and irregular shapes; surveyors may use surveying tapes that are very long, including 300- and 500-foot lengths;

'

MICROMETERS allow automotive service technicians to make extremely accurate inside and outside measurements; and
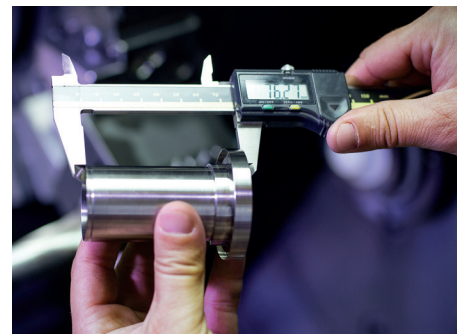
DIAMETER TAPE, TREE CALIPERS, and DIAMETER STICKS all help foresters and others measure the diameter of a tree.

SPECIFIC OBJECTIVES

1. Identify the units used to measure lengths and distances.

2. State the abbreviations of units used to measure lengths and distances.

3. Identify the divisions of a ruler.

4. Explain how to read a ruler.

5. State the steps for measuring an object with a ruler.

6. Determine lengths by using a ruler. (Assignment Sheet 1)

7. Explain how to read a metric ruler.

8. State the steps for measuring an object with a metric ruler.

9. Determine lengths by using a metric ruler. (Assignment Sheet 2)

10. Convert units of length and distance between the metric and English systems. (Assignment Sheet 3)

11. Explain how to convert units of length and distance between larger and smaller units.

12. Convert units of measurement. (Assignment Sheet 4)

13. State principles for adding and subtracting units of length and distance.

14. Calculate measurements of length and distance using addition and subtraction. (Assignment Sheet 5)

Focus Assignment
List three (3) things throughout your house that you would like to measure. Next to each item, write down what you estimate the length (or height) to be. Determine the actual measurement and compare that to your estimate.

objective 1   IDENTIFY THE UNITS USED TO MEASURE LENGTHS AND DISTANCES.

words
you should know

DISTANCE   measurement of the space between two places or objects

LENGTH   measurement of the size of an object

MEASURE   to determine the size or quantity by comparing with a fixed unit or with an object of known size

UNIT   a standard measurement of physical quantities that need clear definitions to be useful

- **ENGLISH UNITS**
  - ▶ 12 inches = 1 foot
  - ▶ 3 feet = 1 yard
  - ▶ 1,760 yards = 1 mile

- **METRIC UNITS**
  - ▶ 1,000 millimeters = 1 meter
  - ▶ 100 centimeters = 1 meter
  - ▶ 10 decimeters = 1 meter
  - ▶ 10 meters = 1 dekameter
  - ▶ 100 meters = 1 hectometer
  - ▶ 1,000 meters = 1 kilometer

    --> **NOTE:** To convert from one metric measurement to another, all you have to do is multiply or divide by units of 10. See Supplement 2.

Did You Know?

The English system of units—also known as the U.S. customary units or standard units—is a system of non-metric units of measurement used in the United States. It is sometimes used alongside the metric system of units. The Imperial system of units is a collection of English units first defined in the Weights and Measures Act of 1824. Imperial units were used in the United Kingdom and its colonies, but were not used in the United States. Both the Imperial and English systems use similar naming "rules" and, in some cases, even use the same measures. However, it is important to recognize them as two separate and different systems of measurement.

The International System of units—often called SI, which stands for the French translation of the term, Système International d'Unités—is also called the metric system in the United States. Every country in the world, except the United States, uses the SI system in daily life. Almost every country—including the United States—uses the SI system in the scientific field.

STATE THE ABBREVIATIONS OF UNITS USED TO MEASURE LENGTHS AND DISTANCES.

- **ENGLISH UNITS**
  - ▶ in. = inch(es)
  - ▶ ft. = foot/feet
  - ▶ yd. = yard(s)
  - ▶ mi. = mile(s)

- **METRIC UNITS**
  - ▶ mm = millimeter(s)
  - ▶ cm = centimeter(s)
  - ▶ dm = decimeter(s)
  - ▶ m = meter(s)
  - ▶ dkm = dekameter(s)
  - ▶ hm = hectometer(s)
  - ▶ km = kilometer(s)

Did You Know?

The earliest system of units was based on parts of the body. The problem with this system was that measurements varied from one person to another. The Egyptians used the width of a man's middle finger (called a digit) and the distance across his palm (called a palm). The Greeks used the length of a finger, which was 0.8 inches. The hand, which equals 4 inches, is still used today to measure the height of horses.

