

Name: \_\_\_\_\_



The Scots College

6<sup>th</sup> September 2017

Year 8 Mathematics Accelerated

Assessment Task 3

Weighting: 15%

Time allowed: 45 minutes

**General Instructions**

- Working time – 45 minutes
- Show all necessary working out
- Board approved calculators may be used in this assessment task
- This exam consists of 9 pages

Topic Strand	Section	Possible Marks	Mark Achieved
Algebraic Fractions, Quadratic Expressions and Equations (Number and Algebra)	1	15	
Graphs of Parabolas and other Non-Linear Relationships (Number and Algebra)	2	18	
Angles, Geometrical Figures, Transformations and Congruence (Measurement and Geometry)	3	10	
Total		43	
Percentage		100	

**Section 1 – Algebraic Fractions, Quadratic Expressions and Equations**

(15 marks)

**SHOW ALL WORKING OUT IN THE SPACES PROVIDED**

1. Simplify

(a)  $\frac{7x-7}{1-x}$

1

(b)  $\frac{7x-6x^2-2}{24x-16}$

3

2. Solve

(a)  $\frac{1}{x+2} - \frac{2}{x-3} = \frac{5}{x^2-x-6}$

3

(b)  $x^2 - 12x + 36 = 0$

2

(c)  $25 = -9x^2 - 30x$

3

3. A rectangular block of land has a perimeter of 140 m and an area of 1125 m<sup>2</sup>. By forming and solving a quadratic equation, find the dimensions of the block.

3

END OF SECTION 1

Section 2 – Graphs of Parabolas and other Non-Linear Relationships (18 marks)  
SHOW ALL WORKING OUT IN THE SPACES PROVIDED

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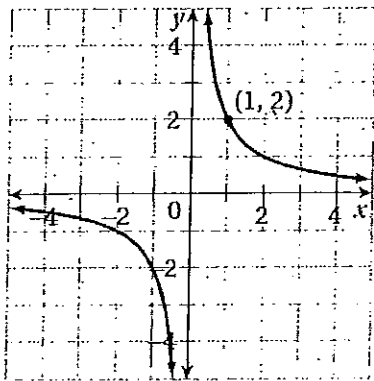
1. Find the equation of the parabola that passes through the origin, as well as the points  $(2, 0)$  and  $(-1, 6)$ .

2

2. Sketch the parabola with equation  $y = x^2 - 6x + 3$ , showing the exact values for the  $x$  and  $y$  intercepts, and the coordinates of the vertex.

4

3. Find the equation represented by this graph:



1

5. By calculating the discriminant, determine how many x intercepts the graph of  $y = 2x^2 - 4x + 3$  will have; and if they exist, whether they are rational or irrational.

2

4. Sketch a graph of  $y = 2^{x-1} - 1$ , showing any asymptotes, intercepts, and at least one other point.

4

6. Find the intersection points of  $y = \frac{1}{x}$  and  $y = 3x - 2$

2

7. The cost of hiring a yacht in the Whitsundays is \$550. It can accommodate up to 8 people.

- (a) Write an equation showing the relationship between the number of people and the cost per person. 1
- (b) Sketch a graph with suitable start and end points for the number of people. 2

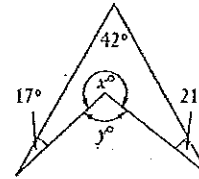
Section 3 – Angles, Geometrical Figures, Transformations and Congruence  
(10 marks)

SHOW ALL WORKING OUT IN THE SPACES PROVIDED

1. Find the values of each pronumeral

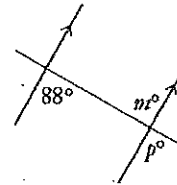
(a)

2



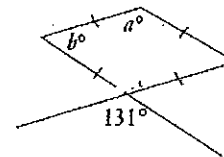
(b)

1

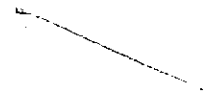


(c)

2

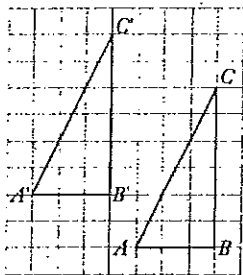


2. Draw a diagram that has two axes of symmetry. State its order of rotational symmetry. 2



END OF SECTION 2

3. Consider the following diagram.



(a) State the transformation used on the original figure to create the image. 2

(b) Name which test could be used to demonstrate that the two triangles are congruent. 1

END OF ASSESSMENT

Name: SOLUTIONS.



