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聖嬰中學

HOLY INNOCENTS' HIGH SCHOOL

Name of Student

Class

Index Number

60

MID-YEAR EXAMINATION 2015
SECONDARY 2 EXPRESS
MATHEMATICS PAPER 1

4048/01

Date: **12 May 2015**

Duration: **1 h 30 min**

Students answer on Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use paper clips, glue or correction tape/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 of the marks for this paper is **60**.

The use of an approved scientific calculator is expected, 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.

Set by: Ms Lua Bee Hian
Vetted by: Mdm Hayati & Ms Goh Lay Ching

This document consists of 13 printed pages (including cover page).

41

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For Examiner's Use

Answer **all** the questions.

For Examiner's Use

1 (a) Calculate $\dfrac{6+\sqrt{71-9\times3\times(-2)}}{5}$.

Write down the first five digits on your calculator display.

(b) Write your answer to part **(a)** correct to two decimal places.

Answer *(a)* ..... [1]

(b) ..... [1]

2 Given that $1 < x < 5$ and $-3 \le y \le 2$, and x and y are integers, find

(a) the greatest possible value of $x - y$,

(b) the least possible value of xy^2.

Answer *(a)* ..... [1]

(b) ..... [1]

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For Examiner's Use

3 It is given that $V = \frac{1}{3}\pi r^2 h$.

(a) Find V when $r = 15$ and $h = 8$. Leave your answer in terms of π.

(b) Express r in terms of V, h and π.

Answer (a) ..... [1]

(b) ..... [2]

For Examiner's Use

4 The area of a rectangle is $(36 - a^2)$ cm^2, where $a > 0$.
One of its sides is $(12 - 2a)$ cm.
Find an expression in terms of a for the length of the other side of the rectangle.

Answer ..... cm [3]

42

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For Examiner's Use

5 The diagram shows a point A and the line l_1.

(a) Write down the coordinates of point A.

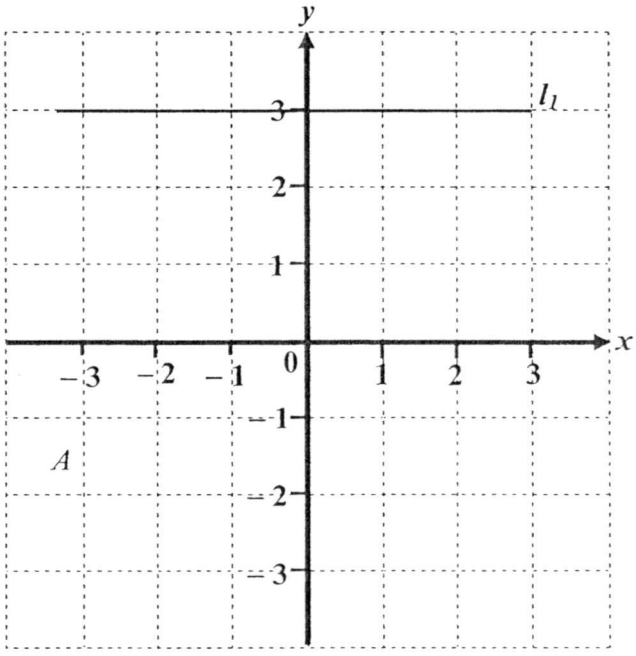
(b) Write down the equation of the line l_1.

(c) On the axes below, draw a line with gradient 1.5 and passes through point A.

Answer *(a)* A (..... , ...) [1]

(b) ..... [1]

Answer (c) [1]



6 Given that $a+b=8$ and $ab=15$, find the value of

(a) $(a+b)^2$,

(b) a^2+b^2.

Answer *(a)* ..... [1]

(b) ..... [2]

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For Examiner's Use

7 Dion's mass is x kg.
Ethan is 2 kg heavier than Dion.
Samuel is 1.5 times heavy as Ethan.

(a) Write down an expression, in terms of x, for the total mass of Dion, Ethan and Samuel.

(b) Hence write down an inequality if their total mass is not more than 180 kg.

(c) Solve the inequality and find the largest possible mass of Dion.

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Answer (a) .....kg [1]

(b) ..... [1]

(c) ..... kg [2]

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For Examiner's Use

8 (a) Express 720 as the product of its prime factors.

(b) Find the highest common factor of 105 and 720.

(c) Red beads are sold in packs of 720.
White beads are sold in packs of 105.
Lynn buys the same number of red beads as the white beads.
Find the least number of packs of red beads that she bought.

Answer *(a)* 720 =..... [1]

(b) ..... [1]

(c) ..... [2]

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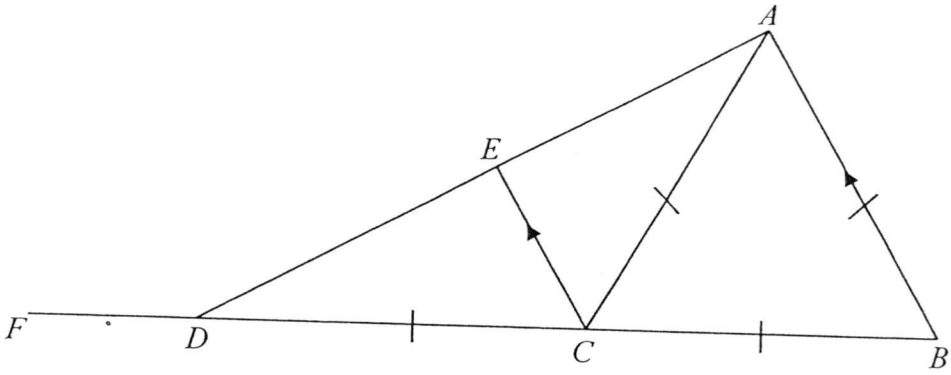
For xaminer's Use

For Examiner's Use

9 Triangle ABC is an equilateral triangle.
Triangle ACD is an isosceles triangle.
AB is parallel to EC.



(a) Find

(i) angle ACE,

(ii) angle ADF.

