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Geylang Methodist School (Secondary)

Mid – Year Examination 2014

Candidate
Name

Class

Index Number

MATHEMATICS

Paper 1

Sec 2 Normal (Academic)

Candidates answer on the Question Paper.

1 hour

16 May 2014

Setters: Ms Wendy Wong

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

The number of marks is given in brackets [] at the end of each question or part question.

If working is needed for any question, it must be shown in the space below the question.

Omission of essential working will result in loss of marks.

The total number of marks for this paper is 50.

You are expected to use a scientific calculator to evaluate explicit numerical expressions.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to 3 significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142.

For Examiner's Use

50

This document consists of 10 printed pages.

Total Score: [50 marks]

Answer ALL questions in this paper.

1

Evaluate $\{10 - 2[5 + (-8)]^2\} \times \sqrt{\frac{25}{64}}$, showing your working clearly.

Ans:

[3]

2

The sides of a triangle are in the ratio 3 : 7 : 12. The difference in lengths between the shortest side and the longest side of the triangle is 27.45 cm. Find the perimeter of the triangle.

Ans:

cm

[3]

- 3 Mr Lim's car travels at an average speed of $95\frac{1}{2}$ km/h.
- (a) How long will it take for him to travel 425 km? Leave your answer in hours and minutes.
- (b) If Mr Lim's car has a petrol consumption rate of 12.8 km/litres, find the minimum amount of petrol needed to travel 425 km? Leave your answer to the nearest litres.

Ans: (a) _____ hrs _____ mins [2]

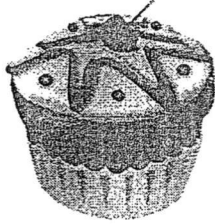
(b) _____ litres [2]

- 4 At a Boy's Generation concert, 25% of the tickets sold were for Category A seats. If 8880 of the tickets sold were not Category A seats, find the total number of tickets sold for the concert.

Ans: _____ tickets [3]

- 5 Kathy wants to buy 20 cupcakes for her birthday party. She went to 2 bakery stores and saw the promotion offered by each store.

By showing your working clearly, explain which store should Kathy buy from.



Shop A
Cherry Cupcakes

\$1.65 each

Buy 3 Get 1 Free!



Shop B
Honey Stars Cupcakes

\$7.50 for a box of 5 cupcakes

***15% Discount!**

Terms and Conditions:

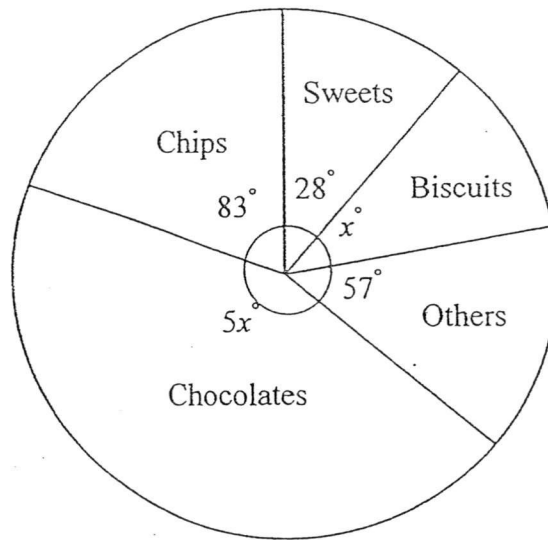
*Only when you buy 6 boxes of cupcakes or more.

Explain:

Ans: Store

[4]

- 6 The pie chart below shows the snacks preferred by a group of students. Diagram is not drawn to scale.



- (a) Calculate the value of x .
- (b) Given that there are 84 students who liked to snack on sweets, find the total number of students surveyed.

Ans: (a) _____ [2]

(b) _____ students [2]

7 If x is directly proportional to $(2y + 1)$ and $x = 3$ when $y = 4$, find

(a) an equation connecting x and y ,

(b) x when $y = 7$,

(c) y when $x = 11$.

Ans: (a) _____ [2]

(b) $x =$ _____ [1]

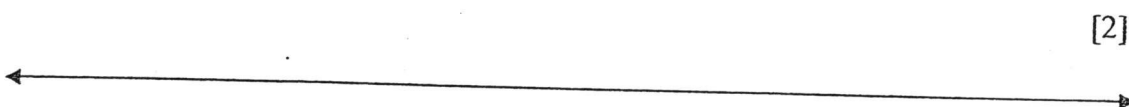
(c) $y =$ _____ [2]

8 (a) Solve the inequality $2y + 6 \leq 35$.