From ancient Egypt, a cubit was the distance from a person's elbow to the tip of his or her outstretched finger; it equaled about 19.5 inches. To avoid confusion, a standard cubit was formed from black granite and called the Royal Cubit. It measured 20.4 inches, and all other cubit sticks were measured against this one. The Babylonians were the first to use the human foot as a unit of measurement in about 1500 B.C., which equaled about 13 inches. The Romans and Greeks also used the human foot as measurement, which equaled about 11.7 inches. Inches were first introduced by the Romans, who divided one foot into 12 units that equaled the width of a man's thumb. A mile originally equaled 1,000 paces of a Roman soldier (where one pace equaled two strides). It was approximately 1,591 yards. The measurement of a yard was introduced by traders to measure cloth and equaled the length of the stretched out cloth between the chin and fingertip. In the 12th century, King Henry I of England defined a yard as the distance between his nose and the tip of his middle finger. In 1305 the yard was changed to equal 3 feet.

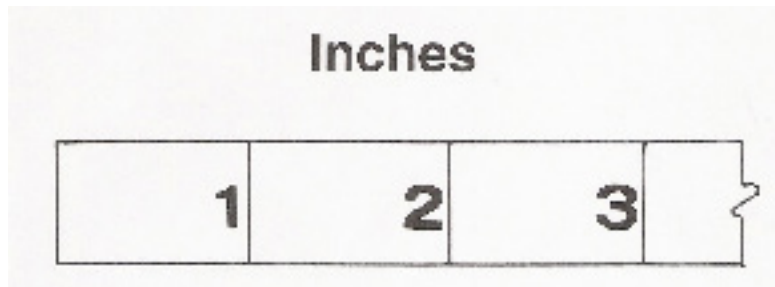## objective 3   IDENTIFY THE DIVISIONS OF A RULER.

- 1 INCH

Inches

Figure 1

--> **NOTE:** Each inch is marked with a vertical line and a number.

- ½ INCH

Halves
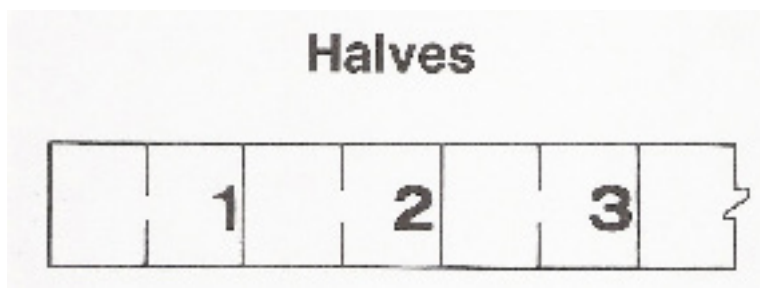
Figure 2

--> **NOTE:** Each inch is divided into 2 equal sections. These sections are called fractions. Each section equals ½ inch. The bottom number of the fraction tells you how many units there are per inch. In this case, there are two units per inch.

- $^1\!/_4$ INCH

Quarters or Fourths
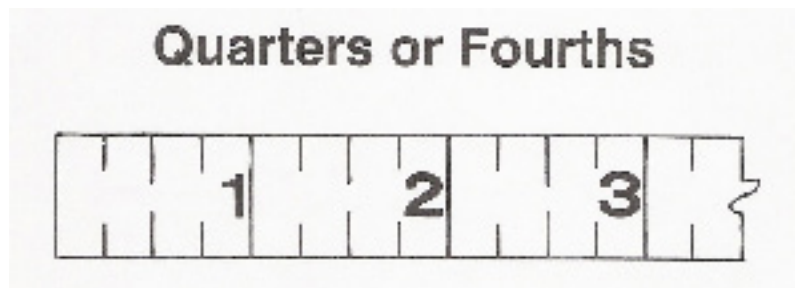
Figure 3

--> **NOTE:** Each inch is divided into 4 equal sections. Each section equals ¼ inch.

- $^1\!/_8$ INCH

Eighths

Figure 4

--> **NOTE:** Each inch is divided into 8 equal sections. Each section equals ⅛ inch.

- $^1\!/_{16}$ INCH

Sixteenths

Figure 5

--> **NOTE:** Each inch is divided into 16 equal sections. Each section equals ⅟₁₆ inch. This is the most accurate type of ruler that measures inches.

objective 4   EXPLAIN HOW TO READ A RULER.

The figure below illustrates a ruler that measures $\frac{1}{16}$ of an inch. You can also use this ruler to read $\frac{1}{8}$ of an inch, ¼ of an inch, and ½ of an inch. As the fraction becomes smaller, the lines become shorter.
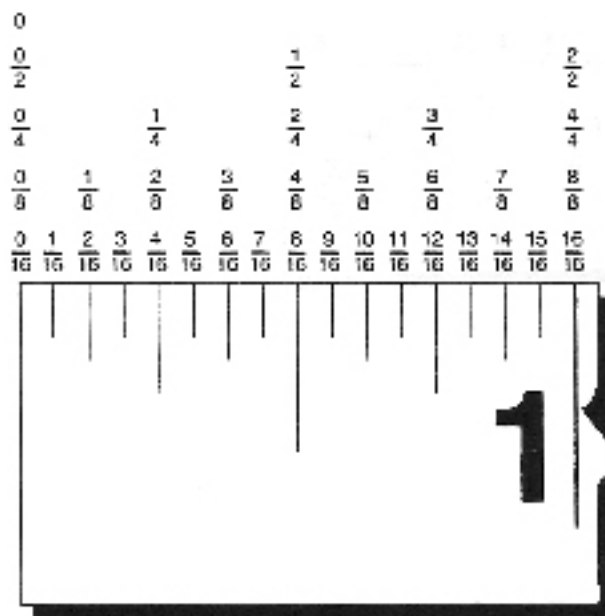
Figure 6

- **Reading inches**—Each inch is marked by a numbered line. These lines are the longest.