(b) What is the name of the triangle ABD?

Answer *(a) (i)* angle ACE = ...° [1]

(ii) angle ADF = ...° [2]

(b) .....[1]

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For Examiner's Use

10 Expand and simplify

(a) $(3x-4)^2 - 7x$,

(b) $(2x-1)(3x+2)$.

Answer *(a)* ..... [2]

(b) ..... [2]

For Examiner's Use

11 Solve

(a) $\dfrac{5+2y}{2} = \dfrac{3y-1}{6}$,

(b) $q^2 + 7q = 0$.

Answer *(a)* $y =$..... [2]

(b) $q =$..... or ..... [2]

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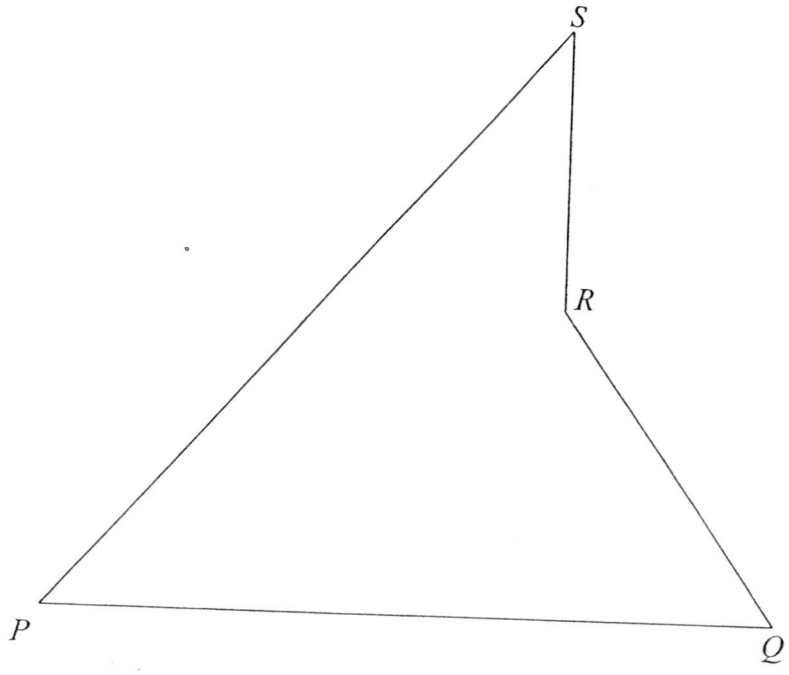
For Examiner's Use

12 The quadrilateral $PQRS$ is drawn in the answer space below.

Answer (b) and (c)



(a) Measure the reflex angle in $PQRS$.

(b) Construct
(i) the perpendicular bisector of PS, [1]
(ii) the bisector of angle SPQ. [1]
Label all your constructions clearly.

(c) The point A is a point in the quadrilateral $PQRS$ such that A is equidistant from the lines PQ and PS and nearer to point P than to point S.

Mark a possible position for point A. [1]

Answer (a) .....° [1]

45

For Examiner's Use

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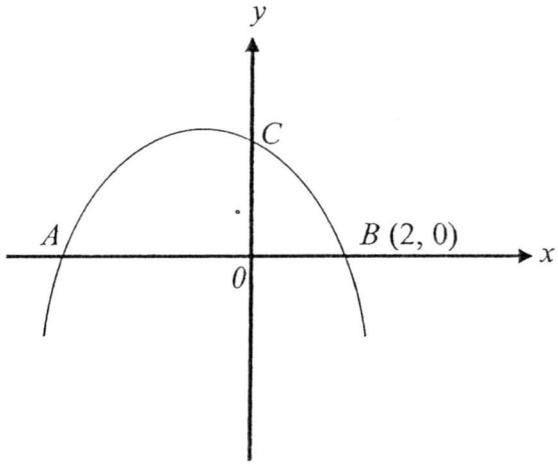
For Examiner's Use

13 The sketch of the graph $y = -x^2 + px + q$ is shown in the diagram below.

The graph cuts the x-axis at points A and $B(2, 0)$.
The graph also cuts the y-axis at point C.
$x = -1$ is the line of symmetry of the graph.



(a) Write down the coordinates of the point A.

(b) Find the values of p and q.

(c) Write down the coordinates of the point C.