(b) Represent the solution of this inequality on the number line below.

(c) Hence, state the largest possible prime number y such that $2y + 6 \leq 35$.

Answer for (b)



[2]

Ans: (a) _____ [1]

(c) _____ [1]

9 Solve

(a) $\frac{2x-15}{8} = \frac{7+3x}{5},$

(b) $\frac{2(m+1)}{3} - \frac{m-5}{2} = 4.$

Ans: (a) $x =$ _____ [3]

(b) $m =$ _____ [3]

10 Solve the simultaneous equations.

$$2x + 4y = 4$$

$$3x = 2 + 2y$$

Ans: $x = \underline{\hspace{2cm}}, y = \underline{\hspace{2cm}}$ [3]

- 11 (a) Complete the table for the following equations.

[2]

$$y = 2x - 1$$

x	-2	0	2
y		-1	3

$$2y + x = 3$$

x	-1	0.2	3
y	2	1.4	

- (b) Draw the 2 graphs in the grid below.

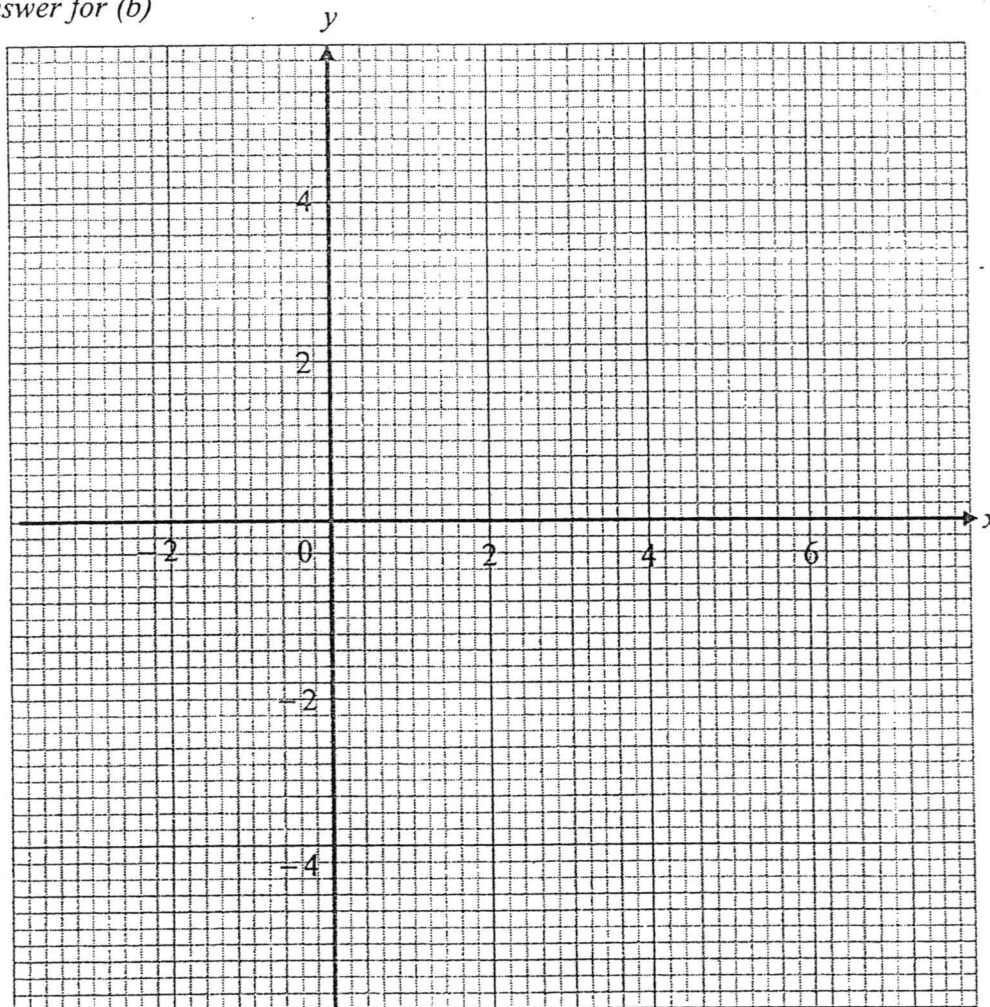
[3]

