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GAN ENG SENG SCHOOL
Mid-Year Examination 2016

CANDIDATE NAME

CLASS

INDEX NUMBER

MATHEMATICS
Paper 1

6 May 2016
1 hour

Sec 2 Express

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your class, index number 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 soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid/tape.

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 are NOT allowed.

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 3.142, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 50.

	For Examiner's Use
Total	50

This paper consists of **11** pages including the cover page.

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Answer **all** the questions.

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1 Express $\frac{x}{1-3x}+\frac{4}{5+x}$ as a single fraction in its simplest form.

Ans: _____ [2]

2 Factorise the following completely.

(a) $xy-x^2+zy-xz$

(b) $x^2+4xy+4y^2+5x+10y$

Ans: (a) _____ [2]

(b) _____ [3]

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3 (a) Factorise $2p^2 - p - 3$.

(b) Hence simplify $\frac{2p^2 - p - 3}{3p} \div \frac{4p^2 - 9}{6p^2 + 9p}$.

Ans: (a) _____ [2]

(b) _____ [2]

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4 If $3q = \frac{5p - 4q}{2r - 3p}$, express p in terms of q and r.

Ans : _____ [3]

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5 Solve the equation $(x+1)(x-5)=16$.

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Ans: _____ [3]

6 p is the largest prime number between 80 and 100.
q is the smallest prime number between 50 and 70.

Calculate the value of $p-q$

Ans: _____ [2]

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7 The diagram below shows a plot of land in the shape of a hexagon. The dimensions are given below.

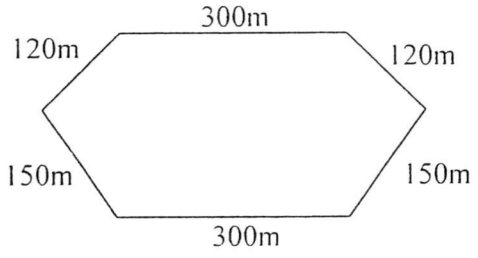


Diagram is not drawn to scale

The owner of the land wants to erect a fence along its perimeter. To minimise cost, the support poles are:

- positioned as far apart as possible,
- equally spaced.

(a) Find the distance between any two adjacent poles.

(b) Find the total number of poles needed if a pole must be erected at each corner.

Ans: (a) _____ m [1]

(b) _____ [2]

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8 The cost of an orange is 60 cents and the cost of an apple is 40 cents. If $\frac{3}{4}$ of the total number of oranges is $\frac{9}{8}$ times the total number of apples, find the ratio of the total cost of oranges to the total cost of apples.

Ans: _____ : _____ [3]

9 Bus tickets cost \$3 for an adult and \$2 for a child.
There are x adults and y children on a bus.
The total number of people on the bus is 52.
The total cost of the 52 tickets is \$139.
Find the number of adults and the number of children on the bus.

Ans: No. of adults = _____

No. of children = _____ [3]

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10 The dimensions of a rectangle are x cm and y cm. It is given that x and y are in inverse proportion, and $y = 20$ when $x = 28$.

(a) Find the equation connecting x and y.

(b) Find the value of y when $x = 14$.

(c) Find the value of x when $y = 8$.

(d) What can you say about the area of the rectangle?

Ans: (a) _____ [1]

(b) $y =$ _____ [1]

(c) $x =$ _____ [1]

(d) _____ [1]

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11 On map A, 2 cm represents 3 km. The area of a park on map A is 4 cm^2.

(a) Express the scale of map A in the form 1 : n.

(b) Calculate the actual area of the park in km^2.

(c) Calculate the area, in cm^2, of the park on map B which has a scale of 1:50 000.