- **Reading ½ inch**—The second longest lines indicate the ½ inch marks.

- **Reading ¼ inch**—The third longest lines indicate the ¼ inch marks.

- **Reading $\frac{1}{8}$ inch**—The fourth longest lines indicate the $\frac{1}{8}$ inch marks.

- **Reading $\frac{1}{16}$ inch**—The shortest lines indicate the $\frac{1}{16}$ inch marks.

objective 5

STATE THE STEPS FOR MEASURING AN OBJECT WITH A RULER.

Figure 7

- STEP 1 : Determine the type of ruler you are using. For example, does the ruler have inches divided into ½ inch, ¼ inch, ⅛ inch, or $\frac{1}{16}$ inch?

  EXAMPLE: The above ruler has inches divided into 16ths.

- STEP 2 : Line up the left end of the ruler with the left edge of the object to be measured.

- STEP 3 : Record the largest whole inch mark closest to the right edge of the object (without going past the edge).

  EXAMPLE: For the object in Figure 7, the largest whole inch mark is 2 inches.

- STEP 4 : Count the number of lines from the whole inch mark to the right edge of the object.

  EXAMPLE: From the 2 inch mark on the ruler, there are 8 lines to the right edge of the object or line being measured.

- STEP 5 : Determine the fraction to use. In step 1, it was determined that this ruler measures $\frac{1}{16}$ inch. The lower number in this fraction will be the lower number (or denominator) of the answer fraction, or $\frac{x}{16}$. The top number (or numerator) will be the number found in Step 4, which was 8. Therefore, the fraction will be $\frac{8}{16}$. You can reduce this fraction to ½.

- STEP 6 : Record the measurement.

  EXAMPLE: 2 ½ inches

objective 6

COMPLETE ASSIGNMENT SHEET 1.

objective 7   EXPLAIN HOW TO READ A METRIC RULER.

Reading a metric ruler is similar to reading a ruler that measures in English units. Rather than the units of the ruler being inches, the units on a metric ruler are centimeters and millimeters.
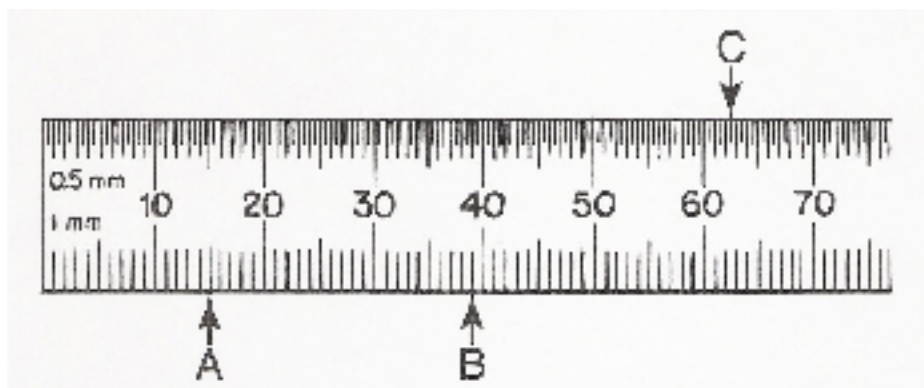

Figure 8

- **Reading centimeters**—Each centimeter is marked by a numbered line. Similar to an inch ruler, these lines are the longest. In the figure above, the numbered lines are in millimeters (10, 20, 30, etc.). Because a centimeter is equal to 10 millimeters (see Supplement 2), each numbered line on this ruler also represents one centimeter.

- **Reading millimeters**—All of the lines between each numbered line represent millimeters. Most metric rulers use a longer line to indicate the halfway point (5 millimeters) between each centimeter.

objective 8 — STATE THE STEPS FOR MEASURING AN OBJECT WITH A METRIC RULER.
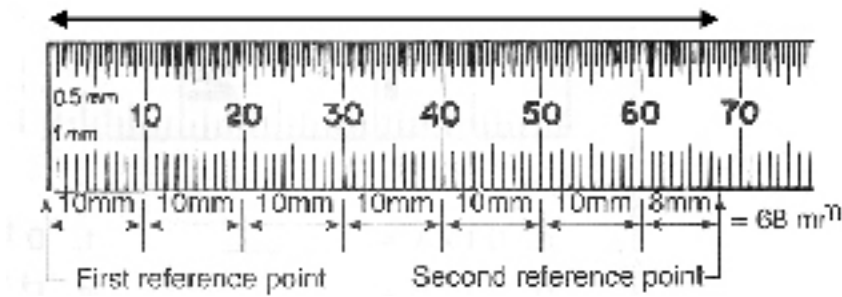
- **STEP 1 :** Line up the left end of the ruler with the left edge of the object to be measured.