- (c) Hence, find the solutions to the pair of simultaneous equations.

$$y = 2x - 1$$

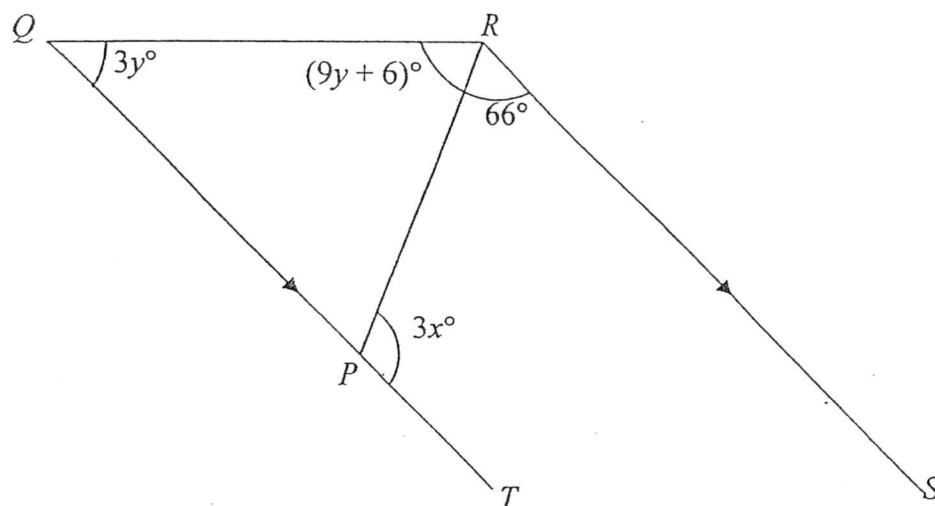
$$2y + x = 3$$

Answer for (b)



Ans: (b) $x =$ _____ and $y =$ _____ [2]

- 12 In the figure below, $QT \parallel RS$, $\angle PQR = 3y^\circ$, $\angle QRP = (9y + 6)^\circ$, $\angle RPT = 3x^\circ$ and $\angle PRS = 66^\circ$.



- (a) Form an equation in terms of x and solve for the value of x .
 (b) Form an equation in terms of y and solve for the value of y .

Ans: (a) $x =$ _____ [2]

(b) $y =$ _____ [2]

--- End of Paper 1 ---



Geylang Methodist School (Secondary) Mid – Year Examination 2014

Candidate
Name

— Marking Scheme —

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This document consists of 10 printed pages.

Total Score: [50 marks]

Answer ALL questions in this paper.

1 Evaluate $\{10 - 2[5 + (-8)]^2\} \times \sqrt{\frac{25}{64}}$, showing your working clearly.

$$= [10 - 2(-3)^2] \times \frac{5}{8} \text{ --- 1m}$$

$$= [10 - 2(9)] \times \frac{5}{8}$$

$$= (10 - 18) \times \frac{5}{8}$$

$$= -8 \times \frac{5}{8}$$

$$= -5 \text{ --- 1m}$$

Ans: -5 [3]

2 The sides of a triangle are in the ratio 3 : 7 : 12. The difference in lengths between the shortest side and the longest side of the triangle is 27.45 cm. Find the perimeter of the triangle.

$$12 - 3 = 9$$

$$9 \text{ units} = 27.45 \text{ cm} \text{ --- 1m}$$

$$1 \text{ unit} = \frac{27.45}{9} = 3.05 \text{ cm}$$

$$22 \text{ units} = 3.05 \times 22$$

$$= 67.1 \text{ cm} \text{ --- 1m}$$

Ans: 67.1 cm [3]

3

Mr Lim's car travels at an average speed of $95\frac{1}{2}$ km/h.

- (a) How long will it take for him to travel 425 km? Leave your answer in hours and minutes.
- (b) If Mr Lim's car has a petrol consumption rate of 12.8 km/litres, find the minimum amount of petrol needed to travel 425 km? Leave your answer to the nearest litres.