Answer (a) A (..... , ...) [1]

(b) p =....., q =..... [2]

(c) C (..... , ...) [1]

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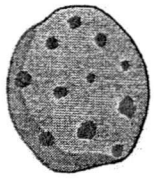
For Examiner's Use

14 Jynn wants to make 35 strawberry cookies.

For Examiner's Use

Strawberry cookie recipe

35 grams of sugar
400 grams of flour
5 grams of baking soda
3 grams of salt
1 box of strawberry

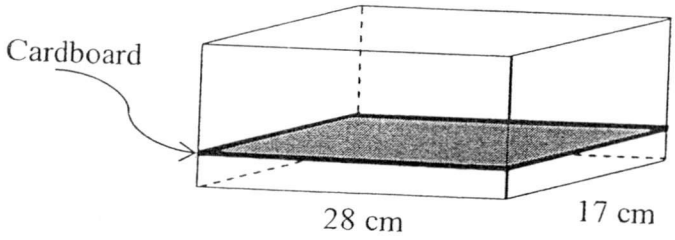


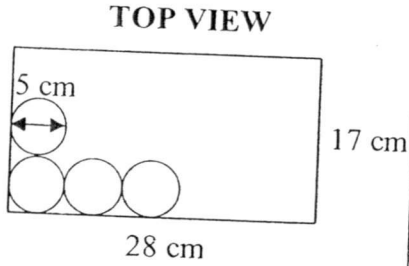
Makes 14 cookies

(a) How many grams of baking soda will she use?

(b) Each box of strawberry cost $8.
How much will Jynn spend on buying strawberries?

(c) Each cookie has a diameter of approximately 5 cm.
She packed the cookies into a box with a rectangular base of dimension 17 cm by 28 cm. She used cardboards as partitions to separate layers of cookies. How many cardboards will she need to use as partitions to stack up the cookies?





Answer *(a)* .....g [2]

(b) $..... [1]

(c) ..... [2]

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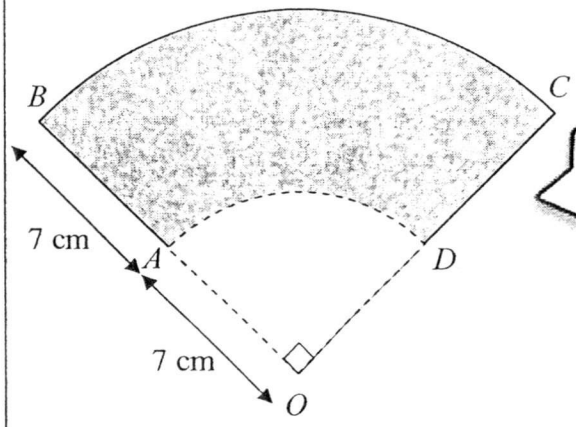
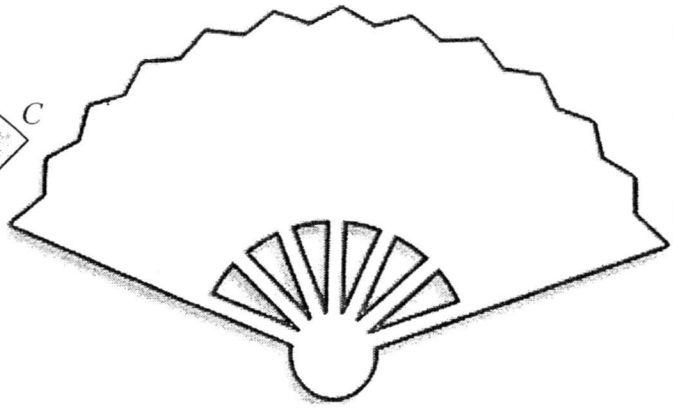
For Examiner's Use

15 The shaded region $ABCD$ is cut out from a quadrant OBC to decorate a paper fan.
$OA = AB = OD = DC = 7$ cm.
[Take $\pi = 3.142$]





Paper fan

(a) Find the area of the shaded region.

(b) Jenny has some laces. Each lace is 5 cm long.
How many of such laces will she need to glue around the perimeter of the shaded region?

Answer *(a)* .....cm^2 [2]

(b) ..... [3]

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For Examiner's Use

16 (a) p is inversely proportional to the cube of v.

(i) It is known that $p = 4$ for a particular value of v.
What is the value of p when v is doubled?

(ii) Given that $p = 1$ and $v = 2$, write down a formula connecting p and v.

(iii) Hence find the value of v when $p = 125$.

(b) Four men can paint a school hall in six days.

Assuming that each man works the at same rate, how long would it take for 3 men to paint the school hall?

For Examiner's Use

Answer (a) (i) $p =$ ..... [2]

(ii) ..... [2]

(iii) $v =$ ..... [1]

(b) ..... [1]

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~ ***End of paper*** ~

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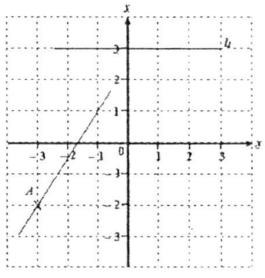
1 (a) 3.4360
(b) 3.44

2 (a) 7
(b) 0

3 (a) 600π
(b) $r = \pm\sqrt{\dfrac{3v}{\pi h}}$

4 $\dfrac{6+a}{2}$

5 (a) $(-3,-2)$
(b) $y = 3$
(c)



6 (a) 64
(b) 34

7 (a) $3.5x + 5$ or $\dfrac{7}{2}x + 5$
(b) $3.5x + 5 \le 180$
(c) $x \le 50$
The largest possible mass of Dion is 50 kg.