- **STEP 2 :** Record the largest whole centimeter mark closest to the right edge of the object (without going past the edge).

  EXAMPLE: For the object in Figure 9, this number is 6 centimeters (60 millimeters).

- **STEP 3 :** Count the number of lines from the whole centimeter mark to the right edge of the object. This will give you the number of millimeters.

  EXAMPLE: From the 6 centimeter mark on the ruler, there are 8 lines to the right edge of the object, or 8 millimeters.

- **STEP 4 :** Record the measurement.

  EXAMPLE: 6 centimeters and 8 millimeters

- STEP 5 : Write the answer as a decimal.

  EXAMPLE: Remember that the metric system is based on units of 10. There are 10 millimeters in 1 centimeter. Looking at the measure recorded in Step 4, we can also write that as $6 \, {}^{8}/_{10}$ centimeters or 6.8 centimeters.

objective 9 — COMPLETE ASSIGNMENT SHEET 2.

objective 10 — COMPLETE ASSIGNMENT SHEET 3.

EXPLAIN HOW TO CONVERT UNITS OF LENGTH AND DISTANCE BETWEEN LARGER AND SMALLER UNITS.

- FROM LARGER TO SMALLER UNITS

RULE	Multiply the given number of larger units by the number of smaller units contained in one larger unit.
FORMULA	(given number of larger units) x (number of smaller units per larger unit) = answer in smaller units
EXAMPLE 1	How many inches are in 5 feet? Given number of larger units = 5 feet Number of smaller units per larger unit = 12 inches per 1 foot or $\dfrac{12 \text{ in}}{1 \text{ ft}}$ (5 feet) x $\dfrac{12 \text{ in}}{1 \text{ ft}}$ = 60 inches There are 60 inches in 5 feet.
EXAMPLE 2	How many meters are in 3 hectometers? Given number of larger units = 3 hectometers Number of smaller units per larger unit = 100 meters per 1 hectometer or $\dfrac{100 \text{ m}}{1 \text{ hm}}$ (3 hectometers) x $\dfrac{100 \text{ m}}{1 \text{ hm}}$ = 300 meters There are 300 meters in 3 hectometers.

- FROM SMALLER TO LARGER UNITS

RULE	Divide the number of smaller units by the number of smaller units in one of the larger units.
FORMULA	$\dfrac{\text{given number of smaller units}}{\text{the number of smaller units per larger units}}$ = answer in larger units
EXAMPLE 1	How many miles are in 5,280 yards? Given number of smaller units = 5,280 yards Number of smaller units per larger unit = 1,760 yards per 1 mile $\dfrac{5{,}280 \text{ yards}}{1{,}760 \text{ yards per mile}}$ = 3 miles There are 3 miles in 5,280 yards.
EXAMPLE 2	How many kilometers are in 500 decimeters? Given number of smaller units = 500 decimeters Number of smaller units per larger unit = 10,000 decimeters per 1 kilometer $\dfrac{500 \text{ decimeters}}{10{,}000 \text{ dm per kilometer}}$ = 0.05 km There are 0.05 kilometers in 500 decimeters.

objective 12   COMPLETE ASSIGNMENT SHEET 4.

objective 13

STATE PRINCIPLES FOR ADDING AND SUBTRACTING UNITS OF LENGTH AND DISTANCE.

ADDING UNITS

- Add like units.
- Simplify the answer by converting smaller units into larger units when possible.

EXAMPLE: Add 4 feet 5 inches to 20 inches.

```
    4 ft.      5 in.              Add inches to inches.
+              20 in.
    4 ft.      25 in.
```

Because 25 inches is more than 1 foot (12 inches), convert the 25 inches into feet:

$$\frac{25 \text{ in.}}{12 \text{ in. per 1 ft.}} = 2 \text{ ft. 1 in.}$$

Add the 2 feet 1 inch to the 4 feet:

```
4 feet 25 inches       =    4 feet + 2 feet 1 inch
                       =    6 feet 1 inch
```

SUBTRACTING UNITS

- Subtract like units if possible. If not, regroup units to allow for subtraction.
- Write the answer in simplest form.

EXAMPLE: Subtract 6 yards 2 feet from 12 yards 3 feet.

```
    12 yd.     3 ft.              Subtract feet from feet.
−    6 yd.     2 ft.              Then subtract yards from yards.
     6 yd.     1 ft.
```

EXAMPLE: Subtract 3 feet 6 inches from 5 feet 4 inches.

```
    4      16
    5 ft.  4 in.                  1 foot = 12 inches, and 12 inches plus 4 inches = 16 inches
−   3 ft.  6 in.
    1 ft.  10 in.
```

Did You Know?

