

# Fully-Worked Solutions

## CHAPTER 10 Gradient of a Straight Line

### UPSKILL 10.1

- 1 (a) Gradient of  $PQ = \frac{9.6}{6.0} = 1.6$   
 (b) Gradient of  $PQ = \frac{24}{36} = \frac{2}{3}$
- 2 Gradient of  $AB = \frac{4 - (-6)}{-5 - 3}$   
 $= -\frac{5}{4}$   
 Gradient of  $BC = \frac{10 - (-6)}{9 - 3}$   
 $= \frac{16}{6}$   
 $= \frac{8}{3}$
- 3 (a)  $\frac{11 - 2}{4 - 1} = \frac{9}{3} = 3$   
 (b)  $\frac{1 + 3}{-3 - 5} = \frac{4}{-8} = -\frac{1}{2}$   
 (c)  $\frac{6 - 6}{7 + 2} = 0$   
 (d)  $\frac{9 + 2}{4 - 4} = \text{undefined}$
- 4 (a)  $m = -\frac{6}{10} = -\frac{3}{5}$   
 (b)  $m = -\frac{6}{-4} = \frac{3}{2}$
- 5  $m = -\frac{12}{-4} = 3$
- 6  $m = -\frac{-3}{15} = \frac{1}{5}$
- 7  $-\frac{8}{x} = -12$   
 $x = \frac{8}{12} = \frac{2}{3}$
- 8 (a) 0  
 (b) Undefined  
 (c)  $\frac{10 - 4}{8 - 12} = -\frac{3}{2}$
- 9 (a)  $l_2, l_3$   
 (b)  $l_1, l_4$
- 10 (a)  $\frac{80}{2} = 40$  km/h  
 (b) (i)  $\frac{60}{1} = 60$  km/h  
 (ii)  $\frac{20}{3} = \frac{80}{3} = 26\frac{2}{3}$  km/h  
 (c) From 0915 hours to 1015 hours, the bus moves faster than the lorry, and then moves slower than the lorry after 1015 hours.
- 11 (a)  $\frac{120}{2} = 60$  km/h

- (b) The gradient represents the speed of the bus
- 12 (a)  $-\frac{200}{40} = -5$  litres/minute  
 (b) Water is drained out at the rate of 5 litres per minute.
- 13 (a) Gradient of  $AB =$  Gradient of  $AC$   
 $= \frac{1 - 4}{7 + 2}$   
 $= -\frac{1}{3}$   
 (b)  $\frac{y - 4}{0 + 2} = -\frac{1}{3}$   
 $y = -\frac{2}{3} + 4$   
 $y = \frac{10}{3}$
- 14 (a)  $4 - k = 0$   
 $k = 4$   
 (b)  $h - (-3) = 0$   
 $h = -3$   
 (c)  $\frac{2a - 4}{a + 3} = 3$   
 $2a - 4 = 3a + 9$   
 $a = -13$   
 (d)  $\frac{b - 4}{3b + 3} = -\frac{2}{3}$   
 $3b - 12 = -6b - 6$   
 $9b = 6$   
 $b = \frac{2}{3}$
- 15 (a)  $\frac{40}{100} = \frac{2}{5}$   
 (b) 0  
 (c)  $\frac{60}{60} = 1$   
 (d)  $-\frac{100}{80} = -\frac{5}{4}$

## Summative Practice 10

### Section A

- 1 Gradient  $= \frac{3.6}{2.7} = \frac{4}{3}$   
 Answer: **B**
- 2 Taking two points: (4, 1), (-2, -3)  
 Gradient  $= \frac{1 + 3}{4 + 2}$   
 $= \frac{4}{6}$   
 $= \frac{2}{3}$   
 Answer: **C**
- 3  $\frac{8 - 2}{4 - 8} = -\frac{6}{4} = -\frac{3}{2}$   
 Answer: **B**
- 4  $\frac{8 + 4}{-3 - 1} = -\frac{12}{4} = -3$   
 Answer: **D**

$$5 \quad \frac{4-2}{-9-x} = -\frac{1}{6}$$

$$12 = 9 + x$$

$$x = 3$$

Answer: C

$$6 \quad -\frac{5}{-8} = \frac{5}{8}$$

Answer: A

$$7 \quad \frac{5+2}{h-0} = \frac{-6+2}{8-0}$$

$$56 = -4h$$

$$h = -14$$

Answer: B

$$8 \quad -\frac{6}{x} = -\frac{3}{4}$$

$$x = 2 \times 4 = 8$$

Answer: A

$$9 \quad \text{Gradient} = \frac{5-5}{3+2} = 0$$

Hence, straight line JK is parallel to x-axis.

