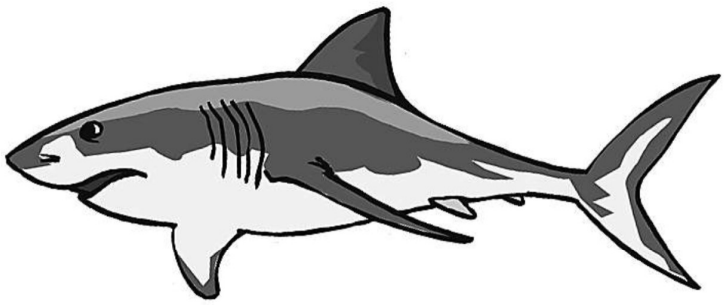
1.5

Measurement Lesson #5:
Scale Diagrams

Great white sharks can grow to a length of approximately 6.5 metres.

The diagram is a scale drawing of a great white shark.



To determine the actual length of the shark, we need to know the scale used in the diagram.

The scale can be given in the following ways:

1. As a **statement**: 1 cm represents 0.5 m.
   This statement tells us that 1 cm on the diagram represents 0.5 m of actual length of the shark.

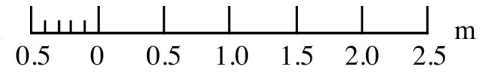
1m=100cm

$\frac{1}{2}$m=50cm

2. As a **rate**: 1 cm : 0.5 m or $\frac{1 \text{ cm}}{0.5 \text{ m}}$.
   This rate also tells us that 1 cm on the diagram represents 0.5 m of actual length of the shark.

3. As a **ratio**: 1:50 ratios must use same units
   This ratio indicates that one unit on the diagram represents 50 units of actual length of the shark. (eg 1 cm on the diagram represents 50 cm of actual length of the shark).

4. As a **line graph scale**:



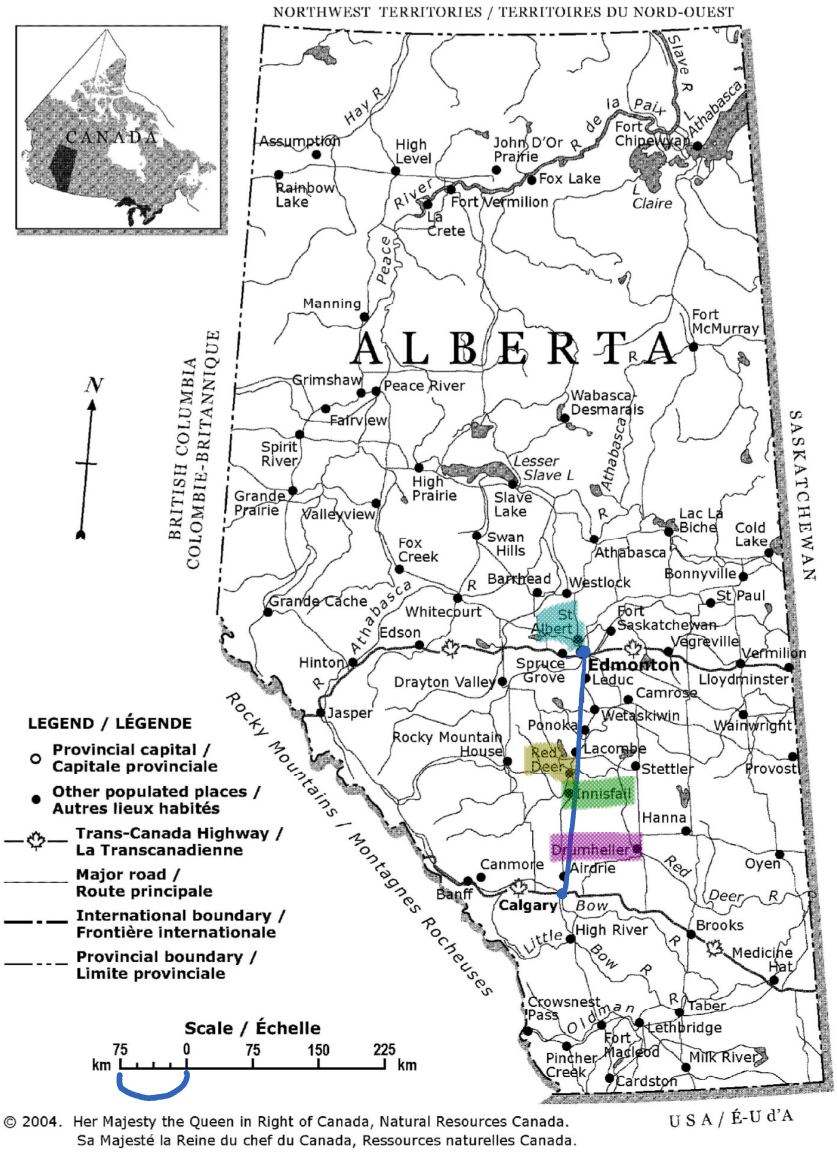
   This scale indicates a measure of 1 cm on the scale diagram represents 0.5 m of actual length of the shark.