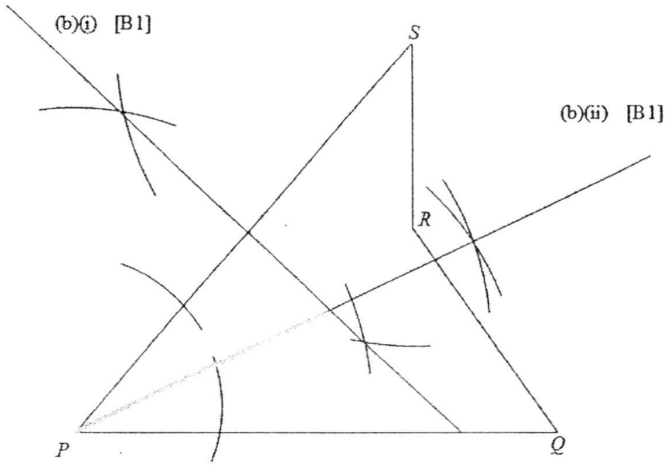
8 (a) $2^4 \times 3^2 \times 5$
(b) 15
(c) 7

9 (a) (i) angle $ACE = 60^\circ$
(Alternate angles)
(ii) angle $ADF = 150^\circ$
(b) Right angled triangle

10 (a) $9x^2 - 31x + 16$
(b) $6x^2 + x - 2$

11 (a) $y = -5\dfrac{1}{3}$
(b) $q = 0$ or $q = -7$

12. (a) 215°
(b) and (c)



(c) [B1] anywhere on the highlighted line but not point of interection between the two bisectors

13. (a) $A(-4,0)$
(b) $p = -2$ and $q = 8$
(c) $C(0,8)$

14 (a) 12.5 grams
(b) \$24
(c) Per layer can put 15 cookies. Therefore, 35 cookies will need **three layers** (one base and two cardboard). Hence she will need **two cardboards**.

15 (a) 115.4685 cm^2
(b) No. of laces needed = 10

16 (a) (i) $p = \dfrac{1}{2}$
(ii) $p = \dfrac{8}{v^3}$ or
$pv^3 = 8$
(iii) $v = 0.4$
(b) 3 men took **8 days**

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1 (a) 3.4360 [B1]

(b) 3.44 [B1]

2 (a) $4-(-3)=7$ [B1]

(b) 0 [B1]

3 (a) $v=\frac{1}{3}\pi 15^2(8)$

$=600\pi$ [B1]

(b) $v=\frac{1}{3}\pi r^2 h$

$\frac{3v}{\pi h}=r^2$ [M1, o.e.]

$r=\pm\sqrt{\frac{3v}{\pi h}}$ [A1]

4 $\frac{36-a^2}{12-2a}$

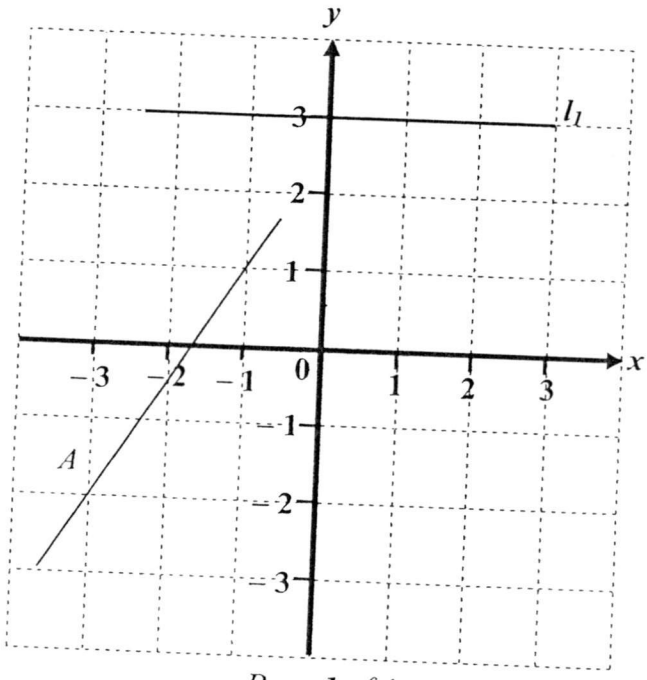
$=\frac{(6+a)(6-a)}{2(6-a)}$ [M1 each for factorise numerator and denominator]

$=\frac{6+a}{2}$ [A1]

5 (a) $(-3,-2)$ [B1]

(b) $y=3$ [B1]

(c) [B1]



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6 (a) $8^2 = 64$ [B1]

(b) $(a+b)^2 = a^2 + 2ab + b^2$

$a^2 + b^2 = (a+b)^2 - 2ab$ [M1]

$= 64 - 2(15)$

$= 34$ [A1]

7 (a) Accept either $x + x + 2 + 1.5(x+2)$ or $3.5x + 5$ [B1]

(b) Accept either $x + x + 2 + 1.5(x + 2 \leq 180$ or $3.5x + 5 \leq 180$ [B1]

(c) $3.5x \leq 175$ [M1]

$x \leq 50$

The largest possible mass of Dion is 50 kg. [A1]

8 (a) $2^4 \times 3^2 \times 5$ [B1]

(b) $105 = 3 \times 5 \times 7$

H.C.F. $= 3 \times 5$

$= 15$ [B1]

(c) LCM $= 2^4 \times 3^2 \times 5 \times 7$ [M1]

$= 5040$

Number of packs of red beads $= 5040 \div 720$

$= 7$ [A1]

9 (a) (i) angle $ACE = 60^\circ$ (Alternate angles) [B1]

(ii) angle $ECD = 60^\circ$ (corresponding angles) [M1]

angle $ADC = \dfrac{180^\circ - 120^\circ}{2} = 30^\circ$ (isos. angles)

angle $ADF = 180^\circ - 30^\circ = 150^\circ$ [A1]

(b) Right angled triangle [B1]

10 (a) $9x^2 - 24x + 16 - 7x$ [M1]

