

Lesson

## Relating SI &amp; Imperial Units

PRE-SKILL

Rounding

round to the nearest tenth

23.221

45.68

39.999

round to the nearest whole unit

3.9cm

~~542149~~  
m

m to km

5284m to km

$$5284\cancel{\text{m}} \times \frac{1 \text{ km}}{1000\cancel{\text{m}}} = 5.284\text{km}$$

5208 mm to km

0.005208 km


Km Hm Dam Metre Dm Cm Mm

### 1.3 Relating SI and Imperial Units

**LESSON FOCUS** Convert measurements between SI units and imperial units.

**Make Connections**

Two cars are driven in opposite directions from a Canada/United States border crossing. In one hour, Hana drove 62 mi. south while Farrin drove 98 km north. How could you determine which vehicle travelled farther from the border?



Each measurement in the imperial system relates to a corresponding measurement in the SI system.

This table shows some approximate relationships between imperial units and SI units.

SI Units to Imperial Units	Imperial Units to SI Units
1 mm = ?	1 in. = ?
1 cm = ?	1 ft. = ?
1 m = ?	1 ft. = ?
1 m = ?	1 yd. = ?
1 m = ?	1 yd. = ?
1 km = ?	1 mi. = ?

We can use the data in the table above to convert between SI and imperial units of measure.

1.3 Relating SI and Imperial Units

Imperial Units to SI Units	
1 in. =	2.54 cm
1 ft. =	0.3048 m
1 yd. =	0.9144 m
1 yd. =	
1 mi. =	1.6093 km

**Example 1** Converting from Metres to Feet

1A A bowling lane is approximately 19 m long.  
What is this measurement to the nearest foot?

**SOLUTION**

Pg 18 19m to feet (whole #)

$$\frac{19\cancel{\text{m}}}{1} \times \frac{1\text{ ft}}{0.3048\cancel{\text{m}}} = \frac{19\text{ ft}}{0.3048} = 62\text{ ft}$$

1.3 Relating SI and Imperial Units

**CHECK YOUR UNDERSTANDING**

1B1. A Canadian football field is approximately 59 m wide.  
What is this measurement to the nearest foot?

$$59\cancel{\text{m}} \times \frac{1\text{ ft}}{0.3048\cancel{\text{m}}} = 193.56 \sim 194\text{ ft}$$

1.3 Relating SI and Imperial Units

**Example 2** Converting between Miles and Kilometres

After meeting in Emerson, Manitoba, Hana drove 62 mi. south and Farrin drove 98 km north. Who drove farther?

**SOLUTION**

Hana

$$\frac{62\cancel{\text{mi}}}{1} \times \frac{1.6093\text{ km}}{1\cancel{\text{mi}}} = 99.78\text{ km}$$

$99.78\text{ km} > 98\text{ km}$   
So Hana drove farther.

1.3 Relating SI and Imperial Units

**CHECK YOUR UNDERSTANDING**

B

After meeting in Osoyoos, B. C., Takoda drove 114 km north and Winona drove 68 mi. south. Who drove farther?

$$68\cancel{\text{mi}} \times \frac{1.6093\text{ km}}{1\cancel{\text{mi}}} = 109\text{ km}$$

$109\text{ km} < 114\text{ km} \therefore \text{Takoda drove farther.}$

1.3 Relating SI and Imperial Units

**Example 3 Solving a Problem that Involves Unit Conversions**

3A Alex is 6 ft. 2 in. tall. To list his height on his driver's license application, Alex needs to convert this measurement to centimetres.

a) What is Alex's height to the nearest centimetre?  
 b) Use mental math and estimation to justify that the answer is reasonable.

**SOLUTION**

① 6ft 2 in into cm

① Change Whole Measure to inches

$$6\text{ft} \times \frac{12\text{in}}{1\text{ft}} = 72\text{in}$$

② Change to cm

$$6\text{ft} 2\text{in} = 74\text{inches}$$

1.3 Relating SI and Imperial Units

**CHECK YOUR UNDERSTANDING**

3B Nora knows that she is 5 ft. 7 in. tall.

a) What height in centimetres will she list on her driver's license application?