The lengths of sharks are generally measured from the tip of the nose to the middle of the tail. Measure the length of the shark in the scale diagram and use proportional reasoning to determine the actual length of the shark represented in the scale diagram.

The shark measures 9.6cm

$\frac{1\text{cm}}{0.5\text{m}} = \frac{9.6\text{cm}}{x\text{m}}$ $x = 9.6(0.5)$ $x = 4.8$

so actual length of shark is 4.8m



Original map data provided by The Atlas of Canada http://atlas.gc.ca/

Use the line graph scale to determine the approximate straight line distance between Calgary and Edmonton.

1cm represents 75km Distance on map = 3.6cm

$$\frac{1\text{cm}}{75\text{km}} = \frac{3.6\text{cm}}{x\text{ km}} \qquad 75(3.6) = 270$$

Distance is 270 km

Original map data provided by The Atlas of Canada http://atlas.gc.ca/

Distance 340km

a) Calculate the approximate straight line distance between New Hazelton and Prince George.

$\frac{1cm}{100km} = \frac{3.4cm}{x km}$ $x = 100(3.4)$

b) Is the answer in a) a realistic estimate of the actual driving distance between New Hazelton and Prince George? Describe a method for determining a more accurate estimate of the driving distance between New Hazelton and Prince George.

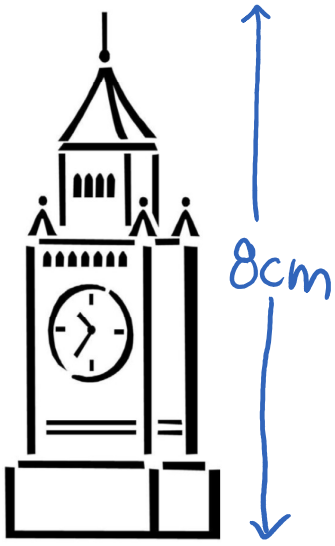
rate

Class Ex. #4

Tyler's scale diagram of a tower is shown.
The actual tower is 240 m tall.

Write the scale Tyler used

$\frac{8cm}{240m} = \frac{1cm}{30m}$



a) in statement form

1cm represents 30m

b) as a rate

1cm : 30m $\frac{1cm}{30m}$

c) as a ratio (need same units)

$30m \times \frac{100cm}{1m} = 3000cm$ 100cm = 1m

1cm : 3000cm

Class Ex. #5

Kylie from Abstract Renovations designs a plan for a candy store to be renovated. The scale drawing on the plan of the candy store is 1 cm : 50 cm.

1m = 100cm

a) What are the actual dimensions of the storage room if the scale diagram dimensions are 8 cm x 12 cm?

$\frac{8}{x} = \frac{1}{50}$ $x = 400$

$\frac{12}{y} = \frac{1}{50}$ $y = 600$

actual dimensions
400cm x 600cm
4m x 6m

b) What are the dimensions on the plan if the dimensions of the chocolate section of the store are to be expanded to be 3.5 m x 4.75 m?

