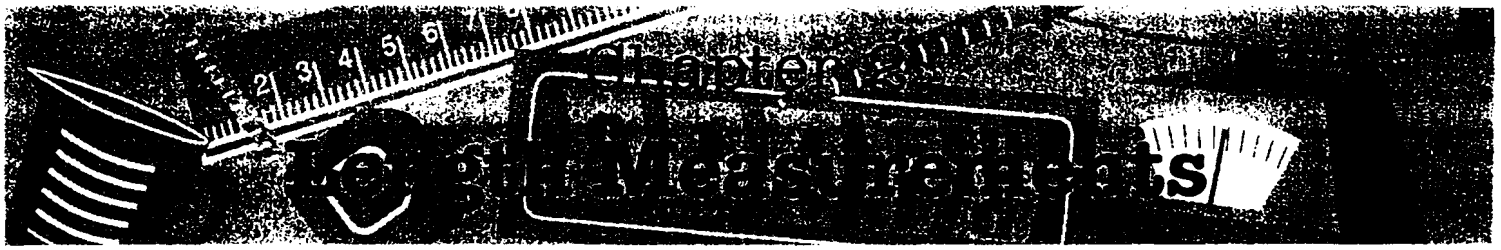


This chapter will introduce you to metric length measurements. You will also learn how to convert between different length units. Developing skills to convert between units is crucial to your future success as you are introduced to other metric measurements in subsequent chapters.

The **meter** is the basic unit of metric length. Other units of length that are commonly used are the kilometer (km),decimeter (dm), centimeter (cm), and millimeter (mm). More about the hectometer (hm) and the dekameter (dam) later.

Let's compare the simple metric length units. Here is a Metric Value Chart which compares all unit lengths relative to the meter (the "basic" unit).

Metric Value Chart 1 • Length Measurement

Unit	Kilometer	Hectometer	Dekameter	Basic Unit Meter	Decimeter	Centimeter	Millimeter
Symbol	1 km =	1 hm =	1 dam =	1 m =	1 dm =	1 cm =	1 mm =
Base Unit Value	1000 m	100 m	10 m	1 m	0.1 m	0.01 m	0.001 m

Prefixes added to a **basic unit** (meter, liter, gram) create larger or smaller units by factors that are powers of 10.

Prefix =	Kilo	Hecto	Deka	Basic Unit	Deci	Centi	Milli
	thousand x Basic Unit	hundred x Basic Unit	ten x Basic Unit		tenth x Basic Unit	hundredth x Basic Unit	thousandth x Basic Unit

Converting Units Moving the Decimal

Use the Metric Value Chart as a guide and you will discover that conversion between units occurs easily by moving the decimal point.

Examples:

Convert (a) 9 m to cm, (b) 47 m to mm, and (c) 4.5 cm to mm.

SOLUTIONS:

a. Place a decimal point to the right of 9 m. Now move the decimal point TWO places to the RIGHT because centimeter is TWO places to the RIGHT of meters on the Metric Value Chart.

Kilometer	Hectometer	Dekameter	Meter	Decimeter	Centimeter	Millimeter

9 •

Therefore, 9 m = 900 cm.

9 .0.0. = 900 cm
m dm cm

To convert 900 cm back to meters, place a decimal point to the RIGHT of 900. Now move the decimal point TWO places to the LEFT because meters are TWO places to the left of centimeters on the Metric Value Chart. Therefore, 900 cm = 9 m (The decimal point is removed because there are no digits to the right of the decimal point.)

9 .0.0. = 9 m
m dm cm

b. To convert 47 m to mm, move the decimal THREE places to the RIGHT. 47 m = 47 000 mm.

Kilometer	Hectometer	Dekameter	Meter	Decimeter	Centimeter	Millimeter

47 •

Another conversion: Convert 47 000 mm to km. Move the decimal point SIX places to the LEFT because kilometer is SIX places to the LEFT of millimeter on the Metric Value line. 47 000 mm = .047 m

c. To convert 4.5 cm to mm, move the decimal point ONE place to the RIGHT because millimeter is ONE place to the RIGHT on the Metric Value Chart. 4.5 cm = 45 mm.

Another conversion: Convert 45 mm to meters. Move the decimal point THREE places to the LEFT because meter is 3 places to the LEFT on the Metric Value Chart. 45 mm = .045 m.

Refer to the Metric Value Chart. Recognize this relationship: .009 km = .09 hm or .9 dam or 9 m or 90 dm or 900 cm or 9 000 mm. All of these notations were reached be moving the decimal point to the RIGHT. All have the same value! They all measure the same distance.

The Metric Value Chart is a helpful guide for your use and reference. You will be presented with other, similar charts as you work with other metric measurements.

It is important to mention that hectometers (hm) and dekameters (dam) are not commonly used metric length meaurements. They are brought to your

attention to show their relationship to other units on the Metric Value Chart. Your attention and interest should be directed to kilometer (km), meter (m), decimeter (dm), centimeter (cm) and millimeter (mm).

