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**TANJONG KATONG SECONDARY SCHOOL**  
**Mid-Year Examination 2017**  
**Secondary 2**

CANDIDATE  
NAME

CLASS

INDEX NUMBER

**MATHEMATICS**

**4048/01**

Paper 1

Friday 12 May 2017

1 hour 30 min

Candidates answer on the Question Paper.

**READ THESE INSTRUCTIONS FIRST**

Write your name, class and register 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 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.

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 three significant figures. Give answers in degrees to one decimal place.

For  $\pi$ , use either your calculator value or 3.142, unless the question requires the answer in terms of  $\pi$ .

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 of the marks for this paper is 60.

**For Examiner's Use**

--

Answer all the questions

For  
Examiner's  
UseFor  
Examiner's  
Use

- 1 (a) Calculate  $\frac{3.143}{\sqrt{48.12 + 1.912}}$ .  
Write down the first five digits on your calculator display.

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

- (b) Write your answer to part (a) correct to 2 significant figures.

Answer (b) ..... [1]

- 2 (a) Express  $15\frac{7}{12}$  in its recurring decimal form.

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

- (b) Arrange the following numbers in ascending order.

$$\sqrt{-3900}, 15\frac{7}{12}, 151.8\%, -4^2$$

Answer (b) ..... [2]

For  
Examiner's  
Use

For  
Examiner's  
Use

- 3 The table shows the temperature taken in different cities at 12 noon, and twelve hours later at 12 midnight.

Day	Tokyo	Paris	Singapore	Moscow
12 p.m.	11°C	8°C	32°C	3°C
12 a.m.	-2°C	12°C	24°C	-5°C
<i>Answer (b)</i> Temperature Change				

- (a) Which city recorded the coldest temperature at 12 a.m.?

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

- (b) Calculate the temperature change for each of the 4 different cities and write them in the empty boxes above. [2]

- (c) One of the data in the table has been recorded wrongly. Identify the error and explain why it is wrong.

*Answer (c)* .....

.....

..... [2]

- 4 Kim used to cycle  $x$  km to school on his old bicycle. His new bicycle is the foldable model with wheels with smaller diameters.

- (a) Assuming that Kim pedals at the same speed on both bicycles, explain how the diameter of the wheel impacts the distance he travels.

*Answer (a)* .....

.....

..... [1]

- (b) Each wheel of the old bicycle has a diameter of 80 cm while each wheel of the new bicycle has a diameter of 32 cm. When both wheels make the same number of revolutions, Kim would travel  $x$  km on the old bicycle but 1.2 km less on the new bicycle. Find the value of  $x$ .

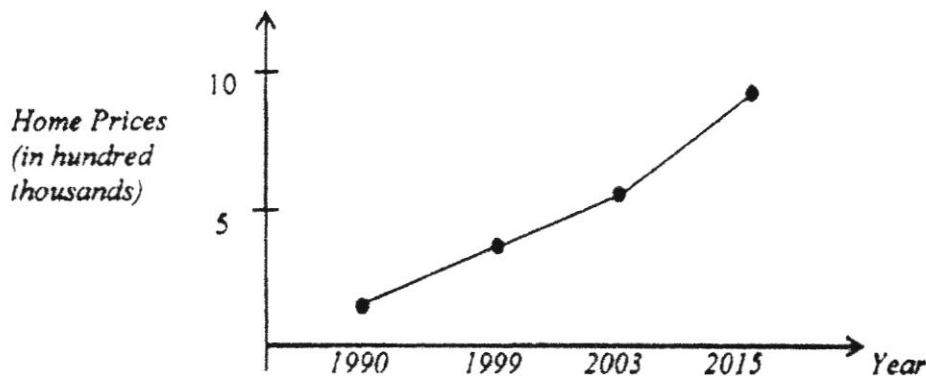
*Answer (b)* ..... [2]

For  
Examiner's  
Use

5 State one way in which the following chart is misleading.

For  
Examiner's  
Use

**Massive Increase in Home Prices**



Answer .....

.....

.....

.....

.....

[2]

- 6 (a) Factorise  $2x^2 - 2xy + x - y$ .
- (b) Hence or otherwise, simplify  $\frac{2x^2 - 2xy + x - y}{4} + \frac{x^2 - xy}{2}$ .

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

(b) ..... [2]

5

For  
Examiner's  
Use

- 7 (a) Simplify
- $p^2q \times p^{-2}r \times (-2r^2)^3$
- .

For  
Examiner's  
Use

Answer (a) ..... [3]

- (b) Solve the following equation.

$$7^{3x-7} = 49$$

Answer (b)  $x =$  ..... [2]

- 8 The total population of Singapore in 2011 is 5 180 000.

- (a) Express 5 180 000 in standard form.