The planets of our solar system are near Earth. If Earth is the size of a grain of rice, Mars is another rice grain about 4 meters (20 feet) away. A nearby star is a grapefruit as far as New York is from Los Angeles. If that "grapefruit" star had its own planets, they would be rice grains as well. Imagine trying to see a rice grain that is 6,000 km (3,500 miles) away.

Source: NASA, *Taking the Measure of the Universe*

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objective 14

COMPLETE ASSIGNMENT SHEET 5.

SUPPLEMENT 1

MORE ENGLISH UNITS OF LENGTH AND DISTANCE

ROD   The length equal to the standardized length of the ox-goad used by medieval English ploughmen. It is also known as a perch or pole. The measurement still appears today. For example, in maps of the Boundary Waters Canoe Area Wilderness in Minnesota, the length of the trails connecting one lake to another is measured in rods.

5 ½ yards = 1 rod

CHAIN   Originally the length of a chain of 100 links, where each link was 6 inches long. It was commonly used in Great Britain as a method for measuring land. It is still widely used in the railway industry.

4 rods = 1 chain

FURLONG   The word "furlong" comes from the Old English words furh (furrow) and lang (long). It referred to the length of the furrow in one acre of a ploughed field. It is still used in horse racing today.

10 chains = 1 furlong
8 furlongs = 1 mile

LEAGUE   Originally used in Europe and Latin America, it measured the distance a person, or a horse, could walk in 1 hour of time. It is no longer used by any system.

3 miles = 1 league

NAUTICAL MILE   Used around the world for naval and aviation purposes.

1.5 miles = 1 nautical mile

LIGHT YEAR   The distance that light travels in one year.

5,878,000,000,000 miles = 1 light-year

SUPPLEMENT 2

HOW THE METRIC SYSTEM WORKS

The metric system is easier to learn than the English system. The five basic units of measurement are listed in the table below.*

MEASUREMENT	UNIT	SYMBOL
length	meter	m
volume	liter	L or l
weight	gram	g
time	second	s
temperature	degree Celsius	C

Prefixes are then attached to each metric unit to indicate the amount measured.

PREFIX	SYMBOL	MULTIPLICATION FACTOR
milli	m	$\frac{1}{1000}$
centi	C	$\frac{1}{100}$
deci	D	$\frac{1}{10}$
deka	Dk	10
hecto	H	100
kilo	K	1,000

To convert from one measurement to another, all you have to do is multiply or divide by units of 10.

> EXAMPLE 1
> How many milligrams are in 1 gram?
> 1 g = ? mg
> To go from grams to milligrams, multiply the number of grams by 1,000. This is also the same as moving the decimal point three spaces to the right.
> 1 g = 1,000 mg

EXAMPLE 2

How many kilometers are in 1 meter?

1 m = ? km

To go from meters to kilometers, divide the number of meters by 1,000. This is also the same as moving the decimal point three spaces to the left.

$1 \text{ m} = \dfrac{1}{1000} \text{ km} = .001 \text{ km}$

For more examples, see the table below.

MEASUREMENT		KILOMETERS	HECTOMETERS	DEKAMETERS	METERS	DECIMETERS	CENTIMETERS	MILLIMETERS
ABBREVIATION		KM	HM	DKM	M	DM	CM	MM
1 kilometer	=	1	10	100	1,000	10,000	100,000	1,000,000
1 hectometer	=	0.1	1	10	100	1,000	10,000	100,000
1 dekameter	=	0.01	0.1	1	10	100	1,000	10,000
1 meter	=	0.001	0.01	0.1	1	10	100	1,000
1 decimeter	=	0.0001	0.001	0.01	0.1	1	10	100
1 centimeter	=	0.00001	0.0001	0.001	0.01	0.1	1	10
1 millimeter	=	0.000001	0.00001	0.0001	0.001	0.01	0.1	1

*There are additional units of measurement associated with the metric system (such as the ampere that measures electrical current), but for our purposes only the five units listed in the first table will be discussed.

ASSIGNMENT SHEETS

ASSIGNMENT SHEET 1

name _____ score _____

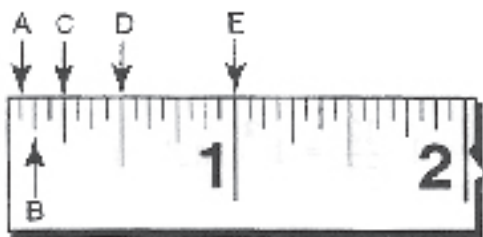### objective 6
DETERMINE LENGTHS BY USING A RULER.

INSTRUCTIONS

Write your answers in the spaces provided.

