

## 11.1 Linear Measure

Our book tells us that early attempts at measurement involved using hands, arms and feet as units of measure. The English eventually standardized these measurements into the very complicated system called the English System. Today, the U.S. is the only major industrial nation in the world that uses this system.

Some of the units we use:

Unit:	Equivalent to:
1 yard (yd)	3 feet (ft)
1 foot	12 inches (in)
1 mile (mi)	1760 yd, or 5280 ft

Try these conversion problems:

1) 125 ft	yd
2) 3259 yd	mi
3) .3 mi	ft
4) 7 yd	in

The Metric System is also called a decimal system (based on 10's).

The meter is the base unit of the metric system. In terms we can understand, a meter is about the distance from your nose to your outstretched fingertips when you turn your head away from your outstretched arm. One meter is about 39 inches, just a bit longer than a yard.

The other measures in the metric system can be obtained by multiplying the base unit by powers of ten. The following table combines two tables from your book:

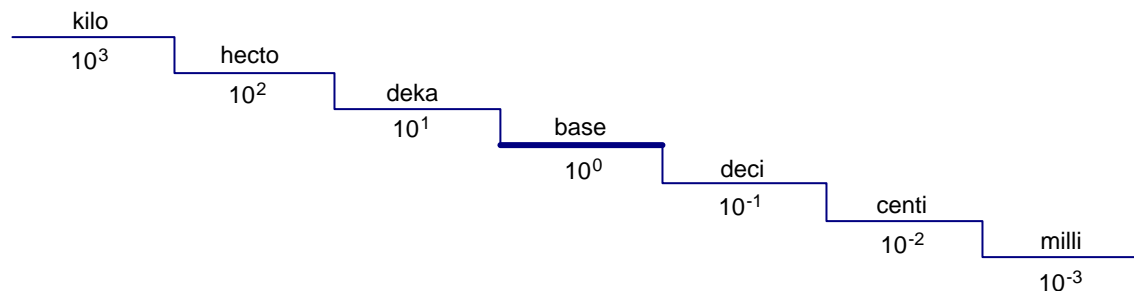
Prefix	Factor	Unit	Symbol	Relationship to Base Unit
kilo	1000	kilometer	km	1000meters
* hecto	100	* hectometer	hm	100 meters
* deka	10	* dekameter	da	10 meters
		meter	m	1 meter
* deci	.1	* decimeter	dm	.1 meter
centi	.01	centimeter	cm	.01 meter
milli	.001	millimeter	mm	.001 meter

\* not commonly used

More conversion problems:

- 1) 2.3 km = \_\_\_\_\_m
- 2) 347mm = \_\_\_\_\_m
- 3) .06km = \_\_\_\_\_cm

Here is a chart that some people find helpful for conversion problems in the metric system:



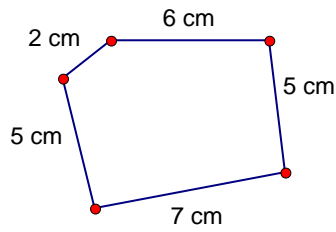
Use the chart to do the three conversions above.

The units we have discussed in this section are all used to measure distance. They are all linear measures. On page 742, read the three Properties of Distance.

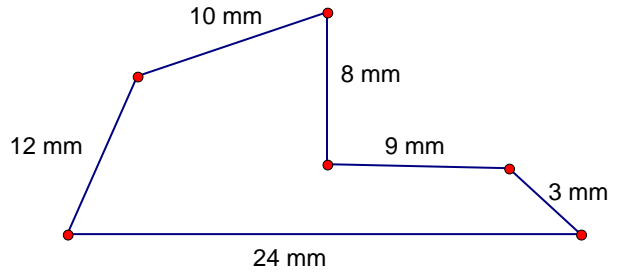
Distance Around a Plane Figure: Perimeter.

If the figure is a polygon, then the perimeter is the sum of the lengths of its sides.

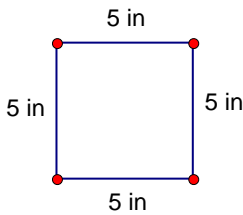
For example, find the perimeters of these polygons:



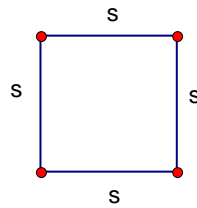
P = \_\_\_\_\_



P = \_\_\_\_\_

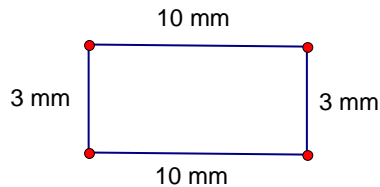


P = \_\_\_\_\_

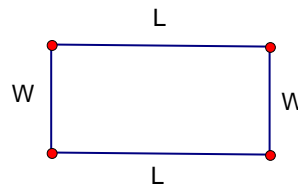


P = \_\_\_\_\_

So, the Perimeter of a Square with side length  $s$  is \_\_\_\_\_



P = \_\_\_\_\_



P = \_\_\_\_\_

So, the Perimeter of a Rectangle with width  $W$  and length  $L$  is \_\_\_\_\_

Circumference of a Circle: The perimeter of a circle (or distance around it).

The ancient Greeks discovered that whenever they divided the circumference of any circle by the length of its diameter, they always got the same result. That result was  $\approx 3.14$ . We call this number pi, and write it using the Greek letter  $\pi$ . **Remember,  $\pi$  is approximately  $\frac{22}{7}$ , or 3.14.**

So,  $\frac{C}{d} = \pi$ , where  $C$  is the circumference and  $d$  is the diameter of a circle. Therefore,

$$C = \pi d \text{ or } C = 2\pi r \quad (r, \text{ the radius})$$

Examples:

- 1) Find the circumference of a circle whose diameter is 10 mm.

2) Find the circumference of a circle whose radius is 3 ft.

Now we can use the circumference of a circle to measure the length of an arc if we know the measure of the central angle of that arc.

For example:



The formula for the measure of the length of an arc with central angle  $\theta$  on a circle of radius  $r$ , is:

$$\frac{\theta}{360} \cdot 2\pi r \text{ or } \frac{\pi r \theta}{180}$$

Examples:

1) Find the length of a  $32^\circ$  arc on a circle whose radius is 5 cm.

2) What is the measure of the central angle of an arc that measures 12 inches on a circle of radius 8?

