



# PERTH MODERN SCHOOL

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**Independent Public School**

## Course Methods

## Year 11

Student name: \_\_\_\_\_

Teacher name: \_\_\_\_\_

Date: 17/02/20

**Task type:** Response

**Time allowed for this task:** 40 mins

**Number of questions:** 6

**Materials required:** NO CALCULATOR REQUIRED  
NO NOTES REQUIRED

**Standard items:** Pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

**Special items:** Drawing instruments, templates and formula sheet

**Marks available:** 37 marks

**Task weighting:** 10 %

**Formula sheet provided:** Yes

**Note: All part questions worth more than 2 marks require working to obtain full marks.**

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**Question 1 (1.1.6)****(2, 2 = 4 marks)**Solve each of the following for  $x$ .

$$\text{i) } \begin{array}{r} 2x - 3 = 11 - 5x \\ +5x \qquad +5x \end{array}$$

$$\begin{array}{r} 7x - 3 = 11 \\ +3 \qquad +3 \end{array}$$

$$7x = 14 \quad \checkmark$$

$$x = 2 \quad \checkmark$$

$$\text{ii) } 10 - 2x = \frac{2x}{3}$$

$$30 - 6x = 2x$$

$$30 = 8x \quad \checkmark$$

$$\frac{30}{8} = x \quad \checkmark$$

$$\text{or } \frac{15}{4}$$

( $\neq$  does not need to be simplified)

**Question 2 (1.1.4, 11.5, 1.1.6)**

**(2, 3, 2, 3 = 10 marks)**

Determine the equation of a line that passes through the point  $(-4, 6)$  and:

- i) has a gradient of 3

$$y = 3x + c$$

$$6 = 3(-4) + c$$

$$6 = -12 + c$$

$$18 = c$$

$$y = 3x + 18$$

✓ finding the gradient  
 ✓ finding the y-intercept

- ii) passes through the point  $(2, 5)$ .

$$m = \frac{5 - 6}{2 - (-4)}$$

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

$$y = -\frac{1}{6}x + \frac{16}{3}$$

✓ finding gradient  
 ✓ correct substitution of point  
 ✓ finding y-intercept

$$y = -\frac{1}{6}x + c$$

$$5 = -\frac{2}{6} + c \quad 5 + \frac{1}{3} = c$$

- iii) is parallel to the line  $2y - 4x = -7$ .

$$2y = 4x - 7$$

$$y = 2x - \frac{7}{2}$$

✓ finding gradient  
 ✓ finding y-intercept

$$y = 2x + c$$

$$6 = 2(-4) + c$$

$$6 = -8 + c$$

$$14 = c$$

$$y = 2x + 14$$

- iv) is perpendicular to the line  $2y - x - 8 = 0$ .

$$2y = x + 8$$

$$y = \frac{x}{2} + 4$$

$$m = -2$$

$$y = -2x - 2$$

✓ finding the gradient of original equation  
 ✓ finding the perpendicular gradient  
 ✓ finding y-intercept

$$y = -2x + c$$

$$6 = -2(-4) + c$$

$$6 = +8 + c$$

$$-2 = c$$

**Question 3 (1.1.1, 1.1.5, 1.1.6)**

**(3, 2, 2 = 7 marks)**

The coordinates  $P(2, p)$  and  $Q(q + 1, 3q - 2)$  both lie on the line  $y = 5x + 1$ .

a) Find:

i) the values of  $p$  and  $q$ .

$$p = 5(2) + 1$$

$$p = 11$$

✓ finding the correct value for  $p$ .

$$3q - 2 = 5(q + 1) + 1$$

$$3q - 2 = 5q + 5 + 1$$

$$3q - 2 = 5q + 6$$

$$-2q - 2 = 6$$

$$-2q = 8$$

$$q = -4$$

✓ substituting  $q$  into the equation/line

ii) the midpoint of  $PQ$ .

$$P(2, 11) \quad Q(-3, -14)$$

$$\left( \frac{2 + (-3)}{2}, \frac{11 + (-14)}{2} \right)$$

$$\left( -\frac{1}{2}, -\frac{3}{2} \right)$$

✓ correctly solves for  $q$ .

✓ uses midpoint formula correctly

✓ finds correct midpoint

b) For what value of  $m$  does the line  $y = mx + 2$  not intersect with the line  $y = 5x + 1$ ? Justify your answer.

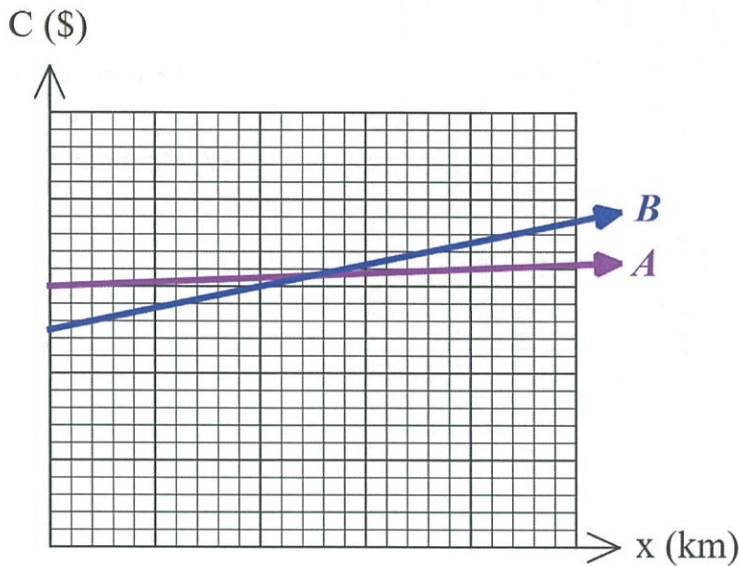
$$m = 5 \quad \checkmark$$

parallel lines do not intersect ✓ justification

**Question 4** (1.1.4, 1.1.5)

(2, 1, 1, 2, 1 = 7 marks)

The graph below shows cost,  $C$ , in dollars versus distance  $x$ , in kilometres, for two different car rental companies A and B. (Assume that parts of distance are charged for proportionately.)