(a) $T = D \div S$

$= 425 \div 95\frac{1}{2}$

$= 4.4503$ — 1m

$= 4 \text{ hours } 27 \text{ minutes}$ — 1m

(b) Amount of petrol $= 425 \div 12.8$

$= 33.2$ litres — 1m

Min. amount $= 34$ litres (nearest litres)

Ans: (a) 4 hrs 27 mins [2]

(b) 34 litres [2]

4

At a Boy's Generation concert, 25% of the tickets sold were for Category A seats. If 8880 of the tickets sold were not Category A seats, find the total number of tickets sold for the concert.

$100\% - 25\% = 75\%$ — 1m

$75\% = 8880$ — 1m

$1\% = \frac{8880}{75} = 118.4$

$100\% = 118.4 \times 100$

$= 11840$ — 1m

Ans: 11840 tickets [3]

5

Kathy wants to buy 20 cupcakes for her birthday party. She went to 2 bakery stores and saw the promotion offered by each store.

By showing your working clearly, explain which store should Kathy buy from.



Shop A
Cherry Cupcakes

\$1.65 each

Buy 3 Get 1 Free!



Shop B
Honey Stars Cupcakes

\$7.50 for a box of 5 cupcakes

*15% Discount!

Terms and Conditions:

*Only when you buy 6 boxes of cupcakes or more.

Shop A

cost per cupcake $= \frac{\$1.65 \times 3}{4}$
 $= \$1.2375$

cost of 20 cupcakes $= \$1.2375 \times 20$
 $= \$24.75$ — 1m

Shop B

cost of 20 cupcakes
 $= \$7.50 \times 4$
 $= \$30$ — 1m



Any logical working

Ans:

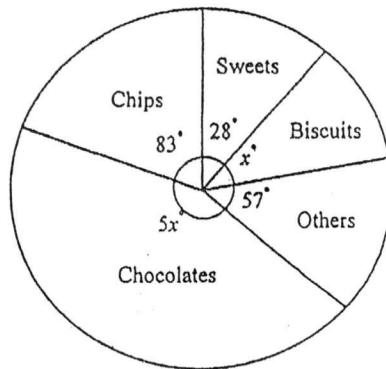
Store A — 1m

Explain:

Kathy should buy from Store A because the total

cost is cheaper than Store B. — 1m [4]

- 6 The pie chart below shows the snacks preferred by a group of students.
Diagram is not drawn to scale.



- (a) Calculate the value of x .
(b) Given that there are 84 students who liked to snack on sweets, find the total number of students surveyed.

$$(a) 5x + x + 83 + 28 + 57 = 360 \quad |m$$

$$6x = 192$$

$$x = \frac{192}{6}$$

$$x = 32 \quad |m$$

$$(b) 28^\circ - 84 \text{ students} \quad |m$$

$$1^\circ - \frac{84}{28} = 3 \text{ students}$$

$$100^\circ - 3 \times 100$$

$$= 300 \text{ students} \quad |m$$

Ans: (a) 32 [2]

(b) 300 students [2]

- 7 If x is directly proportional to $(2y + 1)$ and $x = 3$ when $y = 4$, find

- (a) an equation connecting x and y ,
(b) x when $y = 7$,
(c) y when $x = 11$.

$$(a) x = k(2y + 1)$$

$$3 = k(8 + 1)$$

$$3 = k \times 9$$

$$k = \frac{3}{9}$$

$$k = \frac{1}{3} \quad |m$$

$$x = \frac{1}{3}(2y + 1) \quad |m$$

$$(b) x = \frac{1}{3}(2y + 1)$$

$$= \frac{1}{3}(14 + 1)$$

$$= \frac{5}{1} \quad |m$$

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

$$11 = \frac{1}{3}(2y + 1) \quad \text{Method mark (1m)}$$

$$33 = 2y + 1$$

$$2y = 32$$

$$y = 16 \quad |m$$

Ans: (a) $x = \frac{1}{3}(2y + 1)$ [2]

(b) $x = 5$ [1]

(c) $y = 16$ [2]

- 8 (a) Solve the inequality $2y + 6 \leq 35$.

- (b) Represent the solution of this inequality on the number line below.

