

## Solutions

### 10 Gradient and Straight Line

1. a) Gradient AB =  $\frac{3 - (-7)}{4 - (-1)} \rightarrow \frac{10}{5} \rightarrow 2$

b) Use  $y = mx + c$  Eqn is:  $y = 2x - 5$

c)  $(3k, k)$  lies on AB, so it will satisfy the equation  
Hence,  $k = 2(3k) - 5$   $k = 6k - 5$   $5 = 5k$   $k = 1$

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2. Gradient =  $\frac{a-t}{a^2-t^2} = \frac{\cancel{a-t}}{(a+t)(\cancel{a-t})} = \frac{1}{a+t}$

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3. a) Gradient AB =  $\frac{6-4}{6-2} \rightarrow \frac{2}{4} \rightarrow \frac{1}{2}$

Use  $y = mx + c$ , so  $y = \frac{1}{2}x + c$

Need to find  $c$ , so use point  $(2, 4)$

$4 = \frac{1}{2}(2) + c$   $4 = 1 + c$   $c = 3$

Equation is  $y = \frac{1}{2}x + 3$

b) To find  $M$ , we know that  $y = 0$

Hence  $0 = \frac{1}{2}x + 3$  solving gives  $x = -6$

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4. This is a simplified version of Question 3.

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5. Gradient =  $\frac{3-0}{10-4} \rightarrow \frac{3}{6} \rightarrow \frac{1}{2}$

So,  $T = \frac{1}{2}S + c$

Find  $c$  using  $(4, 0)$  in the equation

$0 = \frac{1}{2}(4) + c$   $0 = 2 + c$   $c = -2$

Equation is:  $T = \frac{1}{2}S - 2$

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6. Gradient =  $\frac{9-1}{4-0} \rightarrow \frac{8}{4} \rightarrow 2$

y-intercept = 1 Equation is:  $y = 2x + 1$

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7. Gradient =  $\frac{9-3}{3-0} \rightarrow \frac{6}{3} \rightarrow 2$

y-intercept = 3 Equation is:  $y = 2x + 3$

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8. Gradient =  $\frac{50-5}{60-0} \rightarrow \frac{45}{60} \rightarrow \frac{3}{4}$

y-intercept = 5 Equation is:  $y = \frac{3}{4}x + 5$

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9. a) Draw graph - plot points  $(0, 10)$  - initial state and  $(6, 40)$  - 6 mins to add 30 litres at 5 litres/min and 40 litres (30 litres added to existing 10)

b) Gradient =  $\frac{40-10}{6-0} \rightarrow \frac{30}{6} \rightarrow 5$

y-intercept = 10

Equation is:  $V = 5x + 10$

### Applications of straight line

1. B is  $(12, 40)$  and A is  $(0, 4)$

Gradient =  $\frac{40-4}{12-0} \rightarrow \frac{36}{12} \rightarrow 3$ , y-intercept = 4

Equation is:  $m = h + 4$

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2. Gradient =  $\frac{100-40}{4-0} \rightarrow \frac{60}{4} \rightarrow 15$ , y-intercept = 40

Equation is:  $H = 15t + 40$

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3. B is  $(90, 82)$  and A is  $(0, 12)$

Gradient =  $\frac{82-12}{90-0} \rightarrow \frac{70}{90} \rightarrow \frac{7}{9}$ , y-intercept = 12

Equation is:  $g = \frac{7}{9}h + 12$

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4. a) Gradient =  $\frac{6-2}{12-0} \rightarrow \frac{4}{12} \rightarrow \frac{1}{3}$ , y-intercept = 2

Equation is:  $y = \frac{1}{3}x + 2 \rightarrow 3y = x + 6$

which can be re-arranged to:  $3y - x = 6$

b) Solve simultaneously:  $3y - x = 6$  .....(1)  
 $4y + 5x = 46$  .....(2)

multiply (1) by 5 and add giving  $y = 4$

substitute into (1) giving  $x = 6$

Co-ordinates are:  $(6, 4)$

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5. a) Gradient =  $\frac{120-160}{12-8} \rightarrow \frac{-40}{4} \rightarrow -10$

Equation is:  $P = -10t + 160$  or  $P = 160 - 10t$

b) Put  $P = 70$

$70 = 160 - 10t$  and solve for  $t$

$10t = 160 - 70$   $10t = 90$   $t = 9$

Expected to be unconscious at 1700 hrs

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6. Draw graph - plot points  $(0, 240)$  and  $(12, 0)$

Gradient =  $\frac{0-240}{12-0} \rightarrow \frac{-240}{12} \rightarrow -20$

y-intercept = 240

Hence equation is:  $V = -20t + 240$  or  $V = 240 - 20t$

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7. Gradient =  $\frac{162-138}{80-0} \rightarrow \frac{24}{80} \rightarrow \frac{3}{10}$

y-intercept = 138

Hence equation is:  $s = \frac{3}{10}t + 138$

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