Ans : (a) _____ [1]

Ans : (b) _____ km^2 [1]

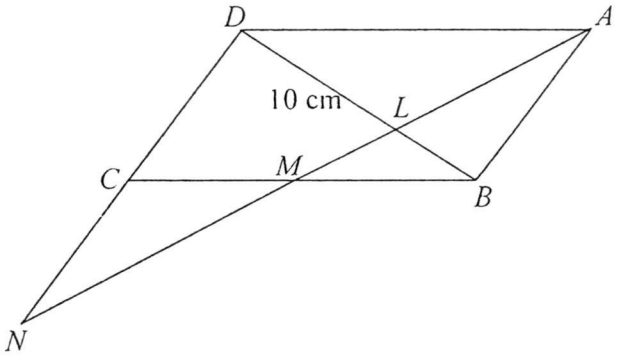
Ans: (c) _____ cm^2 [2]

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12 In the diagram below, $ABCD$ is a parallelogram and L is a point on DB. The line AL produced meets BC at M and DC produced at N. $DA = 2\,MB$ and $DL = 10$ cm.



(a) Name two triangles that are congruent.

(b) It is given that ΔDLA is similar to ΔBLM. Find the length of LB.

Ans: (a) _____ [1]

Ans: (b) _____ cm [2]

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13 The first three positive integers 1, 2 and 3 have a sum of 6.

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(a) The formula for the sum of the first n integers is $\frac{n(n+1)}{2}$. Show that the formula is correct when $n = 3$.

(b) Find the sum of the even numbers
$2 + 4 + 6 + \ldots\ldots\ldots\ldots\ldots + 800$.

(c) Find the sum of the integers
$121 + 122 + 123 + 124 + \ldots\ldots\ldots\ldots + 199 + 200$.

Ans: (a)

_____ [1]

(b) _____ [2]

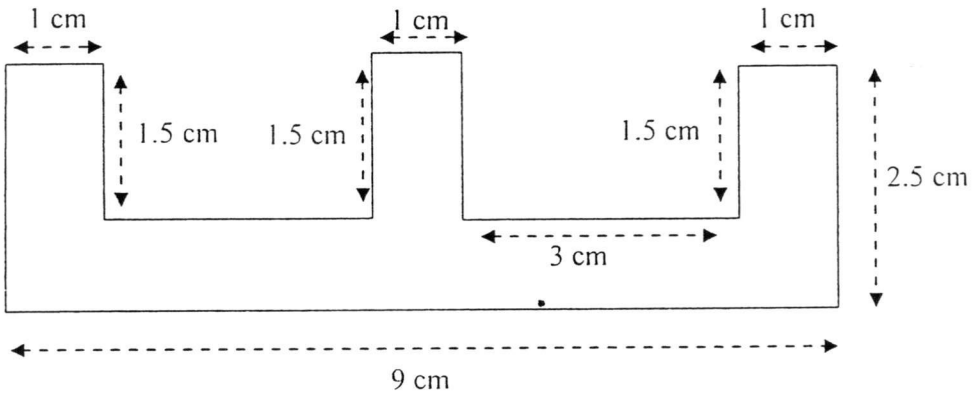
(c) _____ [2]

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For Examiner's Use



In the diagram above, all angles are right angles.

(a) Show that the area of the shape is 13.5 cm^2.

(b) The shape is the cross-section of a metal prism of length 2 metres. Calculate the volume of the prism in cubic centimetres.

(c) A cuboid of volume 8.1 cubic metres is melted down so that the prisms in part (b) can be made. Calculate the number of solid prisms that can be made from the cuboid.

[1 cubic metre = 1 000 000 cm^3]

Ans: (a) _____ cm^2 [2]

(b) _____ cm^3 [2]

(c) _____ [2]

END OF PAPER

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Answers

1	$\frac{x^2-7x+4}{(1-3x)(5+x)}$
2(a)	$(y-x)(x+z)$
(b)	$(x+2y)(x+2y+5)$
3(a)	$(2p-3)(p+1)$
(b)	$p+1$
4	$p=\frac{2q(3r+2)}{5+9q}$
5	$x=7$ or $x=-3$
6	44
7(a)	30 m
(b)	38
8	9 : 4
9	No. of adults = 35 No. of children = 17
10(a)	$x=\frac{560}{y}$ or $y=\frac{560}{x}$ or $xy=560$
(b)	$y=40$
(c)	$x=70$
11(a)	1 : 150 000
(b)	9 km^2
(c)	36 cm^2
12(a)	ΔDAB and ΔBCD
(b)	5 cm

