Calculator Model :		
Class	Full Name	Index Number

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MID YEAR EXAMINATION 2015

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4016/02

MATHEMATICS
Paper 2

Secondary 2 Express
14th May 2015 **1 hour 15 min**

Additional Materials: Writing Papers
Graph Paper (1 sheet)

READ THESE INSTRUCTIONS FIRST

Write your register number, class and name on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
Calculators should be used where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place. For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 50.

DO NOT OPEN THIS PAPER UNTIL YOU ARE TOLD TO DO SO

For Examiner's Use
50

Setter: Mrs Iszal

This document consists of **4** printed pages, including this cover page.

ANSWER ALL QUESTIONS

1 The scale of a map is 1 : 50 000.

(a) This scale can be written in the form 1 cm : h km. Find h. [1]

(b) The distance between two railway stations is 8 cm on the map.

Find, in kilometers, the actual distance between the stations. [1]

2 Factorise each of the following completely.

(a) $w^3 - w^2 - wz^2 + z^2$, [2]

(b) $4x^3 - 25xy^2$. [2]

3 Solve the simultaneous equations

$$x = 1 - 2y$$
$$3x - 4y = -7$$ [3]

4 **(a)** If $x + y = 9$ and $xy = -27$, calculate the value of $\frac{1}{x} + \frac{1}{y}$. [2]

(b) Given that $r = 2\pi\sqrt{\frac{K}{w}}$, express w in terms of r, h, π and K. [2]

5 **(a)** Expand $(x^3 - x^2 + 4)(-x + 4)$. [2]

(b) It is given that $x = 9$ is a root of the equation $x^2 - kx - 63 = 0$, where k is a constant. Find

(i) the value of k. [2]

(ii) the other root of the equation. [1]

6 y is directly proportional to x^2. Given that $y = 144$ when $x = 4$, find

(a) an expression for y in terms of x, [2]

(b) the value(s) of x when $y = 2025$, [1]

(c) the percentage increase or decrease in the value of y when x is doubled. [2]

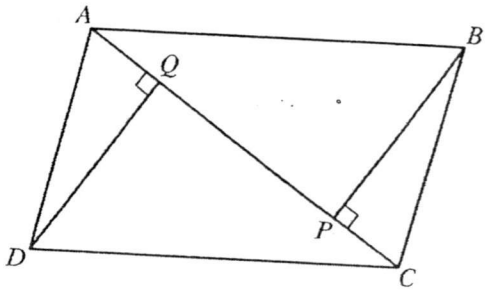
7 In the diagram, ABCD is a parallelogram. The points P and Q lie on the diagonal AC such that $\angle DQA = \angle BPC = 90°$, BP = DQ = 6 cm, AC is 11 cm. and AQ = CP = 3 cm.

(a) State two pairs of congruent triangles. [1]

(b) If $\angle ADQ = 26.6°$, find $\angle BCP$. [1]

(c) Find the length of QP. [1]

(d) Find the area of ABCD. [1]



8 Simplify each of the following.

(a) $\dfrac{3}{x^2-6x+8} \div 2\left(\dfrac{3}{x-2}\right)$ [3]

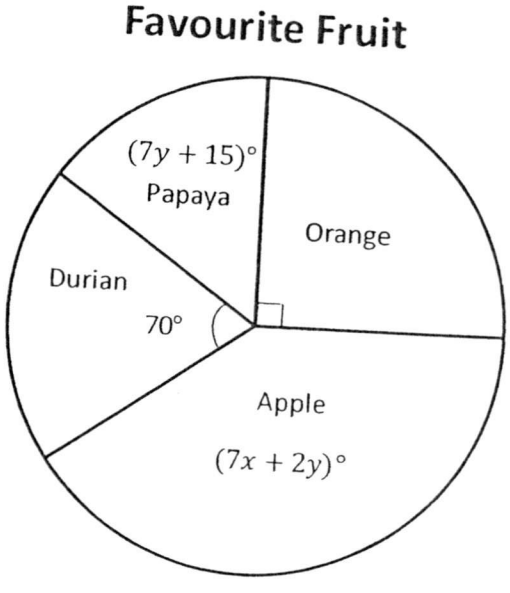
(b) $\dfrac{2y+2}{y^2-1} + \dfrac{5}{1-y}$ [3]

