8.1 Comparing and Interpreting Rates

rate - amount per time
cost per amount

per = divide

ex
240 words / 8 minutes
380 words / 10 minutes

To compare → divide! to get amount / 1 minute

$\frac{240}{8} = 30$ words/minute.

$\frac{380}{10} = 38$ words/minute ← faster.

Different units:

* before dividing units must be the same

What's a better deal $1.50/lb
or $42.89 for 12 kg.

- change kg into lb 1 kg = 2.2 lb

$12 \times 2.2 = 26.4$ lb

SO $\frac{1.50}{1} = \$1.50$ $\frac{42.89}{26.4} = \$1.62$

↑
better deal

Slope as rate (See page 455 for graph)

Δ = change in

$$\text{slope} = \frac{\Delta y}{\Delta x} \text{ or } \frac{\text{rise}}{\text{run}} \text{ or } \frac{y_2 - y_1}{x_2 - x_1}$$

Slope 1 Points $(\overset{x_1}{0}, \overset{y_1}{0})$ and $(\overset{x_2}{30}, \overset{y_2}{2})$

$$\frac{2-0}{30-0} = \frac{2}{30} \text{ km/min}$$

Slope 2 Points (30, 2) (40, 2)

$$\frac{2-2}{40-30} = \frac{0}{10} = 0 \text{ km/m}$$

Slope 3 Points (40, 2) (60, 5)

$$\frac{5-2}{60-40} = \frac{3}{20} \text{ km/min}$$

To change into km/hr

1. $\frac{2}{30\text{min}} \times \frac{60\text{min}}{1\text{ hr}} = 4 \text{ km/h}$

2. still 0 km/h

3. $\frac{3}{20\text{min}} \times \frac{60\text{min}}{1\text{hr}} = 9 \text{ km/hr}$

Fuel Efficiency:

In USA - mi/gal in Canada L/

which is more efficient (ie used less gas)

more efficient

1. 645 km using 48 L $= \frac{48}{645} = 0.074 \text{ L/km} \rightarrow \times 100 = 7.4 \text{ L/100 km}$
2. 392 km using 32.1 L $= \frac{32.1}{392} = 0.081 \text{ L/km} \rightarrow \times 100 = 8.1 \text{ L/100 km}$

8.2 Problems that Involve Rate

Gas prices: Cost for 90 L

→ $\$1.06/L = \$1.06 \times 90 = \$95.40$

→ $\$2.86$ US / gal $-$ 1 gal $= 3.79$ L

a) So $90\,L = \frac{90}{3.79} = 23.75$ gal

b) $(23.75\text{ gal})(\$2.86\text{ US}) = \$67.92$

c) \$1 US / \$1.02 Cdn

$\$67.92 \times \$1.02 = \$69.27$

In Canada ⇒ $90\,L = \$95.40$
In USA ⇒ $90\,L\,(23.75\text{ gal}) = \$69.27$

You need to get snacks for 180 people. You decide to get cookies which come in a box of 36, and cost \$4.99. How many boxes do you need if each person is expected to have 3 cookies.

$180 \times 3 = 540$ cookies needed

$540 \div 36 = 15$ boxes

Cost $15 \times \$4.99 = \$74.85$

8.3 Scale diagrams

Scale diagram – a drawing where measurements are reduced or enlarged from original

Scale factor – $\frac{\text{drawing measurement}}{\text{actual measurement}}$

– can be used to find drawing length by multiplying

ex 1m : 500m $\Rightarrow$ scale factor $= \frac{1}{500}$

original measurements (actual)

$l = 40\text{m} \Rightarrow 40 \times \frac{1}{500} = 0.08\text{m}$ or 8cm

$w = 15\text{m} \Rightarrow 15 \times \frac{1}{500} = 0.03\text{m}$ or 3cm

so you would draw a lot 8cm x 3cm

Reduction – scale factor < 1 but > 0

Enlargement: scale factor > 1

50cm : 1cm $\Rightarrow$ scale factor $= \frac{50}{1}$ or 50

original measurement (actual)

0.3cm = 0.3 x 50 = 15cm
0.02cm = 0.02 x 50 = 1cm
1.1cm = 1.1 x 50 = 55cm

8.4 Scale Factor in 2-D Shapes

When converting area – have to $(\ )^2$ the scale factor.

