# Solutions

Page 314 #s 3, 5ace, 7, 8ace, 9, 13, 14, 20abde, 21a, 22abef

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**3.** At a constant rate, a car travels 216 kilometres in 2 hours.

a) How far will the car travel in 3 hours?

b) How long does it take to travel 54 km?

a) $\frac{km}{hours} \Rightarrow \frac{x}{3} = \frac{216}{2}$

$2x = 216(3)$

$\frac{2x}{2} = \frac{648}{2}$

$x = 324\,km$

b) $\frac{hours}{km} \Rightarrow \frac{x}{54} = \frac{2}{216}$

$x(216) = 2(54)$

$\frac{216x}{216} = \frac{108}{216}$

$x = 0.5$ hours

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5. Solve each proportion (find the value of $x$).

a) $\frac{3}{4}=\frac{x}{8}$ c) $\frac{40}{50}=\frac{x}{10}$ e) $\frac{28}{21}=\frac{4}{x}$

Cross multiply, simplify, divide by coefficient

a) $3(8) = x(4)$

$\frac{24}{4} = \frac{4x}{4}$

$6 = x$

c) $40(10) = x(50)$

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

$8 = x$

e) $28(x) = 4(21)$

$\frac{28x}{28} = \frac{84}{28}$

$x = 3$

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7. Explain what it means for a relationship between two variables to be *proportional*.

For values to be proportional, they are related by multiplication (or division).

Eg

| x | y |
|---|---|
| 3 | 12 |
| 5 | 20 |
| 9 | 36 |

y is proportional to x because the y-values are all created by multiplying the x-values by 4.

Note: to be proportional, the point (0,0) needs to work as well.

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**8.** Solve each proportion (find the value of $x$).

a) $\frac{1}{5}=\frac{x}{12}$ c) $\frac{6}{11}=\frac{y}{50}$ e) $\frac{9}{5}=\frac{4}{p}$

a) $1(12)=x(5)$

$\frac{12}{5}=\frac{5x}{5}$

$2.4=x$

c) $6(50)=y(11)$

$\frac{300}{11}=\frac{11y}{11}$

$27.\overline{27}=y$ ← 27 repeats

e) $9(p)=4(5)$

$\frac{9p}{9}=\frac{20}{9}$

$p=2.\overline{2}$ ← 2 repeats

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**9.** A construction worker uses her boot length to estimate distances. The length of her boot is approximately 28 cm.

a) How many centimetres is a distance that equals 17 boot lengths?

b) How many metres is a distance that measures 32 boot lengths?

c) How many boot lengths are needed to measure a distance of 350 cm?

d) How many boot lengths are needed to measure a distance of 7 m?

a) $\frac{cm}{boot}$

$\Rightarrow \frac{x}{17}=\frac{28}{1}$

$x(1)=28(17)$

$x=476$ cm

b) $\frac{m}{boot}$ 28 cm → m

$\Rightarrow \frac{x}{32}=\frac{0.28}{1}$

$x(1)=0.28(32)$

$x=8.96$ m

c) $\frac{boot}{cm}$

$\Rightarrow \frac{x}{350}=\frac{1}{28}$

$x(28)=1(350)$

$\frac{28x}{28}=\frac{350}{28}$

$x=12.5$ boot lengths

d) $\frac{boot}{m}$

$\Rightarrow \frac{x}{7}=\frac{1}{0.28}$

$x(0.28)=1(7)$

$\frac{0.28x}{0.28}=\frac{7}{0.28}$

$x=25$ boot lengths

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**13.** During his record-breaking race at the 2009 IAAF World Championships, Jamaican sprinter Usain Bolt's average speed was 37.58 km/h. Express this speed in metres per second.