9 In a survey, some students were asked to name their favourite fruit.

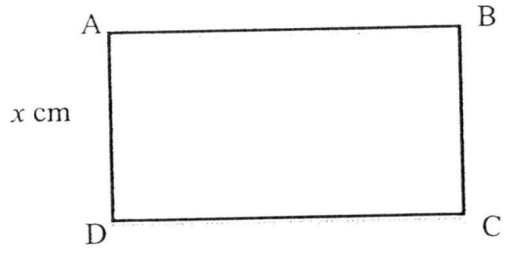
The pie chart below shows the results of the survey. The number of students who chose apple is equal to the number of students who chose both papaya and orange.

(a) form two simultaneous equations in x and y, [2]

(b) solve the simultaneous equations. [3]



10 The perimeter of a tennis court ABCD is 64 m. The length of AD is x m.



(a) Express the length of AB in terms of x. [1]

(b) If its area is 192 m^2, show that $x^2 - 32x + 192 = 0$. [2]

(c) Solve the equation $x^2 - 32x + 192 = 0$. [2]

(d) Find the length of DC. [1]

Answer the whole of this question on a sheet of graph paper.

11 The variables x and y are connected by the equation $y = -2x^2 - 2x + 3$.

Some corresponding values of x and y, are given in the table below.

x	-4	-3	-2	-1	0	1	2	3
y	-21	p	-1	3	3	-1	-9	-21

(a) Calculate the value of p. [1]

(b) Using a scale of 2 cm to represent 1 unit, draw a horizontal x-axis for $-5 \leq x \leq 4$.

Using a scale of 2 cm to represent 5 units, draw a vertical y-axis for $-25 \leq y \leq 10$.

On your axes, plot the points given in the table and join them with a smooth curve. [3]

(c) State the maximum point. [1]

(d) State the equation of the line of symmetry. [1]

END OF PAPER

SEC 2 EXPRESS SA1 PAPER 2 (2015) MARKING SCHEME				
1)	(a)		1 cm : 50 000 cm = 1 cm : 0.5 km h = 0.5 ------ A1	
	(b)		Actual distance = 8 x 0.5 = 4 km -----A1	
2)	(a)		$w^2 - w - wz^2 + z^2$ $= w(w-1) - z^2(w-1)$ $---M1$ $= (w - z^2)(w-1)$ $---A1$	
	(b)		$4x^3 - 25xy^2$ $= x(4x^2 - 25y^2)$ $---M1$ $= x(2x-5y)(2x+5y)$ $---A1$	
3)	(a)		$x = 1 - 2y$ $---(1)$ $3x - 4y = -7$ $---(2)$ *Substitute* (1) int o (2), $3(1-2y) - 4y = -7$ $---M1$ $3 - 6y - 4y = -7$ $-10y = -10$ $y = 1$ $----A1$ *Substitute* $y = 1$ int o (1), $x = 1 - 2(1)$ $= -1$ $---A1$	
4	(a)		$\frac{1}{x} + \frac{1}{y} = \frac{y+x}{xy}$ $----M1$ $= \frac{9}{-27}$ $= -\frac{1}{3}$ $---A1$	