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13(a)	When $n = 3$, sum of 1, 2 and 3 $= \frac{3(3+1)}{2}$ $= 6$ (Shown)
(b)	160 400
(c)	12 840
14(a)	13.5 cm^2
(b)	2700 cm^3
(c)	3000

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GAN ENG SENG SCHOOL
Mid-Year Examination 2016

CANDIDATE NAME

CLASS

INDEX NUMBER

MATHEMATICS
Paper 2

10th May 2016
1 hour 15 min

Sec 2 Express

Additional Materials: 5 pieces of writing paper
Graph paper (1 sheet)

READ THESE INSTRUCTIONS FIRST

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Write in dark blue or black pen on both sides of the paper.
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1. It is given that L is directly proportional to $\sqrt{A}$, and $L = 0.5$ when $A = 0.25\pi$.

   a) Find the equation connecting L and A. Leave your answer in terms of π. [2]

   b) If $A = 9\pi$, find the value of L. [2]

2. a) Make x the subject of the formula $x = \dfrac{12y - 4x}{2y} + 3y$. [3]

   b) Hence, or otherwise, find the value of x when $y = 2$. [1]

3. Simplify each of the following.

   a) $2 + \dfrac{7 - 4p}{2p}$ [2]

   b) $\dfrac{3}{(x+2)} - \dfrac{1}{(x^2 - 4)}$ [2]

4. The surface area of a cube is $(6x^2 - 24x + 24)\,\text{cm}^2$.

   a) Find the length of one side of the cube in terms of x. [2]

   b) i) Using your result from a), find the length of one side of the cube if $x = 15$. [1]

   ii) Hence, or otherwise, find the volume of the cube. [1]

5. If $a + b = 5\dfrac{1}{2}$ and $a^2 + b^2 = 21\dfrac{1}{4}$, find the value of ab. (Hint: use special product) [3]

6. In an animal enclosure in the zoo, there are some chickens and rabbits. Bryan counted 22 heads while Cherilynn counted 58 legs. Form two equations and hence find the number of chickens and rabbits. [4]

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7. a) Factorise each of the following completely, showing your working clearly.

   i) $a^2 - 6ab + 9b^2$ [2]

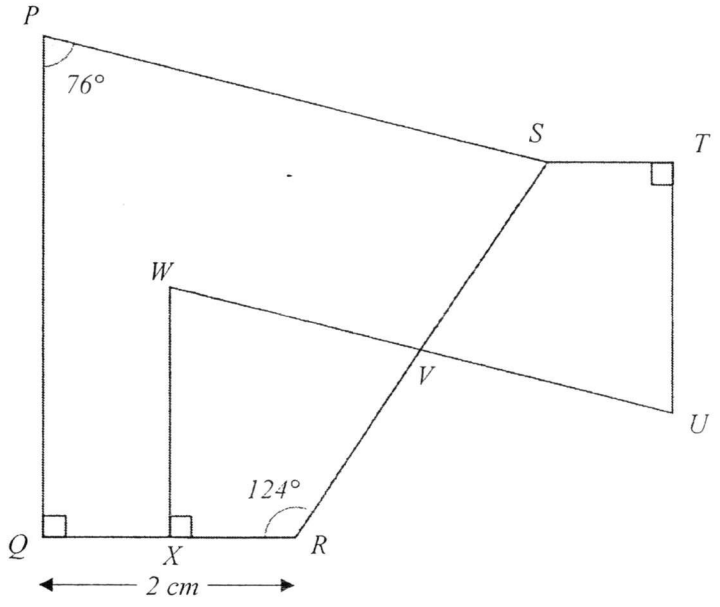
   ii) $2a^2 - a - 15$ [2]

   iii) $14ax + 6ay - 15by - 35bx$ [2]

   b) i) Expand and simplify the expression [2]
   $(2x+1)(x-2) + (3x-1)(x+4)$

   ii) Find the value of the expression when $x = -2$ [1]

8. The figure below shows 3 quadrilaterals. $PQRS$ is similar to $UTSV$, while $UTSV$ is congruent to $WXRV$. The area of $PQRS$ is 11 cm^2 while the area of UTSV is 2.75 cm^2. $QR = 2$ cm, $\angle SPQ = 76°$, $\angle PQR = 90°$ and $\angle QRS = 124°$.