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**Section 1 – Algebraic Fractions, Quadratic Expressions and Equations**

(15 marks)

**SHOW ALL WORKING OUT IN THE SPACES PROVIDED**

1. Simplify

(a)  $\frac{7x-7}{1-x} = \frac{-7(1-x)}{1-x} = \underline{\underline{-7}}$  1

(b)  $\frac{7x-6x^2-2}{24x-16} = \frac{-6x^2+7x-2}{8(3x-2)}$  3  
 $= \frac{(3x-2)(1-2x)}{8(3x-2)}$  ①  
 $= \frac{1-2x}{8}$  ①

2. Solve

(a)  $\frac{1}{x+2} - \frac{2}{x-3} = \frac{5}{x^2-x-6}$  3  
 $\frac{(x-3) - 2(x+2)}{(x+2)(x-3)} = \frac{5}{(x+2)(x-3)}$  ①

Denominators  $x-3 - 2x-4 = 5$  ①  
 $-x-7 = 5$   
 $\underline{\underline{x = -12}}$  ①

(b)  $x^2 - 12x + 36 = 0$  2

$(x-6)^2 = 0$  ①  
 $\underline{\underline{x = 6}}$  ①

(c)  $25 = -9x^2 - 30x$

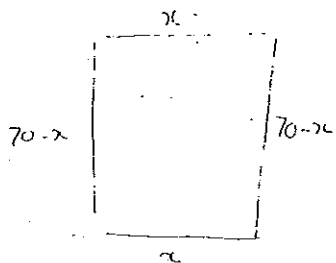
$9x^2 + 30x + 25 = 0$  (1)

$(3x + 5)^2 = 0$  (1)

$x = -\frac{5}{3}$  (1)

3

3. A rectangular block of land has a perimeter of 140 m and an area of 1125 m<sup>2</sup>. By forming and solving a quadratic equation, find the dimensions of the block. 3



Area =  $x(70-x) = 1125$  (1)

$70x - x^2 = 1125$

$x^2 - 70x + 1125 = 0$

$(x - 45)(x - 25) = 0$

$x = 45, 25$  (1)

Alternately

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{70 \pm \sqrt{70^2 - 4(1)(1125)}}{2}$

$= \frac{70 \pm \sqrt{4900}}{2}$

$= 45, 25$

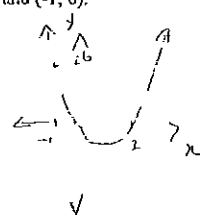
Block is 45m x 25m

END OF SECTION 1

3

Section 2 – Graphs of Parabolas and other Non-Linear Relationships (18 marks)  
SHOW ALL WORKING OUT IN THE SPACES PROVIDED

1. Find the equation of the parabola that passes through the origin, as well as the points (2, 0) and (-1, 6). 2



$y = a(x(x-2))$   
 $= a(x^2 - 2x)$  (1)

at (-1, 6)

$6 = a((-1)^2 - 2(-1))$

$= a(3)$

$\therefore a = 2$

$y = 2x^2 - 4x$  (1)

2. Sketch the parabola with equation  $y = x^2 - 6x + 3$ , showing the exact values for the x and y intercepts, and the coordinates of the vertex. 4

y int  $x = 0, y = 3$

x int  $y = 0$

$x^2 - 6x + 3 = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{6 \pm \sqrt{36 - 4(1)(3)}}{2(1)}$  (1)

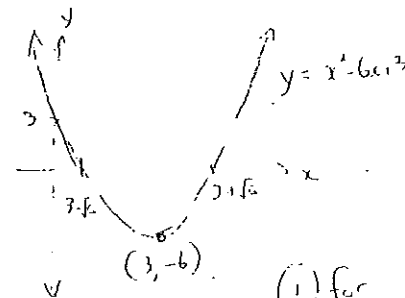
$= \frac{6 \pm 2\sqrt{6}}{2}$

$x = 3 + \sqrt{6}, 3 - \sqrt{6}$  (1)

$\therefore$  vertex between intercepts

$h = 3$

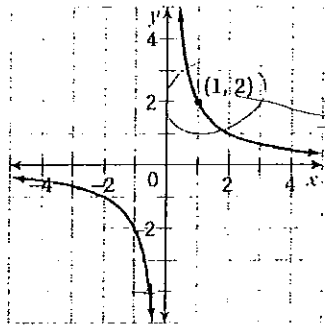
$y = 3^2 - 6(3) + 3$   
 $= -6$  (1)



(1) for correctly labelled sketch

4

3. Find the equation represented by this graph:



$$y = \frac{a}{x}$$

$$2 = \frac{a}{1}$$

$$\therefore y = \frac{2}{x}$$

1

4. Sketch a graph of  $y = 2^{x-1} - 1$ , showing any asymptotes, intercepts, and at least one other point.

shift 1 to the right  
shift down 1.

y int  $x=0$

$$y = 2^{0-1} - 1$$

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

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

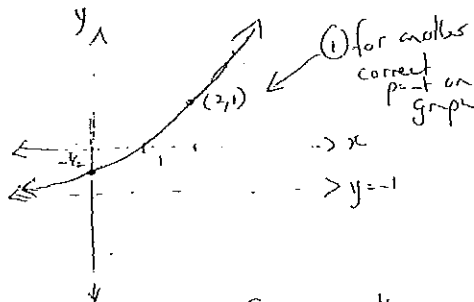
x int  $y=0$

$$2^{x-1} - 1 = 0$$

$$2^{x-1} = 1 = 2^0$$

$$x-1 = 0$$

$$x = 1$$



for another correct point on graph

for correctly labelled sketch.