	(b)		$r = 2\pi\sqrt{\frac{K}{w}}$ $\frac{r}{2\pi} = \sqrt{\frac{k}{w}}$ ---M1 $\left(\frac{r}{2\pi}\right)^2 = \frac{k}{w}$ $w = k\left(\frac{2\pi}{r}\right)^2$ / $w = \frac{4\pi^2 k}{r^2}$ ---A1	
5	(a)		$\left(x^3 + 4 - x^2\right)(4 - x)$ $= 4\left(x^3 + 4 - x^2\right) - x\left(x^3 + 4 - x^2\right)$ ---M1 $= 4x^3 + 16 - 4x^2 - x^4 - 4x + x^3$ $= -x^4 + 5x^3 - 4x^2 - 4x + 16$ ---A1	
	(b)	(i)	$9^2 - 9k - 63 = 0$ ---M1 $18 - 9k = 0$ $-9k = -18$ $k = 2$ ---A1	
		(ii)	$x^2 - 2x - 63 = 0$ $(x - 9)(x + 7) = 0$ $x = 9$ *or* $x = -7$ The other solution is x = -7. ----A1	
6	(a)		$y = kx^2$ $144 = k\left(4^2\right)$ $16k = 144$ $k = 9$ ---M1 $\therefore y = 9x^2$ ---A1	
	(b)		$y = 9x^2$ $2025 = 9x^2$ $x^2 = 225$ $x = \pm 15$ ---A1	

	(c)		*New value of* $y = 9(2x)^2$ $---M1$ $= 9(4x^2)$ $= 4(9x^2)$ $= 4y$ $---M1$ *Percentage change* $= (4y - y) \times 100\%$ $= 300\%$ $---A1$
7)	(a)		$\Delta DAQ \equiv \Delta BCP$ $\Delta BAC \equiv \Delta DCA$ $\Delta ABP \equiv \Delta CDQ$ (*Any pair correct* $A1$)
	(b)		$\angle BCP = 90° - 26.6°$ $= 63.4°$ $----A1$
	(c)		$QP = 11 - 3 - 3$ $= 5\ cm$ $---A1$
	(d)		*Area of* $ABCD = 2\left(\frac{1}{2} \times 6 \times 11\right)$ $= 66\ cm^2$ $---A1$
8)	(a)		$\frac{3}{x^2 - 6x + 8} \div 2\left(\frac{3}{x - 2}\right)$ $= \frac{3}{(x-4)(x-2)} \times \frac{(x-2)}{6}$ $---M1$ $= \frac{1}{2(x-4)}$ $---A1$

26

8	(b)		$\frac{2y+2}{y^2-1}+\frac{5}{1-y}$ $=\frac{2y+2}{(y-1)(y+1)}-\frac{5(y+1)}{(y-1)(y+1)}$ $---M1$ $=\frac{2y+2-5y-5}{(y-1)(y+1)}$ $=\frac{-3y-3}{(y-1)(y+1)}$ $---M1$ $=\frac{-3(y+1)}{(y-1)(y+1)}$ $=\frac{-3}{y-1}$ $---A1$	
9	(a)		$7x+2y+70+7y+15+90=360$ $7x+9y=185$ $---A1$ $7x+2y-(7y+15)=90$ $7x-5y=105$ $---A1$	
	(b)		$7x+2y+70+7y+15+90=360$ $7x+9y=185$ $---1$ $7x+2y-(7y+15)=90$ $7x-5y=105$ $---2$ $1-2,\ (7x+9y)-(7x-5y)=185-105$ $14y=80$ $y=5\frac{5}{7}$ $---A1$ *Substitute* $y=5\frac{5}{7}$ int o 1, $7x+9\left(5\frac{5}{7}\right)=185$ $x=19\frac{4}{49}$ $---A1$ *Correct method and presentation shown, award 1 mark.*	

10	(a)		$AB = DC = \frac{1}{2}(64 - 2x)$ $= 32 - x \quad ----A1$	
	(b)		$x(32 - x) = 192 ----M1$ $32x - x^2 = 192$ $-x^2 + 32x = 192$ $x^2 - 32x + 192 = 0(shown) --- A1$	
	(c)		$x^2 - 32x + 192 = 0$ $(x - 24)(x - 8) = 0 --- M1$ $x = 24 \ \ or \ \ x = 8 --- A1$	
	(d)		$DC = \frac{1}{2}[64 - 2(24)]$ $= 8\ m(rejected)$ $DC = \frac{1}{2}[64 - 2(8)]$ $= 24\ m --- A1$	
11			Graph	