Find

a) $\angle RVW$ (State your reasons clearly), [2]

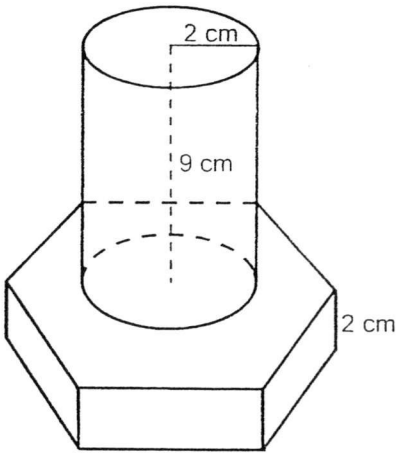
b) the ratio of the area $PQRS$ to the area $WXRV$, [1]

c) QX, showing your working clearly. [2]

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9. The solid ornament below is made up of a regular hexagonal prism for the base and a regular cylinder centred on top of the prism. The cross sectional area of the prism is 41.52 cm^2 and it has a height of 2 cm. The cylinder has a radius of 2 cm and a height of 9 cm.
(Take $\pi = 3.142$)



a) Find the volume of the object. [2]

b) The ornament is to be made completely from one type of wood and must not have a mass greater than 138 g. The table below shows the types of wood available and their densities.

Wood	Elm	Ash	Teak	Maple
Density (g/cm^3)	0.69	0.67	0.63	0.75

Which wood(s) could be used to make the ornament? Show your working clearly. [2]

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

a) Copy and complete the table for the function $y = -x^2 - x + 2$ for $-3 \le x \le 2$. [1]

x	-3	-2	-1	0	1	2
y	-4		2	2		-4

b) Using a scale of 2 cm to 1 unit on both axes, draw the graph of $y = -x^2 - x + 2$ [3]

c) Use the graph to find the value(s) of
   i) the maximum point of the graph, [1]
   ii) the line of symmetry of the graph. [1]

d) On the **same** graph, draw the graph of the linear function $y = -3$. [1]

e) Using the graph, write down the point(s) of intersection of the functions $y = -x^2 - x + 2$ and $y = -3$. [2]

~ End of Paper ~

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Answer Key

Q1a) $L = \sqrt{\frac{A}{\pi}}$

Q1b) $L = 3$

Q2a) $x = 3y$

Q2b) $x = 6$

Q3a) $\frac{7}{2p}$

Q3b) $\frac{3x-7}{(x+2)(x-2)}$

Q4a) $(x - 2)$ cm

Q4bi) Length = 13 cm

Q4bii) Volume = 2197 cm^3

Q5) $ab = 4\frac{1}{2}$

Q6) There are 15 chickens and 7 rabbits.