350cm x 475cm

$\frac{1}{50}(350) = 7cm$

$\frac{1}{50}(475) = 9.5cm$

Dimensions on plan are 7cm x 9.5cm

Complete Assignment Questions #1 - #10

Assignment #1, 3-8 /19

1. Use the Alberta map on a previous page to calculate the approximate straight line distance between

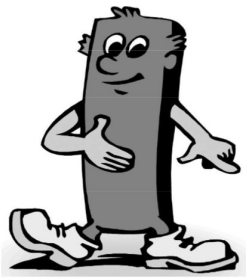
a) St. Albert and Red Deer **b)** Innisfail and Drumheller

2. Which of the straight line distances from question 1 is a more accurate estimate of the actual driving distance between the two places?

3. Use the British Columbia map on a previous page to calculate the straight line distance from

a) Abbotsford to Kamloops **b)** Golden to Fort St. John

4. Rubber Erasers Inc. have designed new erasers. They have also designed a new mascot, on stilts, in the image of an eraser. A scale diagram of the mascot eraser is shown at the right. The actual mascot is 3.6 m tall.



Write the scale used in the diagram

a) in statement form **b)** as a rate **c)** as a ratio

5. Extreme Renos is designing a plan for renovating a house. A scale drawing of the house is made using a scale of 1:50.

a) Determine, in metres, the actual dimensions of the living room if the scale drawing dimensions are 12 cm by 16 cm.

b) What is the width of the garage on the scale drawing if the actual width of the garage is 6.72 m?

c) The renovated kitchen is to measure 3.8 m x 4.3 m. Determine the dimensions of the kitchen on the scale drawing.

6. Vancouver is approximately 350 km from Kamloops. On a map of British Columbia, the cities are 7 cm apart.

a) Determine the scale factor of the map with the units shown:

i) 1 cm : _____ km **ii)** 1 cm : _____ cm

iii) 1 : _____

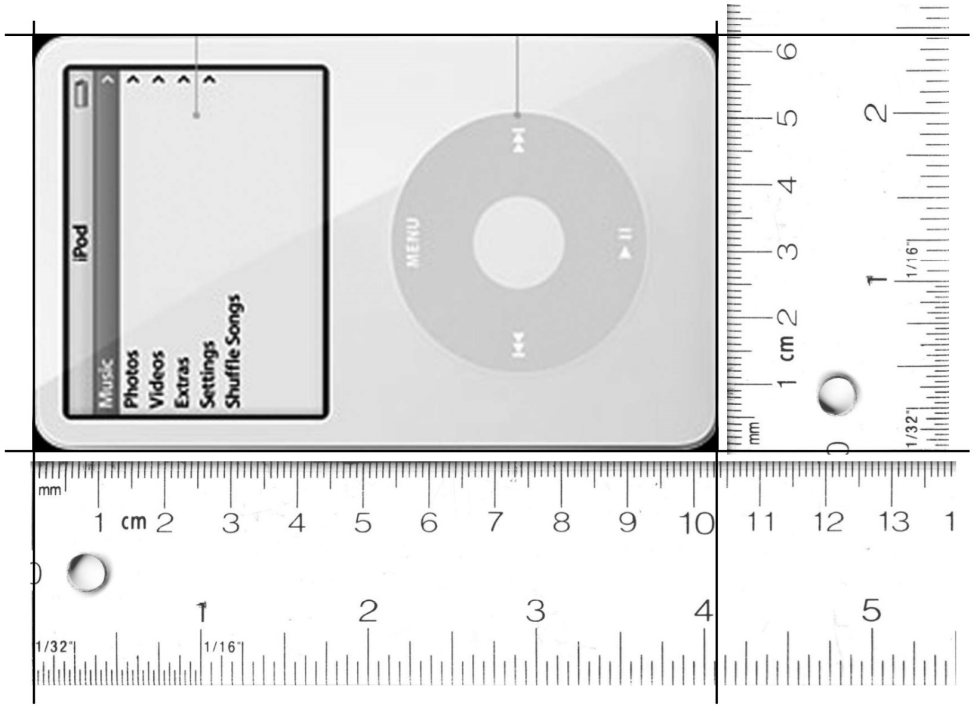
b) Find the actual distance in km between Victoria and Parksville if the distance on the map is 2.9 cm.