The costs for each company are outlined in the table below.

a) Which cost equation corresponds to Company A and Company B?

$C = 250 + 0.25x$	$C = 300 + 0.05x$
B	A
✓	✓

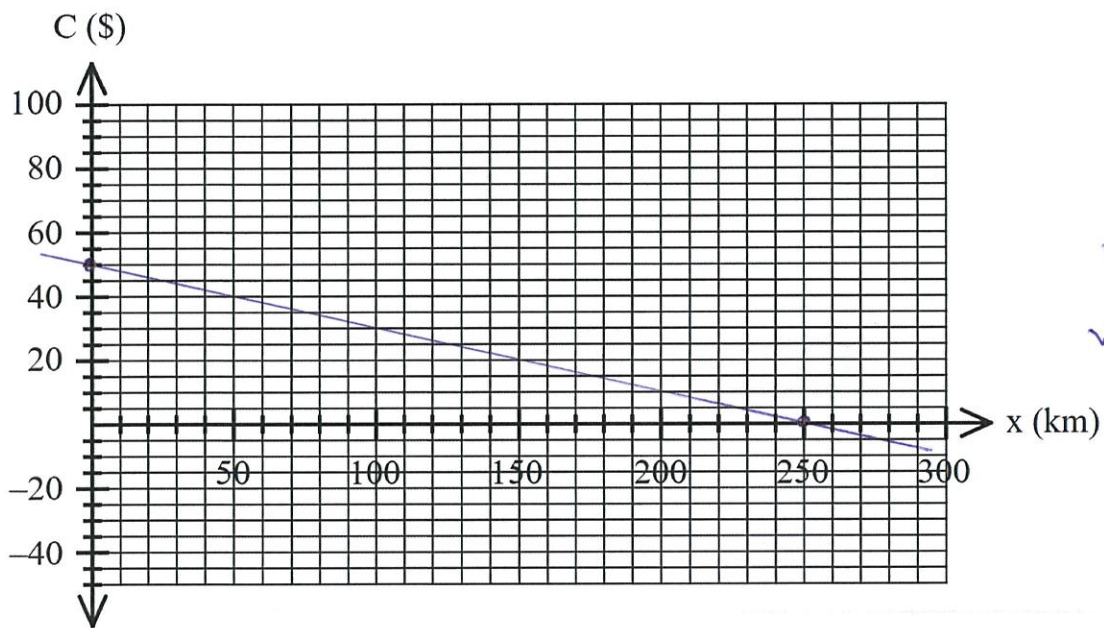
b) Explain what the gradient in the equation  $C = 250 + 0.25x$  represents.

*explanation* ✓ For every km ~~is~~ travelled the cost increases by \$0.25.

c) Construct a linear rule for  $y = C_A - C_B$ , the difference in cost between Company A and Company B.

$$y = 50 - 0.2x \quad \checkmark$$

d) Sketch the equation from part c) on the graph below clearly showing all intercepts.



✓ correct y-intercept  
✓ correct x-intercept

e) Using the graph in part d) determine the number of km when the costs of Company A is cheaper than those of Company B.

More than 250 km ✓

**Question 5** (1.1.6)**(5 marks)**Solve for  $x$ , expressing your answer in its simplest form in terms of  $a$  and/or  $b$ .

$$\frac{x+a}{b} = \frac{b-x}{a} \quad [a, b \neq 0]$$

$$a(x+a) = b(b-x)$$

$$ax + a^2 = b^2 - bx$$

$$ax + bx = b^2 - a^2$$

$$x(a+b) = b^2 - a^2$$

✓ factorising <sup>for</sup>  $x$ 

$$x = \frac{b^2 - a^2}{a+b}$$

✓ expressing  $x$  in terms of  $a$  &  $b$ 

$$x = \frac{(b+a)(b-a)}{b+a}$$

✓ factorising  $b^2 - a^2$ 

$$x = b-a, \quad a+b \neq 0$$

✓ simplified answer

✓ <sup>must</sup> state the solution is only true if  $a+b \neq 0$ .

**Question 6 (1.1.6)****(2, 1, 1 = 4 marks)**

A car travelling at  $60 \text{ km/h}$  takes  $t$  hours to go from  $A$  to  $B$ . If the speed of the car is reduced by  $10 \text{ km/h}$ , the time to go from  $A$  to  $B$  is increased by half an hour.

- a) Construct a linear equation for  $t$  using the information given.

$$60t = 50(t + 0.5) \quad \begin{array}{l} \checkmark \text{ LHS} \\ \checkmark \text{ RHS} \end{array}$$

- b) Solve your equation in part a) and hence calculate the value of  $t$ .

$$\begin{aligned} 60t &= 50t + 25 \\ 10t &= 25 \\ t &= 2.5 \text{ hrs} \quad \checkmark \quad (\text{allow for } t) \end{aligned}$$

- c) Find the distance between  $A$  and  $B$ .

$$\begin{aligned} d &= s \times t \\ d &= 60 \times 2.5 \\ &= 150 \text{ km} \quad \checkmark \quad (\text{allow for } t) \end{aligned}$$

**END OF TEST**