Answer: D

$$10 \quad \frac{12-4}{3a-a} = \frac{4+2}{a+1}$$

$$8a + 8 = 12a$$

$$4a = 8$$

$$a = 2$$

Answer: D

### Section B

1

	Statements	✓ or ✗
(a)	The gradient of a straight line that passes through points $(x_1, y_1)$ and $(x_2, y_2)$ is $\frac{(y_2 - y_1)}{(x_2 - x_1)}$ .	✓
(b)	If $a$ and $b$ are the $y$ -intercept and $x$ -intercept of a straight line respectively, then the gradient of the line is $\frac{a}{b}$ .	✗
(c)	The gradient of a straight line that is parallel to the $x$ -axis is zero.	✓
(d)	On a Cartesian plane, a straight line that inclined upwards from left to right has a positive gradient.	✓

2 (a) The  $y$ -intercept of the line CD is 10

(b) The gradient of BC is  $\infty$

$$(c) \quad \text{Gradient of } OC = \frac{10}{12} = \frac{5}{6}$$

(d)  $OA = 2AB$

$$OA = \frac{2}{3}OB$$

$$= \frac{2}{3} \times 12$$

$$= 8$$

$$\text{Gradient of } AC = \frac{10}{12-8}$$

$$= \frac{10}{4}$$

$$= \frac{5}{2}$$

3  $x$ -intercept = 2

$$\text{Gradient of } AD = -\frac{6}{2} = -3$$

$$\frac{9}{h-2} = -3$$

$$-3 = h - 2$$

$$h = -1$$

$$\frac{k}{5} = -3$$

$$k = -15$$

### Section C

$$1 \quad (a) \quad (i) \quad \frac{12-0}{6-x} = 3$$

$$12 = 18 - 3x$$

$$3x = 6$$

$$x = 2$$

$$(ii) \quad \frac{12-y}{6-0} = 3$$

$$12 - y = 18$$

$$y = -6$$

$$(b) \quad (i) \quad \text{Gradient of } PQ = \frac{6 - \frac{8}{3}}{3 - 8}$$

$$= -\frac{1}{5} \left( \frac{18 - 8}{3} \right)$$

$$= -\frac{1}{5} \left( \frac{10}{3} \right)$$

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

(ii) By considering the points  $(0, c)$  and  $(3, 6)$ ,

$$\frac{c-6}{0-3} = -\frac{2}{3}$$

$$c - 6 = 2$$

$$c = 8$$

$$(c) \quad (i) \quad \frac{15-5}{8-0} = \frac{5}{4}$$

$$(ii) \quad \frac{40-5}{x-0} = \frac{5}{4}$$

$$x = 35 \times \frac{4}{5} = 28$$

The distance travelled is 28 km.

2 (a) (i) 0

(ii) Undefined

$$(iii) \quad \frac{1}{2}$$

$$(b) \quad (i) \quad \text{Gradient of } BC = \frac{-1+3}{2+1} = \frac{2}{3}$$

(ii) Gradient of AD = Gradient of BC

$$\frac{d-0}{0+3} = \frac{2}{3}$$

$$d = 2$$

$$(c) \quad (i) \quad \text{Gradient of } OA = \frac{1\,200}{6} = \text{RM}200 \text{ per month}$$

$$\text{Gradient of } BC = \frac{800-400}{4} = \text{RM}100 \text{ per month}$$

(ii) The gymnasium chosen by Anna is more economical because the gradient of BC is less than the gradient of OA.

$$3 \quad (a) \quad (i) \quad m = \frac{10-4}{0-4} = -\frac{3}{2}$$

(ii)  $m = 0$

$$(iii) \quad m = \frac{8-4}{12-8} = 1$$

$$(iv) m = \frac{0 - 8}{14 - 12} = -4$$

$$(b) (i) m = \frac{-6 + 2}{2 + 6} = -\frac{1}{2}$$

$$(ii) \frac{-6 - 0}{2 - x} = -\frac{1}{2}$$

$$12 = 2 - x$$

$$x = -10$$

$$(iii) \frac{-6 - y}{2 - 0} = -\frac{1}{2}$$

$$12 + 2y = 2$$

$$y = \frac{2 - 12}{2} = -5$$

$$(c) (i) \frac{y - 3}{0 - 3} = -3$$

$$y = 9 + 3 = 12$$

$$(ii) C = (0, 6)$$

$$m = \frac{6 - 3}{0 - 3} = -1$$

$$(iii) \frac{3 - 0}{3 - x} = -1$$

$$3 = -3 + x$$

$$x = 6$$