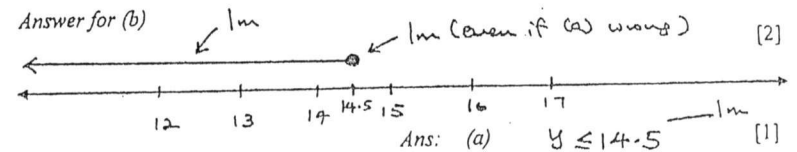
- (c) Hence, state the largest possible prime number y such that $2y + 6 \leq 35$.

$$(a) 2y + 6 \leq 35$$

$$2y \leq 29$$

$$y \leq 14.5 \quad |m$$

Answer for (b)



(c) 13 $|m$ [1]

9 Solve

$$(a) \frac{2x-15}{8} = \frac{7+3x}{5}$$

$$(b) \frac{2(m+1)}{3} - \frac{m-5}{2} = 4$$

$$(a) \frac{2x-15}{8} = \frac{7+3x}{5}$$

$$8(7+3x) = 5(2x-15) \quad | \times$$

$$56 + 24x = 10x - 75 \quad | \times$$

$$24x - 10x = -75 - 56$$

$$14x = -131$$

$$x = \frac{-131}{14}$$

$$x = -9\frac{5}{14} \quad | \times$$

$$(b) \frac{2(m+1)}{3} - \frac{m-5}{2} = 4$$

$$| \times \quad \frac{4(m+1) - 3(m-5)}{6} = 4$$

$$\text{correct expansion (1m)} \rightarrow \frac{4m+4 - 3m+15}{6} = 4$$

$$m+19 = 24$$

$$m = 24 - 19$$

$$m = 5 \quad | \times$$

$$\text{Ans: (a) } x = -9\frac{5}{14} \quad [3]$$

$$(b) m = 5 \quad [3]$$

10 Solve the simultaneous equations.

$$2x + 4y = 4$$

$$3x = 2 + 2y$$

$$2x + 4y = 4 \quad \text{--- (1)}$$

$$3x - 2y = 2 \quad \text{--- (2)}$$

$$(2) \times 2 \quad 6x - 4y = 4 \quad \text{--- (3)}$$

$$2x + 4y = 4 \quad \text{--- (1)}$$

$$(1) + (3)$$

$$(2x+4) + (6x-4y) = 4+4$$

$$8x = 8$$

$$x = 1 \quad | \times$$

$$\text{Sub } x=1 \text{ into (1)}$$

$$2(1) + 4y = 4$$

$$4y = 2$$

$$y = \frac{1}{2} \quad | \times$$

$$\text{Ans: } x = 1, y = \frac{1}{2} \quad [3]$$

- 11 (a) Complete the table for the following equations. [2]

$$y = 2x - 1$$

x	-2	0	2
y	-5	-1	3

1m

$$2y + x = 3$$

x	-1	0.2	3
y	2	1.4	0

1m

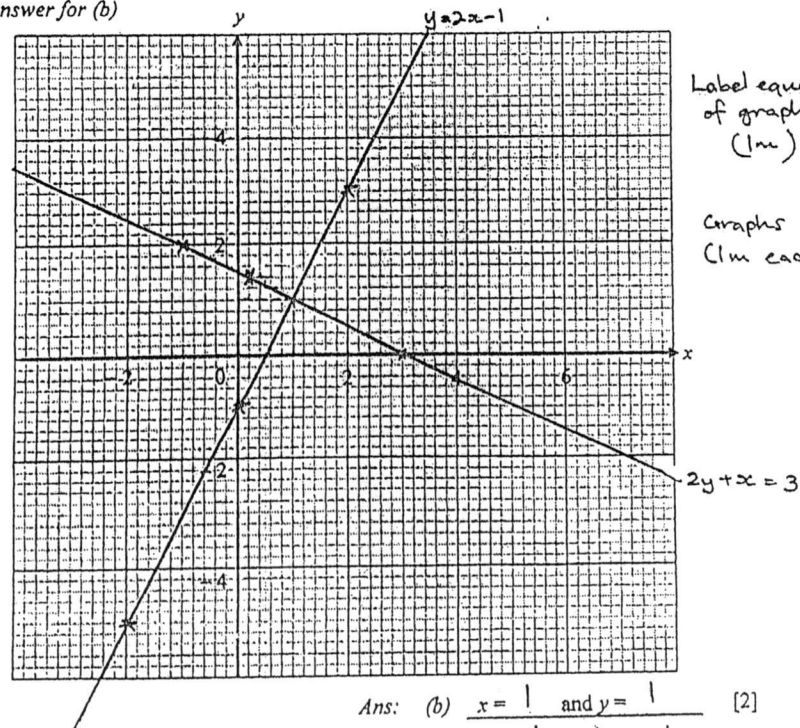
- (b) Draw the 2 graphs in the grid below. [3]

- (c) Hence, find the solutions to the pair of simultaneous equations.