$A = 20\text{cm}^2$ Scale = 2 : 25

She is enlarging so scale factor $= \frac{25}{2}$ or 12.5

Area of enlarged kite

$= (12.5)^2(20\text{cm}^2)$

$= 3125\text{cm}^2$

or $\frac{\text{area scale diagram}}{\text{area of kite}} = (\text{scale factor})^2$

$$\frac{20\text{cm}^2}{x} = \left(\frac{2}{25}\right)^2$$

$$\frac{20\text{cm}^2}{x} = \frac{4}{625} \qquad x = 3125\text{cm}^2$$

Finding scale factor

$$\frac{\text{scale}}{\text{original}} = \frac{2836.7}{108} = (\text{scale factor})^2$$

$$\Rightarrow 26.27 = (\text{scale factor})^2 \quad * \sqrt{\text{both sides}}$$

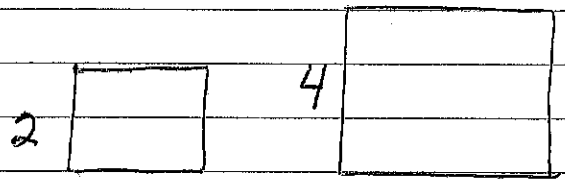
$$\sqrt{26.27} = \sqrt{(\text{scale factor})^2}$$

$$5.13 = \text{scale factor}$$

* once you know the scale factor – you can use it by multiplying to find other sides.

8.5 Similar objects!

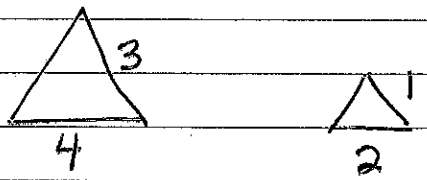
For objects to be similar all measurements have to be the same scale.



$\frac{4}{2} = 2$

$\frac{6}{3} = 2$

same scale so similar



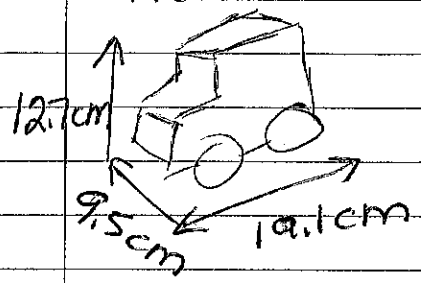
$\frac{4}{2} = 2$

$\frac{3}{1} = 3$

different scale so NOT similar

Determine actual from scale model

Tractor



scale factor $= \frac{1}{16}$

so to find actual x by reciprocal $\left(\frac{1}{16}\right) = 16$

$19.1 \times 16 = 305.6\text{cm}$ or 3m

$9.5 \times 16 = 152\text{ cm}$ or 1.5m

$12.7 \times 16 = 203.2\text{cm}$ or 2m

8.6 Scale Factor and 3-D Objects

When calculating total surface area of new objects (3D)
- multiply by (scale factor)^2

SA = 20cm Scale factor = $\frac{1}{2}$

So new SA = $20\left(\frac{1}{2}\right)^2 = 20 \times \frac{1}{4} = 5$ cm

Volume is cubed. So multiply by (scale factor)^3

V = 20cm scale factor = $\frac{1}{2}$

new V = $20 \times \left(\frac{1}{2}\right)^3 = 20 \times \frac{1}{8} = 2.5$cm

Do Ch 8.5 + 8.6 Quiz + Test

Ch 9 Then start on Project

pg 64, 108, 156, 202, 284, 352, 446, 518.