

1.3 Conversion Between Imperial and SI Units

Converting Measurement

To convert from one measurement system to another, one needs to understand the relationship between the units of length in each system. Depending on the context of the problem, you will need to determine when conversions should be exact or when it might be appropriate to use an approximate conversion. For example, 1 in. is exactly 2.54 cm or approximately 2.5 cm.

Conversions between SI and imperial units will be limited to commonly used linear units of measure. For example:

$$\text{cm} \leftrightarrow \text{in.}$$

$$\text{m} \leftrightarrow \text{ft.}$$

$$\text{mi.} \leftrightarrow \text{km}$$

Unusual conversions will be avoided. For example:

$$\text{miles} \leftrightarrow \text{mm}$$

The following conversion factors will be provided:

$$1 \text{ inch} = 2.54 \text{ centimeters}$$

$$1 \text{ mile} = 1.6 \text{ kilometers}$$

Example 1:

(A) Convert 10 in to centimeters.

$$\frac{10 \text{ in} = X \text{ cm}}{1 \text{ in} = 2.54 \text{ cm}}$$

$$X = 25.4 \text{ cm}$$

(B) Convert 7 m to inches. $K H D m \rightarrow c m$

$$7 m = 700 cm$$

~~$$\frac{700 cm}{0.54 cm} = \frac{x in}{1 in}$$~~

$$\begin{aligned} 2.54 x &= 700 \\ \frac{2.54 x}{2.54} &= \frac{700}{2.54} \\ x &= 276 in \end{aligned}$$

(C) Convert 8 mi to kilometers.

~~$$\frac{8 mi}{1 mi} = \frac{x km}{1.6 km}$$~~

$$x = 12.8 km$$

(D) Convert 5 in to millimeters. $in \rightarrow cm \rightarrow mm$

$$\frac{5 in}{1 in} = \frac{x cm}{2.54 cm}$$

$$x = 12.7 cm \rightarrow 127 mm$$

$$K H D m \rightarrow c m$$

Example 2:

A road sign says to turn left in 1000 feet. Approximately how far is this distance in kilometers?

$ft \rightarrow yds \rightarrow mi \rightarrow km$

$$\frac{1000 ft}{3 ft} = \frac{x yds}{1 yd}$$

$$\frac{3x}{3} = \frac{1000}{3}$$

$$x = 333 yds$$

$$\frac{333 yds}{1760 yds} = \frac{x mi}{1 mi}$$

$$\frac{1760 x}{1760} = \frac{333}{1760}$$

$$x = 0.19 mi$$

$$\frac{0.19 mi}{1 mi} = \frac{x km}{1.6 km}$$

$$x = 0.3 km$$

Example 3:

Which distance is the longest: 1000yd., 1km, 910m?

$$\frac{1000 \text{ yd} = x \text{ mi}}{1760 \text{ yd} \quad 1 \text{ mi}}$$

$$\frac{1760x = 1000}{1760 \quad 1760}$$

$$x = 0.56 \text{ mi}$$

$$\frac{1 \text{ km} = x \text{ mi}}{1.6 \text{ km} \quad 1 \text{ mi}}$$

$$\frac{1.6x = 1}{1.6 \quad 1.6}$$

$$x = 0.63 \text{ mi}$$

$$910 \text{ m} = 0.910 \text{ km}$$

$$\frac{0.910 \text{ km} = x \text{ mi}}{1.6 \text{ km} \quad 1 \text{ mi}}$$

$$\frac{1.6x = 0.910}{1.6 \quad 1.6}$$

$$x = 0.57$$

Example 4:Calculate the perimeter of the following. Express your answer to the nearest ~~100~~ inch. Hint: Circumference of a circle, $C = \pi d$.

$$d = 18 \text{ cm} - 2(2.5 \text{ cm}) = 13 \text{ cm}$$

$$C = \pi d$$

$$C = \pi(13) = 40.8 \text{ cm}$$

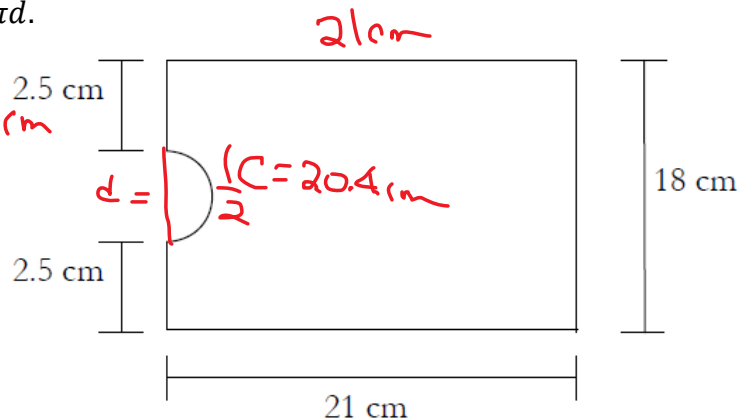
$$\frac{40.8 \text{ cm}}{2} = 20.4 \text{ cm}$$

$$P = 2(21 \text{ cm}) + 18 \text{ cm} + 2(2.5 \text{ cm}) + 20.8 \text{ cm} = 85.4 \text{ cm}$$

$$\frac{85.4 \text{ cm} = x \text{ in}}{2.54 \text{ cm} \quad 1 \text{ in}}$$

$$\frac{254x = 85.4}{254 \quad 254}$$

$$x = 33.6 \text{ in} \approx 34 \text{ in}$$



Example 5:

Convert the following measurement showing unit analysis: 6 yd = ? cm

$$6 \text{ yd} \times \frac{3 \text{ ft}}{1 \text{ yd}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} = 548.6 \text{ cm}$$

Example 6:

Robert bought a Lego™ railway track for his birthday. When he assembled the full track, the distance the toy train travelled along the inside of the track was 182.4 cm. Calculate the radius of the inside edge of the track to the nearest millimetre. ~~Estimate the radius of the outside edge of the track.~~

$$C = 2\pi r \quad \text{or} \quad C = \pi d$$

$$\frac{182.4}{2\pi} = \frac{2\pi r}{2\pi}$$

$$r = 29.3481 \text{ cm} \quad r = 293 \text{ mm}$$