Q7ai) $(a+3b)^2$ or $(a+3b)(a+3b)$

Q7aii) $(2a+5)(a-3)$

Q7aiii) $(2a-5b)(7x+3y)$

Q7bi) $5x^2+8x-6$

Q7bii) -2

Q8a) $\angle RVW = 70°$

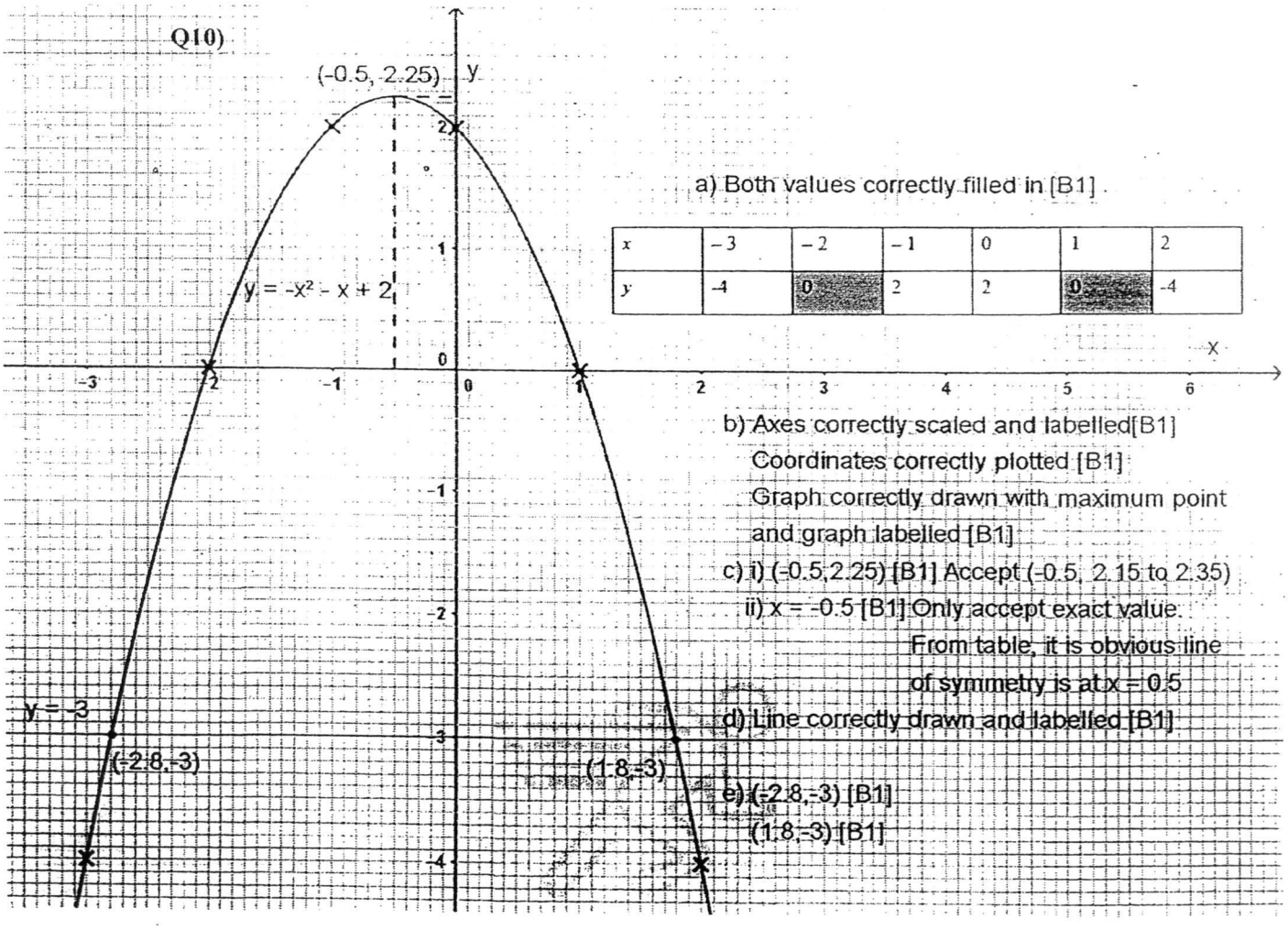
Q8b) 4:1

Q8c) $QX = 1$

Q9a) $196.152cm^3$

Q9b) Either Elm or Ash or Teak can be used
OR All can be used except Maple

Q10)



a) Both values correctly filled in [B1]

x	-3	-2	-1	0	1	2
y	-4	0	2	2	0	-4

b) Axes correctly scaled and labelled[B1]
Coordinates correctly plotted [B1]
Graph correctly drawn with maximum point and graph labelled [B1]

c) i) (-0.5,2.25) [B1] Accept (-0.5, 2.15 to 2.35)
ii) x = -0.5 [B1] Only accept exact value.
From table, it is obvious line of symmetry is at x = 0.5

d) Line correctly drawn and labelled [B1]

e) (-2.8,-3) [B1]
(1.8,-3) [B1]

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