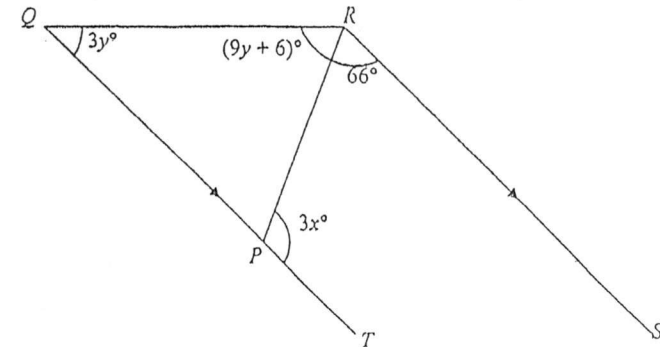
$$y = 2x - 1$$

$$2y + x = 3$$

Answer for (b)



- 12 In the figure below,
- $QT \parallel RS$
- ,
- $\angle PQR = 3y^\circ$
- ,
- $\angle QRP = (9y + 6)^\circ$
- ,
- $\angle RPT = 3x^\circ$
- and
- $\angle PRS = 66^\circ$
- .



- (a) Form an equation in terms of
- x
- and solve for the value of
- x
- .

- (b) Form an equation in terms of
- y
- and solve for the value of
- y
- .

(a) $3x + 66 = 180$ — 1m

$3x = 114$

$x = \frac{114}{3}$

$x = 38$ — 1m

(b) $3y + 9y + 6 + 66 = 180$ — 1m

$12y = 108$

$y = \frac{108}{12}$

$y = 9$ — 1m

Ans: (a) $x = 38$ [2]

(b) $y = 9$ [2]

--- End of Paper 1 ---

Total Score: [50 marks]

Answer ALL questions in this paper.

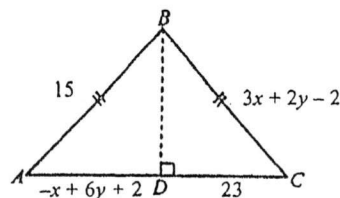
1 Simplify $\frac{x}{3} - \frac{x-2}{4}$, showing your working clearly. [2]

2 Solve

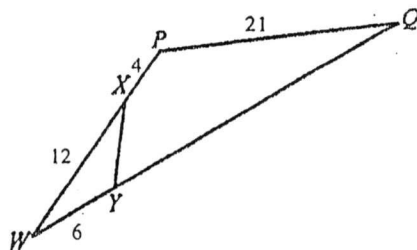
(a) $\frac{1}{2}y + 3 = \frac{3}{4}y$, [2]

(b) $\frac{3z}{z-5} = 13$. [3]

3 The diagram shows an isosceles triangle ABC with BD perpendicular to AC . The dimensions given are in cm. Find the value of x and of y . [4]



4 In the diagram, $\triangle WXY$ and $\triangle QP$ are similar. Given that $PX = 4$ cm, $WX = 12$ cm, $PQ = 21$ cm and $WY = 6$ cm, find the length of



(a) XY , [2]

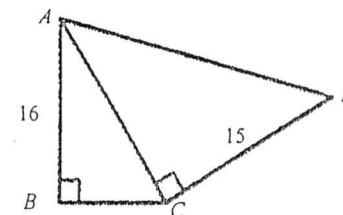
(b) QY . [3]

5 Wonderful Bicycle Rental charges \$3.50/hour for a standard bicycle or \$20/day (bicycle to be returned by 6p.m.), for the same type of bicycle.