$1000\ m = 1\ km$

$\Rightarrow 37.58(1000)\ m = 37.58\ km$

$37{,}580\ m = 1\ km$

$3600$ seconds $= 1$ hour

$(60 \times 60)$

$\Rightarrow$ Speed $= \frac{\text{distance}}{\text{time}}$

$= \frac{37{,}580}{3600} = 10.4\ m/s$

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**14.** Cheetahs are the world's fastest land animal and can reach speeds of up to 70 miles per hour (mph). Express this speed in feet per second, rounded to one decimal place.
*Note: 1 mile = 5280 feet*

$\frac{\text{feet}}{\text{miles}}$

$\Rightarrow \frac{x}{70} = \frac{5280}{1}$

$x(1) = 5280(70)$

$x = 369{,}600\ ft$

$3600$ seconds $= 1$ hour

$(60 \times 60)$

$\Rightarrow \frac{\text{feet}}{\text{second}}$

$= \frac{369{,}600}{3600}$

$= \frac{308}{3}$

$= 102.\bar{6}\ ft/sec$

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**20.** State whether each linear relation is proportional or non-proportional.

a)

| $x$ | $y$ |
|---|---|
| 0 | 10 |
| 1 | 20 |
| 2 | 30 |
| 3 | 40 |
| 4 | 50 |

b)

| $P$ | $t$ |
|---|---|
| −2 | −8 |
| −1 | −4 |
| 0 | 0 |
| 1 | 4 |
| 2 | 8 |

Not proportional
- It doesn't have the point (0,0)

Proportional
- It goes through the point (0,0) AND the rate of change is constant.

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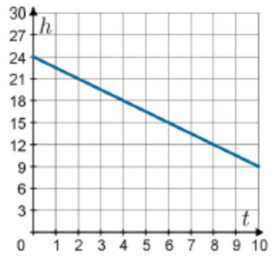
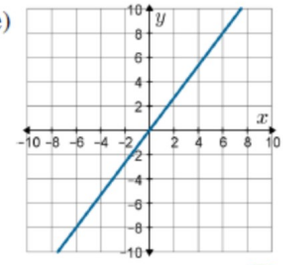
**20.** State whether each linear relation is proportional or non-proportional.

d)




e)




Not proportional
- It doesn't go through the point (0,0)

Proportional
- It goes through the point (0,0) AND the rate of change (slope) is constant.

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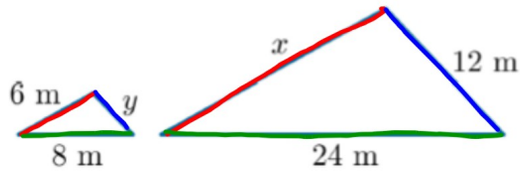
**21.** Two figures are said to be *similar* if they have the same shape. Specifically, similar figures have equal corresponding angles and proportional corresponding side lengths. For each of the following pairs of similar figures, determine the values of $x$ and $y$.
*Note: Diagram scales may not be accurately illustrated.*

a)




$\Rightarrow \frac{x}{6} = \frac{24}{8}$ $\quad \frac{y}{12} = \frac{8}{24}$

$x(8) = 24(6)$ $\quad y(24) = 8(12)$

$\frac{8x}{8} = \frac{144}{8}$ $\quad \frac{24y}{24} = \frac{96}{24}$

$x = 18\text{m}$ $\quad y = 4\text{m}$

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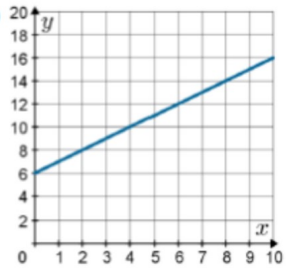
**22.** *Direct variation* occurs when a linear relation is proportional. *Partial variation* occurs when a linear relation is not proportional. State the type of variation for each linear relation.

a)

| $x$ | $y$ |
|---|---|
| 0 | 0 |
| 1 | 16 |
| 2 | 32 |
| 3 | 48 |
| 4 | 64 |

b)




Direct variation

(does pass through (0,0) AND does have a constant rate of change)

Partial variation

(doesn't pass through (0,0))

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**22.** *Direct variation* occurs when a linear relation is proportional. *Partial variation* occurs when a linear relation is not proportional. State the type of variation for each linear relation.

e) $y = 8x - 15$ f) $x + y = 4$

Partial variation (doesn't pass through (0,0))

$y = -x + 4$
Partial variation (doesn't pass through (0,0))

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