The Metric Value Chart is a great beginning "tool" to help you convert between metric measurements. However, after some experience, you will use the Metric Value Chart less and less. Remember the training wheels on your first sidewalk bike? And how anxious you were to discard them? You will eventually feel the same way about the Metric Value Chart.

Exercise 1 Converting Units of Length

You've been studying the Metric Value Chart and how it works when converting between units of length. Now you have an opportunity to test your skills by working the following problems:

1. 10 m = _____ cm
2. 5 cm = _____ mm
3. 25 cm = _____ mm
4. 100 mm = _____ m
5. 165 mm = _____ m
6. 5 mm = _____ km
7. 500 km = _____ m
8. 700 cm = _____ km
9. 7 km = _____ m
10. 35.5 cm = _____ m
11. 7 000 km = _____ m
12. 50 dm = _____ hm
13. 750 m = _____ km
14. 1 500 cm = _____ m
15. 50 m = _____ cm
16. 600 dm = _____ km

Work problems 17 thru 26 by FIRST converting to common units, then add, subtract, or multiply as required.

Example:

4 mm + 1 cm = _____ m (Convert 4 mm to .004 m and 1 cm to .01 m before adding.)

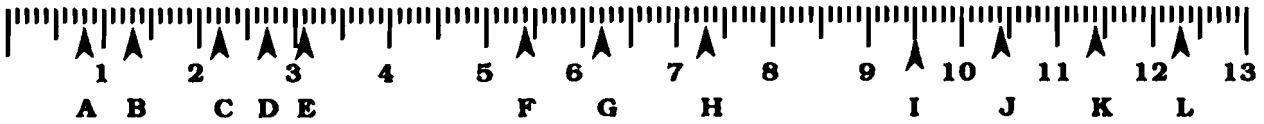
.004 m + .01 m = .014 m (Line up the decimal points.)

17. 5 m + 10 cm = _____ mm
18. 35 m - 20 dm = ____ cm
19. 7 km x 5 = _____ m
20. 150 m x 2.5 = _____ cm
21. 3 cm x 5 mm = _____ mm
22. 7.5 mm x 9 cm = _____ mm
23. 6 m x 5 = _____ cm
24. 5 m - 10 cm = _____ m
25. 9 m + 2 cm - 5 mm = _____ cm
26. 5 x 2 m = _____ cm

Exercise 2 Applying Conversions

Work the length and distance problems that follow.

1. Here is a metric ruler. The numbers indicate centimeters. Give the length in centimeters from the beginning of the ruler to each letter.