(a) John chose to rent the bicycle for \$20/day, thinking that he would need the bicycle for the entire day. If he had to return the bicycle after 2 hours, calculate the amount he could have saved if he had chosen to rent the bicycle on an hourly basis. [1]

(b) Using inequality method, find the minimum number of rental hours, correct to the nearest hour, such that it is cheaper to rent the bicycle at \$20/day than to rent it for \$3.50/hour. [3]

6 In the diagram below, ABC is a right-angled triangle, $AB = 16$ cm and $CD = 15$ cm. Given that the area of triangle ACD is 150 cm^2 , find the length of



(a) AC , [2]

(b) BC . [2]

7 Three workers will take 12 days to paint a bridge. Assuming that the workers work at the same rate, how many more workers are needed to finish painting the bridge 8 days earlier? [3]

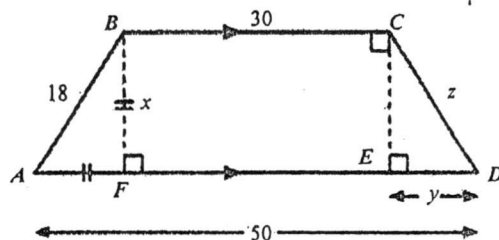
8 A tourist was looking at a map of Universal Studios drawn using a scale of 2 cm : 0.1 km.

(a) Express the scale in the form of 1 : n . [1]

(b) Find the actual distance in km from the entrance to the Jurassic Park Adventure ride if they are 3 cm apart on the map. [2]

(c) The area of The Lost World in Universal Studios is 15 cm^2 on the map. Find the actual area of the map in km^2 . [2]

- 9 In the diagram below, not drawn to scale, the dimensions given are in cm.
Given that $BF = AF$.



- (a) Write down the name of the quadrilateral $ABCDEF$. [1]
- (b) Find the values of
(i) x , [2]
(ii) y , [2]
(iii) z . [2]
- (c) Hence, find the perimeter of the quadrilateral. [1]

- 10 Answer the whole of this question on a sheet of graph paper

- (a) Given that $2x - y = 2$, copy and complete the table of values below in the graph paper provided. [3]
- | | | | |
|-----|----|---|---|
| x | -1 | 0 | 1 |
| y | | | |
- (b) Using a scale of 2cm to represent 1 unit on both axes, draw the graph $2x - y = 2$ for $-4 \leq x \leq 4$ and $-4 \leq y \leq 4$. [4]
- (c) Hence, find the gradient of this line. [1]
- (d) Use your graph to find
(i) the value of y when $x = 0.5$, [1]
(ii) the value of x when $y = -3$. [1]

Answer Sheet

Question	Answer	Question	Answer
1)	$\frac{x+6}{12}$	6a)	20cm
		6b)	12cm
2a)	$y = 12$	7a)	6 more workers
2b)	$z = 6.5$		
3)	$x = 3\text{cm}$	8a)	1 : 5 000
	$y = 4\text{cm}$	8b)	0.15 km
		8c)	0.0375 km ² (3 s.f.)
4a)	$XY = 7.875\text{cm}$ $= 7.88\text{cm}$ (3 s.f.)	9a)	trapezium
4b)	$QY = 26\text{cm}$	9bi)	12.7cm (3 s.f.)
		9bii)	7.27cm (3 s.f.)
		9biii)	14.7cm (3 s.f.)
		9c)	113cm (3 s.f.)
5a)	\$13	10a)	-4, -2, 0
5b)	6 hours	10c)	Gradient = 2
		10di)	$y = -1$
		10dii)	$x = -0.5$

$$1) \frac{x}{3} - \frac{x-2}{4} = \frac{4x}{12} - \frac{3(x-2)}{12}$$

$$= \frac{4x - 3x + 6}{12}$$

$$= \frac{x+6}{12}$$

— (1)

$$2a) \frac{1}{2}y + 3 = \frac{3}{4}y$$

$$\frac{1}{2}y - \frac{3}{4}y = -3$$

$$\frac{2}{4}y - \frac{3}{4}y = -3$$

$$-\frac{1}{4}y = -3$$

$$y = 12$$

— (1)

$$2b) \frac{3z}{z-5} = 13$$

$$3z = 13(z-5)$$

$$3z = 13z - 65$$

$$3z - 13z = -65$$

$$-10z = -65$$

$$z = 6.5$$

— (1)

$$3) \text{ Since } AB=BC \text{ (sides of } \triangle ABC)$$

$$3x+2y-2=15$$

$$3x+2y=17 \quad \text{— (1) } \times 3$$

$$9x+6y=51 \quad \text{— (3)}$$

$$AD=DC \text{ (diagonal bisector)}$$

$$-x+6y+2=23$$

$$-x+6y=21 \quad \text{— (2)}$$

$$(3)-(2)$$

$$9x+6y - (-x+6y) = 51-21$$

$$9x+6y+x-6y=30$$

$$10x=30$$

$$x=3$$

— (1)