Equipment list

- pencil or pen
- inches ruler (measuring $\frac{1}{16}$ of an inch)

Part 1 – Read points on a ruler

1. Using the figure above, identify each of the labeled points.

   A = _____   D = _____

   B = _____   E = _____

   C = _____

2. Looking at the figure above, how many units is each inch divided into? _____

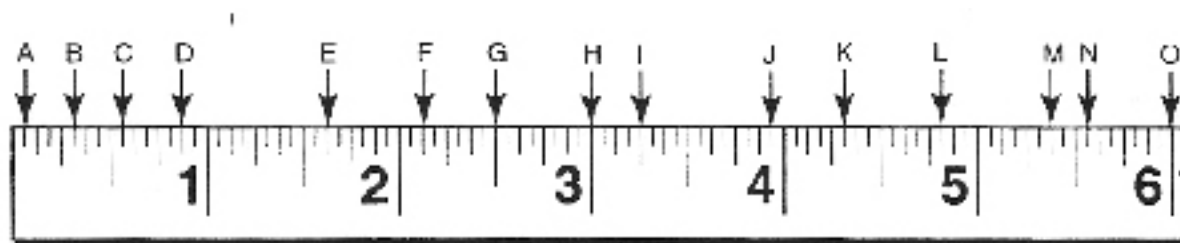3. How many $\frac{1}{16}$ sections are in one inch? _____

4. How many $\frac{1}{8}$ sections are in one inch? _____

5. How many ¼ sections are in one inch? _____

6. How many ½ sections are in one inch? _____

Part 2 – Label points on a ruler

7. Using the ruler below, give the reading of the points listed. Be sure your answers are in the lowest terms.

A = _____   F = _____   K = _____

B = _____   G = _____   L = _____

C = _____   H = _____   M = _____

D = _____   I = _____   N = _____

E = _____   J = _____   O = _____

Using the same ruler, find the distance between the following points. Give your answers in the lowest terms.

8.   A to D = _____   13.   N to O = _____

9.   H to O = _____   14.   B to C = _____

10.   D to E = _____   15.   G to H = _____

11.   H to I = _____   16.   E to F = _____

12.   J to L = _____

Part 3 – Measure lines using a ruler

Using a ruler with inches divided into $\frac{1}{16}$ sections, measure each of the following lines.

17. Length = _____

18. Length = _____

19. Length = _____

20. Length = _____

_____

21. Length = _____

Part 4 – Draw lines the correct length

Using a ruler with inches divided into $\frac{1}{16}$ sections, draw lines that match the following dimensions.

22. 5 inches

23. 3½ inches

24. $1\frac{5}{8}$ inches

25. $2\frac{3}{4}$ inches

ASSIGNMENT SHEET 2

name _____   score _____

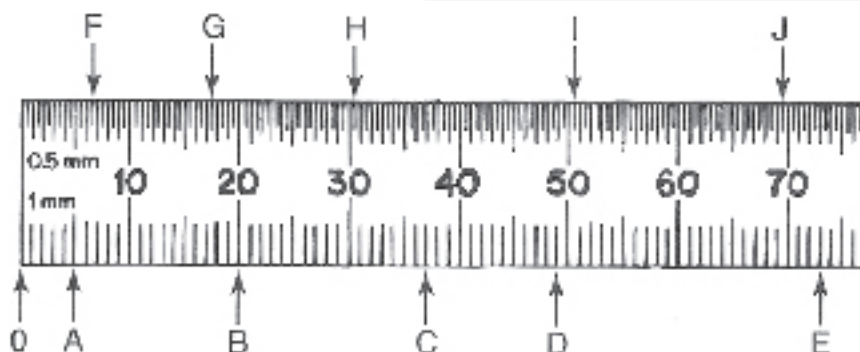## objective 9
DETERMINE LENGTHS BY USING
A METRIC RULER.

INSTRUCTIONS

Write your answers in the spaces provided.

Part 1 – Read points on a metric ruler

1. Read the enlarged metric ruler above. This ruler has 1-millimeter and 0.5-millimeter graduations. Give the reading of the points listed. Be sure your answers are in the lowest terms.

   A = _____   E = _____   I = _____

   B = _____   F = _____   J = _____

   C = _____   G = _____

   D = _____   H = _____

Using the same ruler, find the distance between the following points. Give your answers in the lowest terms.

2. A to B = _____

3. C to D = _____

4. F to G = _____

5. I to J = _____

Part 2 – Measure lines using a metric ruler

Use a metric ruler to measure each of the following lines.

_____

6. Length = _____

_____

7. Length = _____

_____

8. Length = _____

_____

9. Length = _____

Part 3 – Draw lines the correct length

Using a metric ruler, draw lines that match the dimensions in each of the following problems.

10.   3 cm

11.   2.5 cm

12.   1.7 cm

Part 4 – Compare English inches to metric centimeters

For each of the following lines, measure in both inches and centimeters.

_____

13. Length = _____ in.

    Length = _____ cm

_____

14. Length = _____ in.

    Length = _____ cm

_____

15. Length = _____ in.

    Length = _____ cm

_____

16. Length = _____ in.

    Length = _____ cm

_____

17. Length = _____ in.

    Length = _____ cm

name _____ score _____

objective 10
CONVERT UNITS OF LENGTH AND DISTANCE
BETWEEN THE METRIC AND ENGLISH SYSTEMS.

