

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

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

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

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

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

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

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

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

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: $V = 5x + 10$
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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: $H = 15t + 40$

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

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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