Subst $x=3$ into (2)

$$-3+6y=21$$

$$6y=24$$

$$y=4$$

AZONE

4a) $\triangle WXY$ and $\triangle WQP$ are similar

$$\frac{WX}{WQ} = \frac{WY}{WP} = \frac{XY}{QP}$$

$$\frac{XY}{21} = \frac{6}{16}$$

$$XY = \frac{6}{16} \times 21$$

$$= 7.875 \text{ cm}$$

$$\approx 7.88 \text{ cm (3 s.f.)}$$

— (1)

$$4b) \frac{12}{WQ} = \frac{6}{16}$$

$$WQ = 12 \times \frac{16}{6}$$

$$= 32 \text{ cm}$$

— (1)

$$QY = WQ - WY$$

$$= 32 - 6$$

$$= 26 \text{ cm}$$

— (1)

$$5a) \text{ Amount he could have saved} = 20 - (2 \times 3.5)$$

$$= \$13$$

— (1)

$$5b) \text{ Let } x \text{ be the total number of rental hours}$$

$$3.5x > 20$$

$$x > 5.71$$

$$x \approx 6$$

— (1)

The minimum number of rental hours for renting by the day to be cheaper is 6 hours.

6a) Area of $\triangle ACD = 150 \text{ cm}^2$

$$\frac{1}{2} \times AC \times CD = 150$$

$$\frac{1}{2} \times AC \times 15 = 150$$

$$AC = 20 \text{ cm}$$

— (1)

— (1)

6b) In $\triangle ABC$

$$AC^2 = AB^2 + BC^2$$

— (1)

$$20^2 = 16^2 + BC^2$$

$$BC^2 = 20^2 - 16^2$$

$$= 144$$

$$BC = \sqrt{144}$$

$$= 12 \text{ cm}$$

— (1)

7)

Worker	Day
$\div 3 \begin{pmatrix} 3 \\ 1 \\ 9 \end{pmatrix} \times 3$	$\div 8 \begin{pmatrix} 12 \\ 36 \\ 4 \end{pmatrix} \times 3$
$\times 9 \begin{pmatrix} 9 \\ 1 \\ 1 \end{pmatrix}$	$\div 12 \begin{pmatrix} 4 \\ 8 \\ 9 \end{pmatrix}$

— (1)

— (1)

$$9 - 3 = 6$$

— (1)

Therefore, 6 more workers are needed

8a)

$$\div 2 \begin{pmatrix} 2 \text{ cm} : 0.1 \text{ km} \\ 1 \text{ cm} : 0.05 \text{ km} \end{pmatrix} \div 2$$

$$1 : 5000$$

— (1)

8b)

$$\times 3 \begin{pmatrix} 1 \text{ cm} : 0.05 \text{ km} \\ 3 \text{ cm} : 0.15 \text{ km} \end{pmatrix} \times 3$$

— (1)

— (1)

8c)

$$\begin{aligned} 1 \text{ cm} &: 0.05 \text{ km} \\ \times 15 \begin{pmatrix} 1 \text{ cm}^2 : 0.0025 \text{ km}^2 \\ 15 \text{ cm}^2 : 0.0375 \text{ km}^2 \end{pmatrix} \end{aligned}$$

— (1)

— (1)

9a)

Trapezium

$\left(\frac{a+b}{2} \right) h$

— (1)

9bi)

$$18^2 = x^2 + x^2$$

$$2x^2 = 324$$

$$x^2 = 162$$

$$x = \sqrt{162} = 12.7279$$

$$\approx 12.7 \text{ cm} \quad (3 \text{ s.f.})$$

— (1)

9bii)

$$y = 50 - x - 30$$

$$= 50 - 12.7279 - 30 = 7.2721$$

$$\approx 7.27 \text{ cm} \quad (3 \text{ s.f.})$$

— (1)

— (1)

9biii)

$$z^2 = x^2 + y^2$$

$$= 12.7^2 + 7.27^2 = 14.6589$$

$$z \approx 14.7 \text{ cm} \quad (3 \text{ s.f.})$$

— (1)

— (1)

9c)

Perimeter of the equilateral.

$$= 30 + 50 + 18 + 14.66 = 112.6589$$

$$\approx 113 \text{ cm} \quad (3 \text{ s.f.})$$

— (1)