7. The Calgary Tower was built in 1967-68 and has a height of 190.8 m = 626 feet. For a school project, Kevin is to make a scale model of the tower.

a) If Kevin uses a linear scale factor of 0.0001, determine the height of the model
i) to the nearest hundredth of a cm **ii)** to the nearest hundredth of an inch

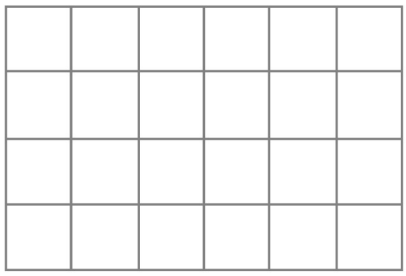
b) Kevin decides to make two sketches of the tower before making the scale model. Determine the scale factor of the sketch if the height of the tower in the sketch is
i) 9.54 cm **ii)** 9.39 inches

8. Consider the first generation iPod shown below.

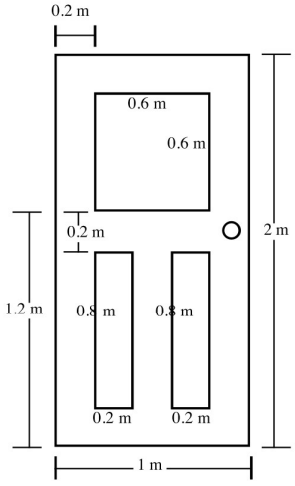


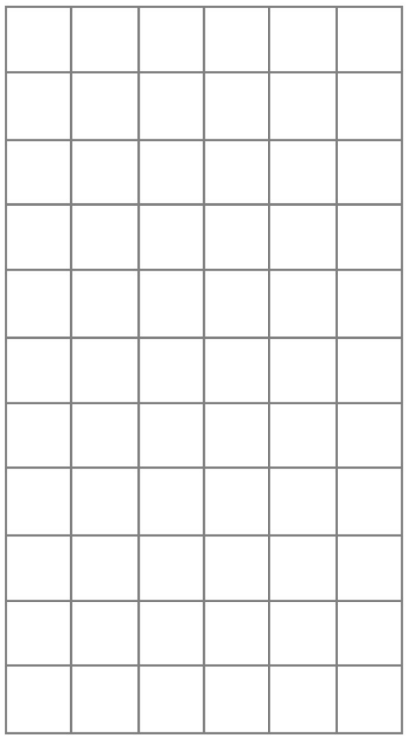
The iPod is a music player and registered trademark of Apple Computers. More information about the iPod may be found at www.apple.com/ca .

On the grid below, draw an accurate scale diagram of the iPod using a scale factor of 1:2.



9. Gerad has made a sketch of a custom door for a client. Use the grid provided to make an accurate scale diagram using a scale factor of $\frac{1}{20}$.





Multiple Choice

10. On a scale map of Western Canada, the distance between Calgary and Edmonton was measured at 11.2 cm. Which of the following gives the best estimate of the real distance between Calgary and Edmonton if the scale on the map is 1cm:25 km?

A. 250 km
B. 280 km
C. 300 km
D. 2 800 km

Answer Key

1. Answers may vary slightly: **a)** 150 km **b)** 105 km **2.** St. Albert to Red Deer
3. Answers may vary slightly: **a)** 230 km **b)** 610 km
4. **a)** 1 cm represents 0.9m **b)** 1cm:0.9m **c)** 1:90
5. **a)** 6 m by 8 m **b)** 13.44 cm **c)** 7.6 cm × 8.6 cm
6. **a)** **i)** 50 **ii)** 5 000 000 **iii)** 5 000 000 **b)** 145 km
7. **a)** **i)** 1.91 cm **ii)** 0.75 inches **b)** **i)** 1:2000 or 0.0005 **ii)** 1:800 or 0.00125
10. B