$= 9x^2 - 31x + 16$ [A1]

(b) $(2x-1)(3x+2)$

$= 2x(3x+2) - (3x+2)$

$= 6x^2 + 4x - 3x - 2$ [M1]

$= 6x^2 + x - 2$ [A1]

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

$15+6y = 3y-1$ [M1]

$3y = -16$

$y = -5\frac{1}{3}$ [A1]

(b) $q^2 + 7q = 0$

$q(q+7) = 0$ [M1]

$q = 0$ or $q + 7 = 0$

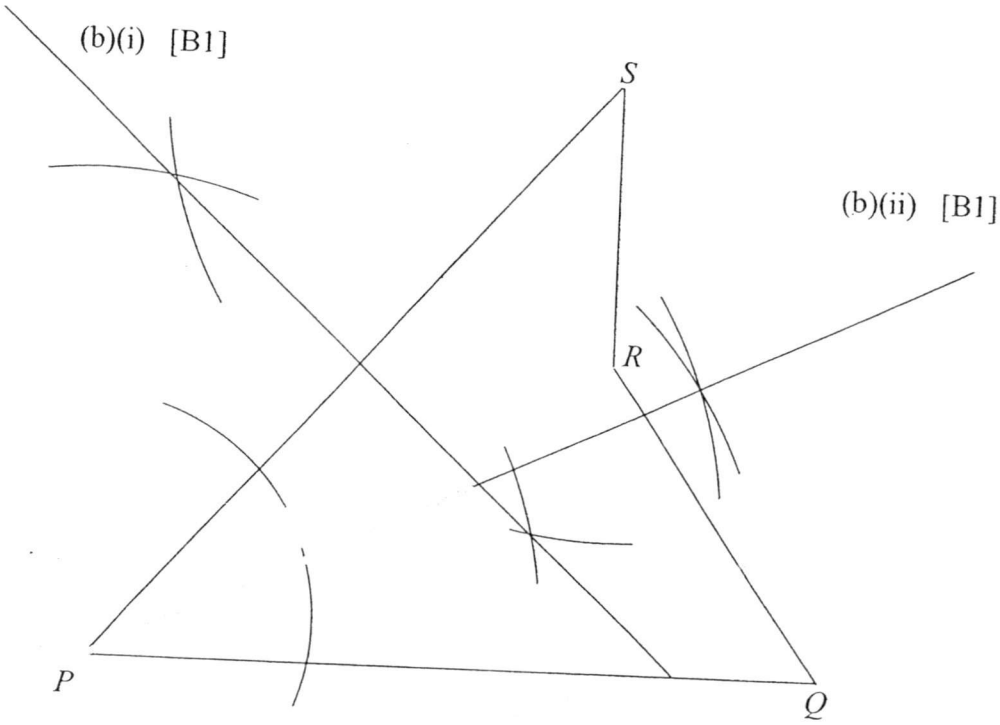
$q = -7$ [A1]

12. (a)

(b) and (c)

(b)(i) [B1]

(b)(ii) [B1]



(c) [B1] anywhere on the highlighted line but not point of interection between the two bisectors

13. (a) $A(-4,0)$ [B1]

(b) $-(x+4)(x-2) = 0$

$-(x^2 + 2x - 8) = 0$

$-x^2 - 2x + 8 = 0$

Therefore, $p = -2$ and $q = 8$ [B1 each]

(c) $C(8,0)$ [B1]

49

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14 (a) 14 cookies uses 5 grams of baking soda

35 cookies uses $\frac{5}{14} \times 35 = 12.5$ grams of baking soda

[M1] [A1]

(b) amount of money spent on strawberries $= 3 \times \$8$

$= \$24$ [B1]

(c) No. of cookies that can be put across the length $= 28 \div 5$

≈ 5

No. of cookies that can be put across the width $= 17 \div 5$

≈ 3

[M1]

Per layer can put 15 cookies.
Therefore, 35 cookies will need **<u>three layers</u>** (one base and two cardboard).
Hence she will need **<u>two cardboards</u>**. [A1]

15 (a) area of shaded region

$= \frac{1}{4}(3.142)(14^2 - 7^2)$ [M1, subst. in correct value into formula for area of quad.]

$= 115.4685 \text{ cm}^2$ [A1]

(b) Perimeter of shaded region

$= \frac{1}{4}(2)(3.142)(14+7) + 7(2)$ [M1, subst. in correct value into formula for arc length of quad.]

$= 46.991$ cm [A1]

16 (a) (i) $p_1(v_1)^3 = p_2(v_2)^3$

$4(v)^3 = p(2v)^3$

$4 = 8p$

$p = \frac{1}{2}$ [B1]

(ii) $p = \frac{k}{v^3}$

When $p = 1$ and $v = 2$, $1 = \frac{k}{2^3}$

$k = 8$

Therefore, $p = \frac{8}{v^3}$. [B1]

(iii) when $p = 125$, $125 = \frac{8}{v^3}$

$v = \sqrt[3]{\frac{8}{125}}$

$v = 0.4$ [B1]

(b) 4 men took 6 days
1 men took 24 days
3 men took **<u>8 days</u>** [B1]

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聖嬰中學

HOLY INNOCENTS' HIGH SCHOOL

Name of Student

Class

Index Number

MID-YEAR EXAMINATION 2015
SECONDARY 2 EXPRESS
MATHEMATICS PAPER 2

4048/02

Date: 15 May 2015

Duration: 1 h 30 min

Additional Materials: 4 Sheets of Writing Paper
1 Sheet of Graph Paper

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use paper clips, glue or correction tape/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 of the marks for this paper is **60**.