A = B = C = D =

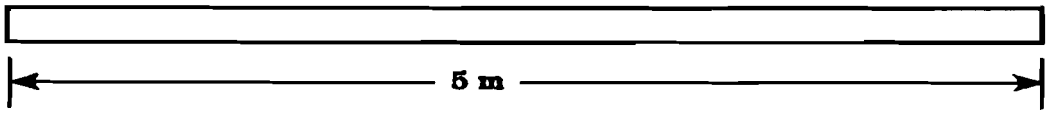
E = F = G = H =

I = J = K = L =

2. Measure the approximate length of the lines shown here:

A = _____ cm B = _ mm C = _____ cm D = ____ mm

3. The piece of pipe shown here is 5 meters (m) long.



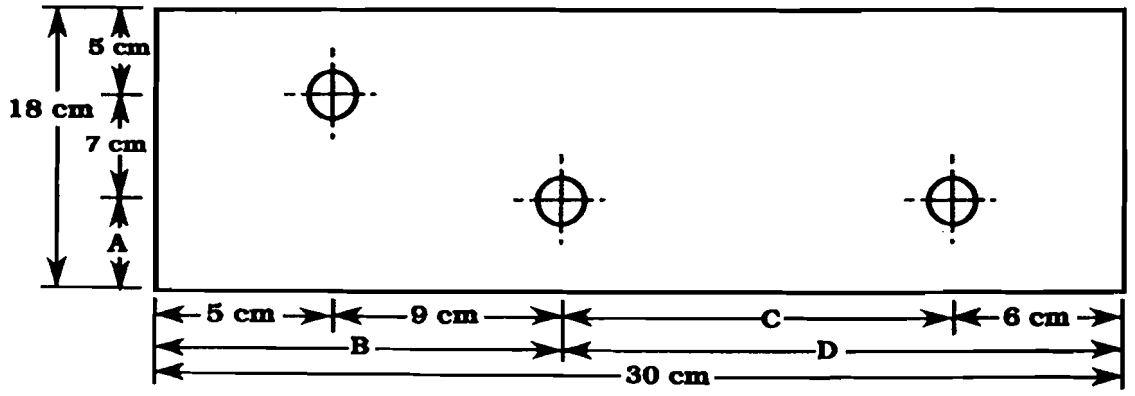
a. The equivalent length in dm = _____

b. The equivalent length in cm = _____

c. The equivalent length in mm = _____

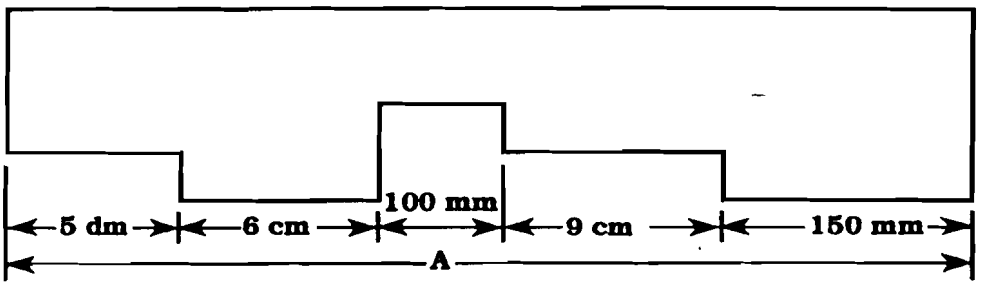
Here are some complex length and distance problems. Remember to make the appropriate conversions to arrive at the required unit of measurement.

4. Determine the missing dimensions.



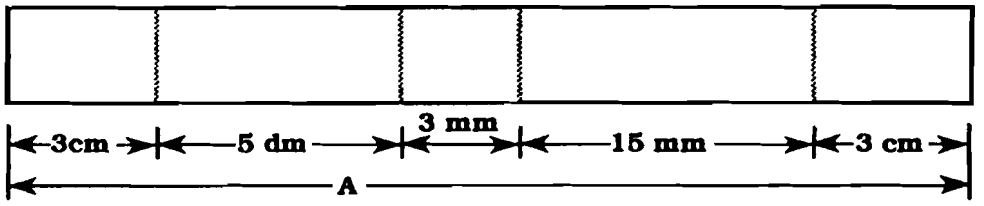
A= _____ B= _____ C= _____ D= _____

5. Determine dimension A in meters (m).



A= _____ m

6. Five pieces of steel pipe are welded together as shown. Determine the length of A in the units required.



a. A = _____ millimeters (mm) b. A = _____ centimeters (cm)

c. A = _____ decimeters (dm) d. A = _____ meters (m)

7. How many total kilometers (km) does a car travel in 7 hours of driving at the average speed of 80 km/hour?

_____ km

8. A speed of 80 km/hour equals approximately how many mph? (Check the Conversion Chart in Chapter 1.)

_____ mph

9. In problem #7 above, approximately how many miles are driven in the 7-hours driving time?

_____ miles

10. Refer to problem #7 above and determine how many meters are driven in 7-hours of driving time.

_____ meters

11. Solve the following mixed operations:

a. 4 m + 25 cm + 90 mm = _____ cm

b. 5.5 cm + 2.5 m - 10 cm = _____ mm

c. 15 m x 5 cm + 10 m = _____ m

d. 15 m - 10 cm + 10 mm = _____ m

e. 5 m x 6 m + 20 cm = _____ cm

f. 200 mm + 25 cm + 50 dm = _____ cm

g. 10 mm x 5 cm = _____ cm

Refer to the charts in Chapter 1 when working the following problems:

12. If there are 25.4 millimeters (mm) in 1 inch, how many meters (m) are in 9'6"?

_____ m

13. Jim Brown is 2 meters (m) tall. How many inches does this equal?

_____ "

14. It's been established that Jim Brown is 2 meters (m) tall, how many centimeters (cm) does this equal?

_____ cm

15. The Chugwater County race track is $1\frac{1}{4}$ miles long. How many kilometers (km) does this equal?

_____ km

16. The neighboring community of High Point is 20 kilometers (km) away. How many meters (m) would this equal?

_____ m

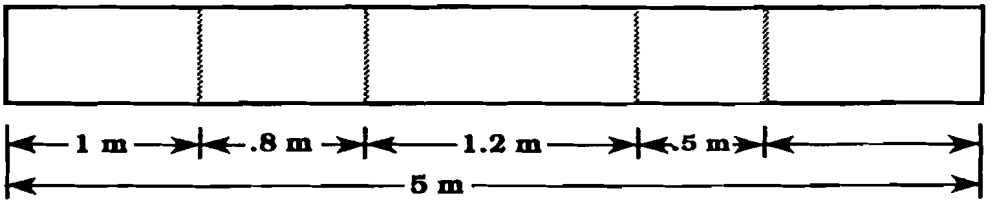
17. A 5K walkathon is scheduled for seniors in our town. How many meters (m) does this equal?

_____ m

18. On a recent cross-country automobile trip, the distance between two cities was 32 miles. How many kilometers (km) does this equal?

_____ km

19. A steel beam shown here has a total length of 5 meters (m). Five pieces are welded together. Determine the missing length.



_____ m