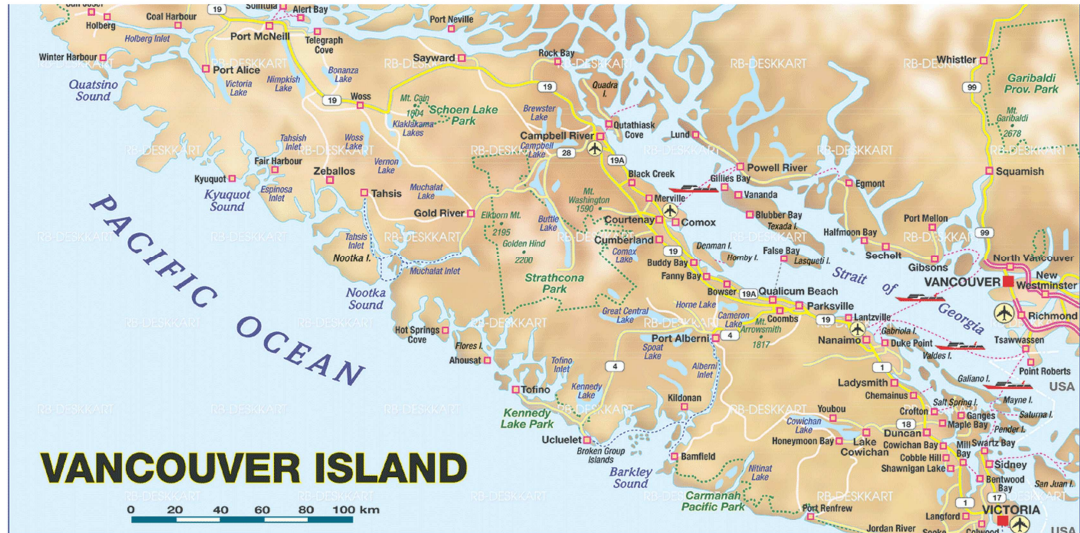


## 3.2 Enlargements and Reductions

Math 9 3.2

### Enlargements and Reductions

Most maps include a **scale** which shows the ratio of distance on the diagram and the actual distance on Earth.



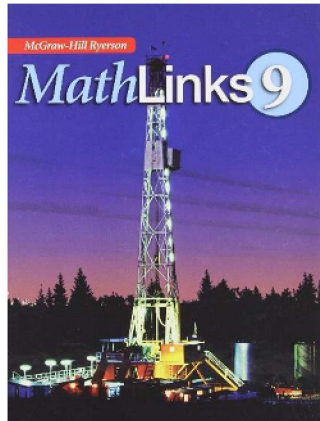
A **scale reduction** is used to illustrate large things that are not practical to draw to actual size because they are too big. Can you think of objects which are drawn using a scale reduction?

- blueprints / floorplans
- interior / exterior design
- large animals
- geological structures
- landmarks

A **scale enlargement** is used to show small things that are too tiny to draw to actual size. Can you think of objects that are drawn using a scale enlargement?

- ants
- insects
- bacteria
- atoms
- molecules

How many times as wide is your textbook as the picture shown here?



← 4.7 cm →

actual width is 20.8 cm  
 $20.8 \div 4.7 \approx 4.4$   
The textbook is about 4.4 times as wide as the picture.

How many times as wide is the dime in the photo as an actual dime?



← 5.9 cm →

actual width is 1.8 cm  
 $5.9 \div 1.8 \approx 3.3$   
The photo is about 3.3 times as wide as an actual dime.

The **scale factor** is the number used as a multiplier in scaling. For example, a scale factor of 3 means the picture is three times as large as the actual object. A scale factor less than one means the picture is smaller than the actual object.

Example: Determine the scale factor used to create this image of a Ferrari 488 GTB if the actual height of the car is 1.2 m.



$$1.2 \text{ m} \times 100 = 120 \text{ cm}$$

$$\text{scale factor} = \frac{\text{image}}{\text{actual}}$$

$$\frac{2}{120} \approx 0.02$$

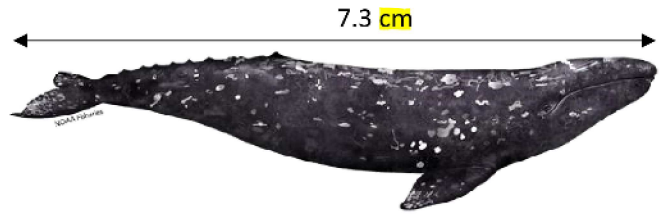
The scale factor is about 0.02.

\* scale factor does not have units

Practice: Determine the scale of this image of a grey whale. The average grey whale is about 14 m in length. Express the scale as a ratio and as a fraction.

$$14\text{m} \times 100 = 1400\text{cm}$$

ratio:  $7.3 : 1400 = 1 : 191.8$



fraction:  $\frac{7.3}{1400} \doteq 0.0052 \leftarrow \text{scale factor}$

Example: The scale for the diagram of the ladybug is 1 : 0.3. What is the scale factor? Calculate the actual height of the ladybug.



$$\text{scale factor} = \frac{1}{0.3} \doteq 3.33$$

$$\frac{1}{0.3} \times \frac{3.7}{x} \leftarrow \begin{array}{l} \text{image} \\ \text{actual} \end{array}$$

$$x = \frac{3.7(0.3)}{1} = 1.11$$

The actual height is 1.11 cm.

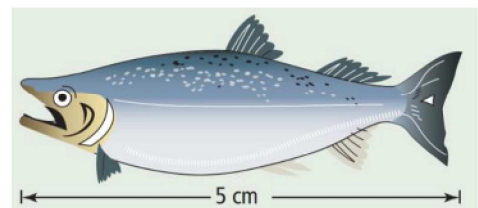
Practice: The scale diagram of the chinook salmon is 1 : 9.2. What is the scale factor? Calculate the actual length of the salmon.

$$\text{scale factor} = \frac{1}{9.2} \doteq 0.11$$

$$\frac{1}{9.2} = \frac{5}{x}$$

$$x = \frac{5(9.2)}{1} = 46$$

The actual length is 46 cm.



Assignment: p. 143 #6 – 12, 14 – 18