The use of an approved scientific calculator is expected, 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.

Set by: Mr Lin WeiDing

Vetted by: Mdm Hayati/Ms Goh Lay Ching

This document consists of 7 printed pages (including cover page). 50

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Answer all the questions

1 (a) Factorise $mn - m^2 - pn + pm$. [2]

(b) Solve the simultaneous equations [3]

$$4y + 6x = -13,$$
$$3x - 2y = 11.$$

---

2 A survey was conducted on a class of 25 pupils to find out the number of hours each pupil spent on using computer daily.
The results are shown in the table below.

4	2	3	2	3
2	3	1	2	3
1	3	4	1	2
2	2	1	3	3
1	4	3	3	3

(a) Copy and complete the table below. [1]

Number of hours spent on computer usage	Tally	Frequency
1	~~IIII~~	5
2	~~IIII~~ II	
3		
4	III	3

(b) Calculate the average number of hours of computer usage per student.
Give your answer in hours. [2]

(c) Students are recommended to spend a maximum of $1\frac{1}{2}$ hours on the computer daily.
Find the percentage of students who follow the recommended usage hours. [2]

(d) If the information is represented on a pie chart, what is the angle representing students with computer usage less than 3 hours? [2]

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3 Jaclyn used objects in the shape of triangle and star to make a series of pattern. The first three patterns are as shown below.

Pattern 1 *Pattern 2* *Pattern 3*

The number of objects used in the above patterns are tabulated in the table shown below.

Pattern Number (n)	Number of stars (s)	Number of triangles (t)	Total number of objects (T)
1	1	6	7
2	4	10	14
3	9	14	23
4	a	b	c

(a) Write down the values of a, b and c. [3]

(b) Write down an equation connecting n and s. [1]

(c) Write down an equation connecting n and t. [1]

(d) Express T in terms of n. [1]

(e) Hence or otherwise, find the pattern number that uses a total of 119 objects. [2]

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4 (a) An island of area 51.2 km^2 is represented on a map by an area of 0.8 cm^2.

(i) Express the scale of the map in the form $1 : n$. [2]

(ii) Two points on the island are 0.9 cm apart on the map.
Calculate the actual distance between these two points in metres. [1]

(iii) Calculate the area of the island represented on another map with a scale of 1 cm to 5 km. [2]

(b) There are 800 students in a school.

(i) On a particular day, 18% of the students were late for a school event.
Calculate the number of students who were early. [2]

(ii) In a particular semester, 35 international students joined the school.
Calculate the percentage increase in the number of students. [1]

---

5 **Answer the whole of this question on a sheet of graph paper.**
The variables x and y are connected by the equation $y = x^2 - x - 2$.
Some corresponding values of x and y are given in the table below.

x	-3	-2	-1	0	1	2	3	4
y	10	p	0	-2	-2	0	4	q

(a) Write down the values of p and q. [1]

(b) Using a scale of 2 cm to represent 1 unit, draw a horizontal x-axis for $-3 \le x \le 4$.
Using a scale of 1 cm to represent 1 unit, draw a vertical y-axis for $-2 \le y \le 10$.

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

[3]

(c) Use your graph to find

(i) the least value of y, [1]

(ii) the solution of $x^2 - x - 2 = 8$, [2]

(iii) the equation of the line of symmetry. [1]

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6 The advertisement below shows an online promotion on the admission pass to Sentosa.

(a) (i) Mr and Mrs Chin plan to bring their two children to Sentosa for one day to visit 20 attractions.
What is the total cost of the Day Fun Pass for the family of four? [2]

(ii) The total cost of the pass is inclusive of 7% GST.
Calculate the GST payable for the amount spent on the Day Fun Pass. [2]

(iii) The family decided to go for only 5 attractions.
How much money can they save now? [2]

Option 1	Pricing One Day Pass (Ticket + FunVee Transfers) / Adult (SGD) / Child (SGD) / One Day Pass + 1 way hotel pick-up service from major city hotels + 2 ways Shuttle Service to & from Universal Studios™ Singapore / $74 / $54 / Book Now
Option 2	2-DAY FUN PASS 1 day access for up to 20 attractions under the DAY FUN PASS One-Day Pass to Universal Studios Singapore (opens at 10am daily) ADULT $139.00 (U.P. $403.90) CHILD $99.00 (U.P. $324.90)

(b) Mr and Mrs Lee with their 2 children plan to spend 2 days in Sentosa.
They can choose to buy the pass from the above 2 options.
Mrs Lee claims that it is more worthwhile to choose Option 2.
Do you agree with her? Explain your answer by showing clear working. [2]

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7 **Figure 1** shows a solid cylinder with height 5 cm.
[Take $\pi = 3.142$]

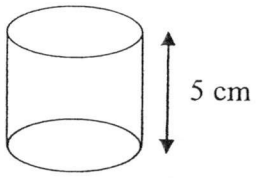

Figure 1

(a) The volume of the cylinder is 45π cm^3.
Show that the diameter of the cylinder is 6 cm. [2]

(b) Find the total surface area of the cylinder to the nearest cm^2. [2]