Equipment list

- pencil or pen

- calculator (optional)

INTRODUCTION

You can easily convert between English and metric units of length
and distance.

- **ENGLISH TO METRIC**
  1 in = 2.54 cm
  1 ft = 30.48 cm = 0.305 m
  1 yd = 0.914 m
  1 mi = 1.609 km

- **METRIC TO ENGLISH**
  1 mm = 0.04 in
  1 cm = 0.39 in
  1 m = 39.37 in = 3.28 ft
  1 m = 1.09 yd
  1 km = 0.62 mi

INSTRUCTIONS

Write your answers in the spaces provided.

Part 1 – Convert English units to metric units

1. 4 ft. = _____ cm

2. 3 yd. = _____ m

3. 5 mi. = _____ km

4. 8 in. = _____ cm

5. 2 yd. = _____ cm

6. 1 ft. = _____ mm

7. 10 in. = _____ dm

8. 12 ft. = _____ dkm

9. 18 mi. = _____ hm

10. 7 yd. = _____ dm

Part 2 – Convert metric units to English units

11. 4 m = _____ yd.

12. 10 cm = _____ in.

13. 5 km = _____ mi.

14. 100 mm = _____ in.

15. 10 m = _____ ft.

16. 20 km = _____ mi.

17. 2 cm = _____ in.

18. 6 m = _____ in.

19. 9 m = _____ yd.

20. 12 m = _____ ft.

ASSIGNMENT SHEET 4

name _____ score _____

objective 12
CONVERT UNITS OF MEASUREMENT.

INSTRUCTIONS

Write your answers in the spaces provided.

Part 1 – Convert from larger to smaller units

1. 4 ft. = _____ in.

2. 8 mi. = _____ yd.

3. 6 yd. = _____ ft.

4. 5 yd. = _____ in.

5. 1 mi. = _____ ft.

6. 10 dkm = _____ m

7. 3 cm = _____ mm

8. 7 hm = _____ cm

9. 1 km = _____ dm

10. 12 hm = _____ dkm

Part 2 - Convert from smaller to larger units

11. 18 in. = _____ ft. _____ in.

12. 3,520 yd. = _____ mi.

13. 48 in. = _____ yd. _____ ft.

14. 7 ft. = _____ yd. _____ ft.

15. 6,000 ft. = _____ mi. _____ yd.

    HINT: First calculate how many feet are in one mile.

16. 2,000 mm = _____ hm

17. 40 m = _____ km

18. 550 cm = _____ dkm

19. 70,000 dm = _____ dkm

20. 350 mm = _____ dm

ASSIGNMENT SHEET 5

name _____ score _____

objective 18
CALCULATE MEASUREMENTS OF LENGTH AND
DISTANCE USING ADDITION AND SUBTRACTION.

INSTRUCTIONS

Write your answers in the spaces provided.

Part 1 – Add measurements

1.   2 yd. 2 ft.
       +7 yd. 1 ft.
       ————————

2.   5 yd. 2 ft.
       + 6 yd. 2 ft.
       ————————

3.   10 ft. 9 in.
       + 4 ft 3 in.
       ————————

4.   20 mi. 40 ft.
       + 15 mi. 80 ft.
       ————————

5.   8 yd. 2 ft. 7 in.
       + 3 yd. 2 ft. 6 in.
       ————————

6.   11 mi. 40 yd. 2 ft.
       +   200 yd. 1 ft.
       ————————

7.   3 ft. 5 in.
       7 ft. 7 in.
       + 4 ft. 11 in.
       ————————

8.   2 mi. 220 yd.
       5 mi. 1100 yd.
       + 3 mi. 653 yd.
       ————————

9.   5 ft. 4 in.
       9 ft. 2 in.
       2 ft. 8 in.
       + 7 ft. 1 in.
       ————————

10.   12 yd. 5 in.
       10 yd. 4 in.
       7 yd. 7 in.
       + 2 yd. 9 in.
       ————————

Part 2 – Subtract measurements

11.   8 yd. 6 ft.
         - 6 yd. 2 ft.

12.   4 ft. 0 in.
       - 1 ft. 9 in.

13.   11 yd. 0 ft.
      - 3 yd.   1 ft.

14.   5 yd. 2 ft.
       - 2 yd. 1 ft.

15.   29 yd. 0 ft. 0 in
      - 4 yd. 1 ft. 7 in.

16. 18 yd. 0 ft. 11 in.
    -         2 ft.   9 in.

17.   15 ft. 9 in.
      - 8 ft. 10. in

18.   6 yd. 1 ft.
      - 5 yd. 2 ft

19.   7 ft   4 in.
      - 5 ft. 11 in.

20.   19 ft. 2 in.
     - 11 ft. 9 in.