4

5. By calculating the discriminant, determine how many x intercepts the graph of  $y = 2x^2 - 4x + 3$  will have; and if they exist, whether they are rational or irrational.

$$\Delta = b^2 - 4ac$$

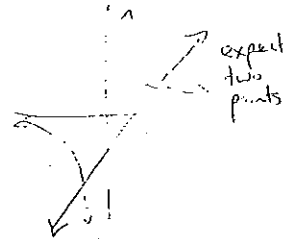
$$= (-4)^2 - 4(2)(3)$$

$$= -8$$

$\therefore \Delta < 0 \therefore$  no x intercepts

2

6. Find the intersection points of  $y = \frac{1}{x}$  and  $y = 3x - 2$



$$3x - 2 = \frac{1}{x}$$

$$3x^2 - 2x = 1$$

$$3x^2 - 2x - 1 = 0$$

$$(3x+1)(x-1) = 0$$

$$\left(x = -\frac{1}{3}\right) \text{ or } (x = 1)$$

$$\left(y = -3\right) \text{ or } (y = 1)$$

for correct answers

2



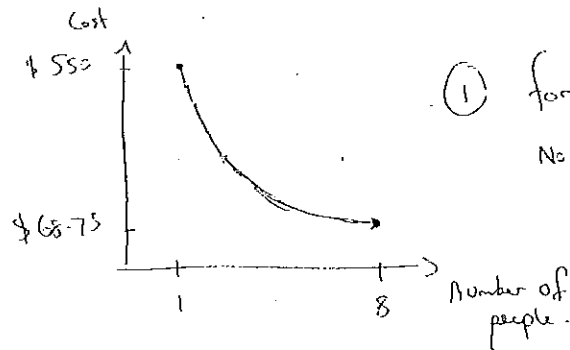
7. The cost of hiring a yacht in the Whitsundays is \$550. It can accommodate up to 8 people.

- (a) Write an equation showing the relationship between the number of people and the cost per person. 1
- (b) Sketch a graph with suitable start and end points for the number of people. 2

(a) let  $n$  = number of people  
 "  $C$  = cost per person

$$C = \frac{550}{n} \quad (1)$$

(b)  $n = 1, C = 550$   
 $n = 8, C = \$68.75$  (1)



(1) for graph.  
 No ARROWS - start and end pts.

END OF SECTION 2

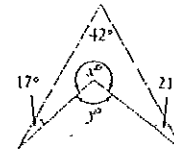
Section 3 – Angles, Geometrical Figures, Transformations and Congruence

(10 marks)

SHOW ALL WORKING OUT IN THE SPACES PROVIDED

1. Find the values of each pronumeral you do not have to state reasons.

(a) 2



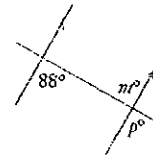
$$x = 360 - 42 - 17 - 21$$

$$= 280 \quad (1)$$

$$y = 360 - 280$$

$$= 80 \quad (1)$$

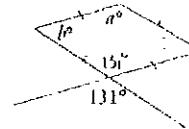
(b) 1



$$m = 88 \quad (1/2)$$

$$p = 88 \quad (1/2)$$

(c) 2



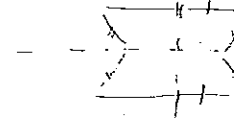
$$b = 180 - 131 = 49 \quad (1)$$

$$a = 180 - 49 = 131 \quad (1)$$

$a = 131$  also as opposite  $\angle$  in rhombus.

2. Draw a diagram that has two axes of symmetry. State its order of rotational symmetry. 2

Many choices

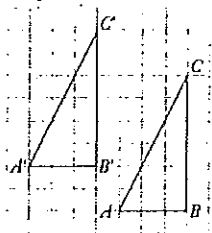


order of rotational symmetry = 2

(1) for circles per your diagram

(1) for diagram

3. Consider the following diagram.



(a) State the transformation used on the original figure to create the image. 2

in vector  $\begin{pmatrix} -4 \\ 2 \end{pmatrix}$ , translation 4 to the left (or  $x = -4$ )  
2 up (or  $y = +2$ )  
① for each correct value.

(b) Name which test could be used to demonstrate that the two triangles are congruent. 1

The grid gives distances along horizontal + vertical,  
and right angles.

Most obvious is SAS  
also RHS could be argued.

END OF ASSESSMENT