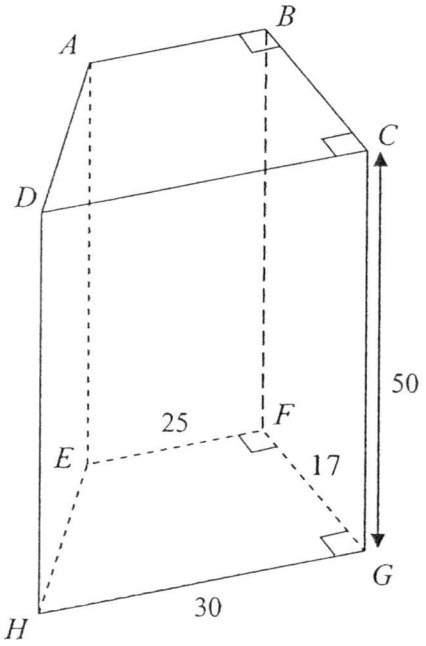

Figure 2

Figure 2 shows an open empty tank in the shape of a prism.
The cross-section of the prism is a trapezium $EFGH$.
$EF = 25$ cm, $FG = 17$ cm, $HG = 30$ cm and $CG = 50$ cm.

(c) 5 cylinders in part (a) are melted into liquid and poured into the tank.
The liquid fills the empty tank up to a height h cm.
Calculate the value of h. [2]

(d) The empty tank needs to be filled to the brim with liquid from the melted cylinder.
Calculate the maximum number of cylinders that should be melted and poured into the tank without overflowing. [2]

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8 A factory packages thumb drives into paper boxes or plastic boxes.

(a) It takes m minutes to package a thumb drive into a paper box.
Write down, in terms of m, an expression for the number of thumb drives that can be packaged into paper boxes in an hour. [1]

(b) The process will take 1 minute longer if the thumb drive is packaged into a plastic box.
Write down an expression, in terms of m, for the number of thumb drives that can be packaged into plastic boxes in an hour. [1]

(c) Thumb drives are packaged into paper and plastic boxes at the same time.
A total of 50 thumb drives can be packaged in an hour.
Form an equation in terms of m and show that it reduces to $5m^2 - 7m - 6 = 0$. [3]

(d) Solve the equation to find the value of m. [2]

(e) Hence find the number of thumb drives that can be packaged into plastic boxes in an hour. [1]

END OF PAPER

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Sec 2 Express MYE 2015 Paper 2 (Answers)

Qn	Answer
1a	$(m-p)(n-m)$
1b	$x=\frac{3}{4}$ and $y=-4\frac{3}{8}$
2a	Number of hours spent on computer usage / Tally / Frequency 1 / 卌 / 5 2 / 卌 II / 7 3 / 卌 卌 / 10 4 / III / 3
2b	2.44 or $2\frac{11}{25}$ hours
2c	20%
2d	172.8^0
3a	$a=16$ $b=18$ $c=34$
3b	$s=n^2$
3c	$t=4n+2$
3d	$T=n^2+4n+2$
3e	9
4ai	1 : 800000
4aii	7200 m
4aiii	Area = 2.048 cm^2
4bi	656
4bii	4.375%
5a	$p=4$ and $q=10$
5b	Draw axes and plot all points given. Draw smooth curve through all points [−1 m] If axes/graph not labelled or wrong scale is used. *No marks to be awarded if graph is not drawn.*

Qn	Answer
5ci	Least value of $y=-2.25\pm0.1$
5cii	$x=-2.7\pm0.1$ or 3.7 ± 0.1
5ciii	$x=0.5$
6ai	\$296
6aii	\$19.36
6aiii	\$80
6b	I agree with Mrs Lee. Total cost for Option 2 is less than the one from Option 1.
7a	6cm
7b	151 cm^2 (nearest cm^2)
7c	1.51 cm
7d	165 cylinders
8a	$\frac{60}{m}$
8b	$\frac{60}{m+1}$
8c	$5m^2-7m-6=0$
8d	$m=2$
8e	20

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Sec 2 Express MYE 2015 Paper 2 (Answers)

Qn	Answer
1a	$(m-p)(n-m)$
1b	$x=\frac{3}{4}$ and $y=-4\frac{3}{8}$
2a	

Number of hours spent on computer usage	Tally	Frequency
1	~~IIII~~	5
2	~~IIII~~ II	7
3	~~IIII~~ ~~IIII~~	10
4	III	3

Qn	Answer
2b	2.44 or $2\frac{11}{25}$ hours
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8e	20

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Sec 2 Express MYE 2015 Paper 2

Marking Scheme

1a	$mn - m^2 - pn + pm$ $= m(n-m) - p(n-m)$ $= (m-p)(n-m)$	 M1 A1
1b	$4y + 6x = -13$ ---------- (1) $3x - 2y = 11$ ---------- (2) By Elimination Method, Eqn (2) x 2, $6x - 4y = 22$ ---------- (3) Eqn (1) + Eqn (3), $6x + 6x = -13 + 22$ $12x = 9$ $x = \frac{9}{12}$ $x = \frac{3}{4}$ or $x = 0.75$ Sub $x = \frac{3}{4}$ into (2), $3\left(\frac{3}{4}\right) - 2y = 11$ $2y = 3\left(\frac{3}{4}\right) - 11$ $y = -4\frac{3}{8}$ or $y = -4.375$	 M1 A1 A1