① Ft to inches

$$5\text{ft} \times \frac{12\text{in}}{1\text{ft}} = 60\text{in}$$

∴ 5ft 7 inches = 67 inches

② 67in x 2.54cm / 1in = 170 cm


1.3 Relating SI and Imperial Units

**Example 4 Estimating and Calculating Using Unit Conversions**

A truck driver knows that her semitrailer is 3.5 m high. The support beams of a bridge are 11 ft. 9 in. high. Will the vehicle fit under the bridge? Justify the answer.

**SOLUTION**

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① ft to inches

$$11\text{ft} \times \frac{12\text{in}}{1\text{ft}} = 132\text{in}$$

$$11\text{ft} 9\text{in} = 132 + 9 = 141\text{in}$$

1.3 Relating SI and Imperial Units

cm to m

$$358\text{cm} \times \frac{1\text{m}}{100\text{cm}} = 3.58\text{m}$$

3.58m > 3.5m so truck will fit.

**CHECK YOUR UNDERSTANDING**

4. **B** A truck driver knows that his load is 15 ft. wide. Regulations along his route state that any load over 4.3 m wide must have wide-load markers and an escort with flashing lights. Does this vehicle need wide-load markers? Justify your answer.

1.3 Relating SI and Imperial Units

Page 22-23  
 Homework - 4all, 5all, 8  
 9, 10, 11, 12, 15

**End of lesson**  
 #3 on assignment

Homework -pages 22-23

- |               |   |
|---------------|---|
| 4a. 40.6 cm   | 7. i. 2ft 6in                                   |
| b. 1.2 m      | ii. 3 yd  |
| c. 4.6 m      | iii. 6 mi                                       |
| d. 1.5 km     |   |
| e. 9.7 km     |   |
| f. 50.8 mm    | 8. 100.6m by 54.9                               |
| 5. a. 1 inch  | 9. Tennessee                                    |
| b. 8 ft       |   |
| c. 11 yd      | 11. store is \$0.97/m so<br>warehouse is better |
| d. 93 mi.     |   |
| 6. a. 55.9 cm | 12. Michael ran more.                           |
| b. 256.5 cm   | J.L. ran 731.52 m                               |
| c. 9.7 m      | 15. 28 inches                                   |

**Example 1** Converting from Metres to Feet

A bowling lane is approximately 19 m long.  
 What is this measurement to the nearest foot?

**SOLUTION**

From the table,  $1 \text{ m} \approx 3\frac{1}{4} \text{ ft.}$

So,  $19 \text{ m} \approx 19(3\frac{1}{4} \text{ ft.})$

$$19 \text{ m} \approx 19\left(\frac{13}{4}\right) \text{ ft.}$$

$$19 \text{ m} \approx \frac{247}{4} \text{ ft.}$$

$$19 \text{ m} \approx 61\frac{3}{4} \text{ ft.}$$

A length of 19 m is approximately 62 ft.

1.3 Relating SI and Imperial Units

**Example 2** Converting between Miles and Kilometres

After meeting in Emerson, Manitoba, Hana drove 62 mi. south and Farrin drove 98 km north. Who drove farther?

**SOLUTIONS**

To compare the distances, convert one measurement so the units are the same.

**Method 1**

Convert the distance Hana drove from miles to kilometres.

$$1 \text{ mi.} \doteq 1.6 \text{ km}$$

$$\text{So, } 62 \text{ mi.} \doteq 62(1.6 \text{ km})$$

$$62 \text{ mi.} \doteq 99.2 \text{ km}$$

Since  $99.2 \text{ km} > 98 \text{ km}$ , Hana drove farther.

(Solution continues.)

**Example 2** Converting between Miles and Kilometres

**Method 2**

Convert the distance Farrin drove from kilometres to miles.

$$1 \text{ km} \doteq \frac{6}{10} \text{ mi.}$$

$$\text{So, } 98 \text{ km} \doteq 98\left(\frac{6}{10} \text{ mi.}\right)$$

$$98 \text{ km} \doteq 58\frac{8}{10} \text{ mi., or } 58\frac{4}{5} \text{ mi.}$$

Since  $58\frac{4}{5} < 62$ , Hana drove farther.