ASSIGNMENT SHEET ANSWERS

ASSIGNMENT SHEET 1

PART 1

1. A. $\frac{1}{16}$ inch
   B. $\frac{1}{8}$ inch
   C. $\frac{1}{4}$ inch
   D. $\frac{1}{2}$ inch
   E. 1 inch

2. 16
3. 16
4. 8
5. 4
6. 2

PART 2

7. A = $\frac{1}{16}$ in. G = $2\frac{8}{16}$ in. = $2\frac{1}{2}$ in. M = $5\frac{6}{16}$ in. = $5\frac{3}{8}$ in.
   B = $\frac{5}{16}$ in. H = 3 in. N = $5\frac{9}{16}$ in.
   C = $\frac{9}{16}$ in. I = $3\frac{4}{16}$ in. = $3\frac{1}{4}$ in. O = 6 in.
   D = $\frac{14}{16}$ in. = $\frac{7}{8}$ in. J = $3\frac{15}{16}$ in.
   E = $1\frac{10}{16}$ in. = $1\frac{5}{8}$ in. K = $4\frac{5}{16}$ in.
   F = $2\frac{2}{16}$ in. = $2\frac{1}{8}$ in. L = $4\frac{13}{16}$ in.

8. A to D = $\frac{13}{16}$ in.
9. H to O = 3 in.
10. D to E = $\frac{12}{16}$ in. = $\frac{3}{4}$ in.
11. H to I = $\frac{4}{16}$ in. = $\frac{1}{4}$ in.
12. J to L = $\frac{14}{16}$ in. = $\frac{7}{8}$ in.
13. N to O = $\frac{7}{16}$ in.
14. B to C = $\frac{4}{16}$ in. = $\frac{1}{4}$ in.
15. G to H = $\frac{8}{16}$ in. = $\frac{1}{2}$ in.
16. E to F = $\frac{8}{16}$ in. = $\frac{1}{2}$ in.

PART 3
Verify correct measurements:

17. $3\frac{1}{8}$ in.
18. $1\frac{7}{16}$ in.
19. $\frac{3}{16}$ in.
20. $2\frac{3}{4}$ in.
21. $1\frac{7}{8}$ in.

PART 4

22.–25. Verify lengths of lines drawn.

ASSIGNMENT SHEET 2

PART 1

1. A = 5 mm
    B = 20 mm
    C = 37 mm
    D = 49 mm
    E = 73 mm
    F = 6.5 mm
    G = 17.5 mm
    H = 30.5 mm
    I = 50.5 mm
    J = 69.5 mm

2. A to B = 15 mm
3. C to D = 12 mm
4. F to G = 11 mm
5. I to J = 19 mm

PART 2

Verify correct measurements:

6. 79 mm = 7.9 cm
7. 10 mm = 1 cm
8. 41 mm = 4.1 cm
9. 54 mm = 5.4 cm

PART 3

10.–12. Verify the measurement of the lines drawn.

PART 4

13. $2 \frac{9}{16}$ in., 6.5 cm
14. $1 \frac{5}{16}$ in., 3.3 cm
15. 3½ in., 8.9 cm
16. $4 \frac{7}{16}$ in., 11.3 cm
17. $\frac{15}{16}$ in., 2.4 cm

ASSIGNMENT SHEET 3

PART 1

1. 121.92 cm
2. 2.742 m
3. 8.045 km
4. 20.32 cm
5. 182.8 cm
6. 304.8 mm
7. 2.54 dm
8. 0.366 dkm
9. 289.62 hm
10. 63.98 dm

PART 2

11. 4.36 yd
12. 3.9 in
13. 3.1 mi
14. 4 in
15. 32.8 ft
16. 12.4 mi
17. 0.78 in
18. 236.22 in
19. 9.81 yd
20. 39.36 ft

ASSIGNMENT SHEET 4

PART 1

1. 48 in
2. 14,080 yd
3. 18 ft
4. 180 in
5. 5,280 ft
6. 100 m
7. 30 mm
8. 70,000 cm
9. 10,000 dm
10. 120 dkm

PART 2

11. 1 ft. 6 in.
12. 2 mi
13. 1 yd. 1 ft.
14. 2 yd. 1 ft.
15. 1 mi. 240 yd.
16. 0.02 hm
17. 0.04 km
18. 0.55 dkm
19. 700 dkm
20. 3.5 dm

ASSIGNMENT SHEET 5

PART 1

1. 10 yd.
2. 12 yd. 1 ft.
3. 15 ft.
4. 35 mi. 120 ft.
5. 12 yd. 2 ft. 1 in.
6. 11 mi. 241 yd.
7. 15 ft. 11 in.
8. 11 mi. 213 yd.
9. 24 ft. 3 in.
10. 31 yd. 25 in. or 31 yd. 2 ft. 1 in.

PART 2

11. 3 yd. 1 ft.
12. 2 ft. 3 in.
13. 7 yd. 2 ft.
14. 3 yd. 1 ft.
15. 24 yd. 1 ft. 5 in.
16. 17 yd. 1 ft. 2 in.
17. 6 ft. 11 in.
18. 2 ft.
19. 1 ft. 5 in.
20. 7 ft. 5 in.

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RCCTA Resource Center for
CareerTech Advancement

resourcecenter@careertech.ok.gov