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2a	<table><tr><th>Number of hours spent on computer usage</th><th>Tally</th><th>Frequency</th></tr><tr><td>1</td><td>~~IIII~~</td><td>5</td></tr><tr><td>2</td><td>~~IIII~~ II</td><td>7</td></tr><tr><td>3</td><td>~~IIII~~ ~~IIII~~</td><td>10</td></tr><tr><td>4</td><td>III</td><td>3</td></tr></table>	B1 (All must be correct)
2b	Average number of hours $= \frac{5(1)+7(2)+10(3)+3(4)}{25}$ $= 2.44$ or $2\frac{11}{25}$ hours	M1 A1
2c	Required Percentage $= \frac{5}{25} \times 100$ $= 20\,\%$	M1 A1
2d	Required Angle $= \frac{12}{25} \times 360$ $= 172.8^{\circ}$	M1 A1
3a	$a = 16$ $b = 18$ $c = 34$	B1 B1 B1
3b	$s = n^2$	B1
3c	$t = 4n + 2$	B1
3d	$T = n^2 + 4n + 2$	B1
3e	$n^2 + 4n + 2 = 119$ $n^2 + 4n - 117 = 0$ $(n-9)(n+13) = 0$ $n = 9$	M1 A1

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4ai	Map: Actual Area 0.8 cm^2: 51.2 km^2 1 cm^2: 64 km^2 1 cm : 8 km 1 : 800000	M1 A1
4aii	Actual distance = 0.9 x 800 000 = 7200 m	B1
4aiii	Map: Actual Area 1 cm : 5 km 1 cm^2: 25 km^2 Actual Area : Map 25 km^2: 1 cm^2 1 km^2: $\frac{1}{25}$ cm^2 51.2 km^2: $\frac{1}{25} \times 51.2$ cm^2 Area = 2.048 cm^2	M1 A1
4bi	Number of students who were early $= \frac{82}{100} \times 800$ = 656	M1 A1
4bii	Percentage increase $= \frac{35}{800} \times 100$ = 4.375 % (*exact answer.*)	B1
5a	$p = 4$ and $q = 10$	B1 (Both must be correct)
5b	Refer to graph. *Draw axes and plot all points given. [P1 if there are more than 3 errors] Draw smooth curve through all points [−1 m] If axes/graph not labelled or wrong scale is used. **No marks to be awarded if graph is not drawn.*	P2 C1
5ci 5cii 5ciii	Least value of $y = -2.25 \pm 0.1$ $x = -2.7 \pm 0.1$ or 3.7 ± 0.1 $x = 0.5$	B1 B1 and B1 B1

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6ai	Total cost = $(79\times 2+69\times 2)$ = \$296	M1 A1
6aii	GST = $\frac{296}{107}\times 7$ = \$19.36	M1 A1
6aiii	Total cost for 5 attractions $=(59\times 2+49\times 2)$ =\$216 Amount saved = $296-216$ = \$80 <u>Alternative method</u> Amount saved for each adult = \$20 Amount saved for each child \$20 Total amount saved $= 20\times 4$ = \$80	M1 A1
6b	<u>Option 1</u> Total cost = $2(74\times 2+54\times 2)$ = \$512 <u>Option 2</u> Total cost = $(2\times 139+2\times 99)$ = \$476 I agree with Mrs Lee as the total cost for Option 2 is less than the one from Option 1. **<u>Note:</u>** Accept also answer that says Option 1 is more worthwhile because of the extra transport service which is not available from Option 2.	M1 A1

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7a	$\pi r^2 h = 45\pi$ $5r^2 = 45$ $r^2 = 9$ $r = 3$ cm Diameter = 6cm (Shown)	M1 A1
7b	Total surface area of cylinder $= 2\pi r^2 + 2\pi r h$ $= 2(3.142)(3)^2 + 2(3.142)(3)(5)$ $= 150.816$ $= 151$ cm^2 (nearest cm^2)	M1 A1
7c	New water level be h cm $\frac{1}{2}(25+30)(17)(h) = 5(3.142)(3)^2(5)$ $h = \frac{706.95}{467.5}$ $h = 1.51219$ $h = 1.51$ cm <u>Alternative Method</u> New water level be h cm $467.5(h) = 5(45\pi)$ $h = \frac{5(45\pi)}{467.5}$ $h = 1.51219$ $h = 1.51$ cm	M1 A1 M1 A1

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7d	Number of cylinders be x $(3.142)(3)^2(5)(x) \le \frac{1}{2}(25+30)(17)(50)$ $x \le \frac{\frac{1}{2}(25+30)(17)(50)}{(3.142)(3)^2(5)}$ $x \le \frac{23375}{141.39}$ $x \le 165.322$	M1
	Maximum number of cylinders = 165	A1
	<u>Alternative Method</u> Volume of prism $= \frac{1}{2}(25+30)(17)(50)$ $= 23375$ Number of cylinders $= \frac{23375}{45\pi}$ $= 165.322$	M1
	$= 165$	A1
8a	Number of thumb drive $= \frac{60}{m}$	B1
8b	Number of thumb drive $= \frac{60}{m+1}$	B1
8c	$\frac{60}{m} + \frac{60}{m+1} = 50$ $\frac{60m+60+60m}{m(m+1)} = 50$	M1
	$120m + 60 = 50m^2 + 50m$ $50m^2 - 70m - 60 = 0$	M1
	$5m^2 - 7m - 6 = 0$	A1

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8d	$5m^2 - 7m - 6 = 0$ $(5m+3)(m-2) = 0$ $m = -\frac{3}{5}$ $\quad m = 2$ $m = 2$	M1 A1
8e	$m = -\frac{3}{5}(rejected)$ Number of thumb drive $= \frac{60}{2+1}$ $= 20$	 B1

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