CHECK YOUR UNDERSTANDING



**Example 3** Solving a Problem that Involves Unit Conversions

Alex is 6 ft. 2 in. tall. To list his height on his driver's license application, Alex needs to convert this measurement to centimetres.

- a) What is Alex's height to the nearest centimetre?
- b) Use mental math and estimation to justify that the answer is reasonable.

**SOLUTION**

- a) Convert 6 ft. 2 in. to inches.

$$1 \text{ ft.} = 12 \text{ in.}$$

$$\text{So, } 6 \text{ ft.} = 6(12 \text{ in.})$$

$$6 \text{ ft.} = 72 \text{ in.}$$

$$\text{And, } 6 \text{ ft. } 2 \text{ in.} = 72 \text{ in.} + 2 \text{ in.}$$

$$6 \text{ ft. } 2 \text{ in.} = 74 \text{ in.}$$

(Solution continues.)

**Example 3** Solving a Problem that Involves Unit Conversions

Write a proportion to convert 74 in. to centimetres.

Let  $h$  represent Alex's height in centimetres.

The ratio of  $h$  centimetres to 74 in. is approximately equal to the ratio of 1 cm to  $\frac{4}{10}$  in.

Write  $\frac{4}{10}$  as 0.4.

$$\frac{h}{74} \doteq \frac{1}{0.4}$$

Multiply each side by 74.

$$74\left(\frac{h}{74}\right) \doteq 74\left(\frac{1}{0.4}\right)$$

$$h \doteq \frac{74}{0.4}$$

$$h \doteq 185$$

Alex is approximately 185 cm tall.

(Solution continues.)



**Example 3** Solving a Problem that Involves Unit Conversions

b) To check:

$$1 \text{ ft.} \approx 30 \text{ cm}$$

$$6 \text{ ft.} \approx 180 \text{ cm}$$

So, 6 ft. 2 in.  $\approx$  185 cm is reasonable.



CHECK YOUR UNDERSTANDING



**Example 4** Estimating and Calculating Using Unit Conversions

A truck driver knows that her semitrailer is 3.5 m high. The support beams of a bridge are 11 ft. 9 in. high. Will the vehicle fit under the bridge? Justify the answer.

**SOLUTION**

Write a proportion to convert 3.5 m to feet.

Let  $h$  represent the height of the vehicle in feet.

The ratio of  $h$  feet to 3.5 m is approximately equal to the ratio of 1 ft. to 0.3 m.

$$\frac{h}{3.5} \approx \frac{1}{0.3}$$

Multiply each side by 3.5.

$$3.5 \left( \frac{h}{3.5} \right) \approx 3.5 \left( \frac{1}{0.3} \right)$$

$$h \approx \frac{3.5}{0.3}$$

$$h \approx 11.\bar{6}, \text{ or } 11\frac{2}{3}$$

(Solution continues.)

**Example 4** Estimating and Calculating Using Unit Conversions

The vehicle is approximately  $11\frac{2}{3}$  ft., or 11 ft. 8 in. high; so it should fit under the bridge.

This height is an estimate that is very close to the bridge height. To be sure the vehicle will fit, calculate an exact conversion. Convert the height of the vehicle in centimetres to inches.

Use the conversion: 2.54 cm = 1 in.

So,

$$350 \text{ cm} = \frac{350}{2.54} \text{ in.}$$

Converting 3.5 m to 350 cm

$$350 \text{ cm} = 137.7952... \text{ in.}$$

Convert inches to feet.

$$350 \text{ cm} = \frac{137.7952...}{12} \text{ ft.}$$

$$350 \text{ cm} = 11.4829... \text{ ft.}$$

This measurement is a little less than  $11\frac{1}{2}$  ft. or 11 ft. 6 in., so the vehicle will fit under the bridge.



CHECK YOUR UNDERSTANDING



What other strategy could you use to determine Alex's height in centimetres?



Discuss the Ideas

1. When might you want to convert:
  - a measurement in SI units to imperial units?
  - a measurement in imperial units to SI units?

Discuss the Ideas

2. What relationships can help you check that an answer is reasonable when you convert between systems of measurement?

Discuss the Ideas

3. When you use unit analysis to verify an answer, how do you decide which conversion factor to use?