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

Of these, only 3.70 million (rounded to the nearest hundredth million) are Singapore citizens and Permanent Residents.

- (b) State the minimum and maximum possible number of Singapore citizens and Permanent Residents.

Answer (b) minimum = ..... [1]

maximum = ..... [1]

[Turn over

For  
Examiner's  
Use

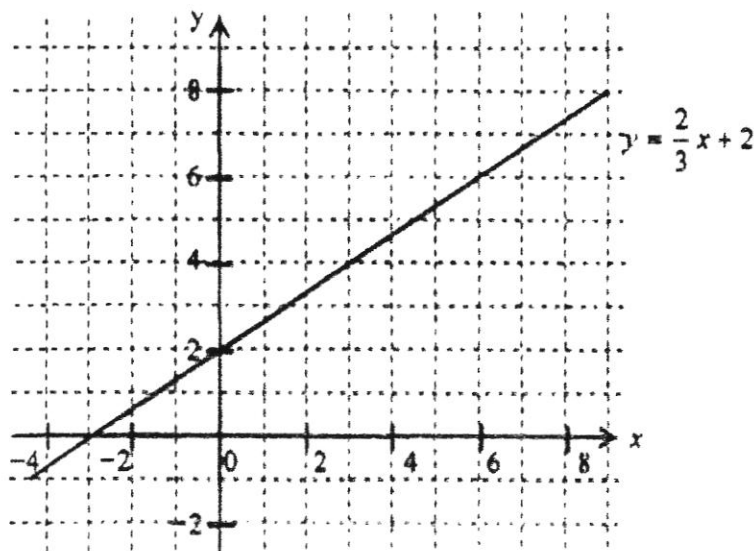
- 9 Solve the following simultaneous equations.

$$5x - 3y = 43$$

$$\frac{x}{2} + y = 3$$

For  
Examiner's  
UseAnswer (a)  $x = \dots\dots\dots$ ,  $y = \dots\dots\dots$  [3]

- 10 The graph
- $y = \frac{2}{3}x + 2$
- is drawn below.

By drawing a straight line, find the solution for  $-x + 7 = \frac{2}{3}x + 2$ .Answer  $x = \dots\dots\dots$  [2]

For  
Examiner's  
Use

- 11 (a) Solve the inequality  $3 - 2x \leq 4x - 3 \leq 17$ .

For  
Examiner's  
Use

Answer (a) ..... [3]

- (b) Hence, write down all the prime number(s) that satisfy  $3 - 2x \leq 4x - 3 \leq 17$ .

Answer (b) ..... [1]

- 12 (a) Given that  $a^2 - b^2 = -18$  and  $a - b = 3$ , find the value of  $2(a + b)^2$ .

Answer (a) ..... [3]

- (b) Explain why  $2(a + b)^2$  can never be a negative value.

Answer (b) .....

.....

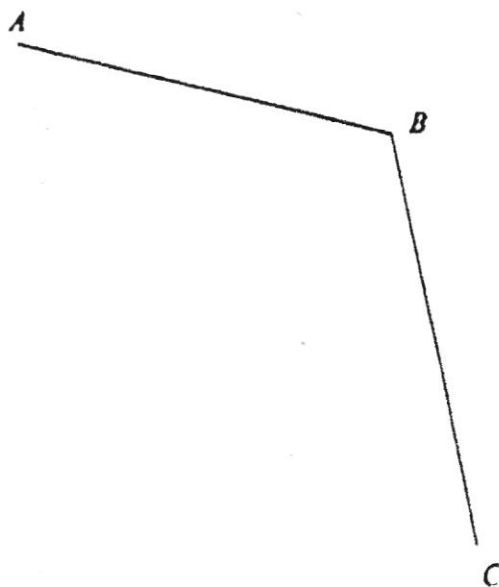
..... [1]

For  
Examiner's  
Use

For  
Examiner's  
Use

- 13 Three points  $A$ ,  $B$  and  $C$  are shown below.
- (a) Construct the bisector for angle  $ABC$ . [1]
  - (b) Construct the perpendicular bisector of  $AB$ . [1]
  - (c)  $ABCD$  is a quadrilateral where  $AB$  is parallel to  $DC$ . Given that  $AD$  is 6.3 cm and angle  $BAD$  is an obtuse angle, mark point  $D$ . [2]
  - (d) Point  $E$  lies on  $CD$  and is equidistant from points  $A$  and  $B$ . Mark point  $E$ . [1]
  - (e) Find the length of  $CE$ .

Answer (a), (b), (c) and (d)



Answer (e) ..... cm [1]

For  
Examiner's  
Use

For  
Examiner's  
Use

- 14 The volume,  $V \text{ cm}^3$ , of a cylinder is directly proportional to the square of its radius  $r \text{ cm}$ . When  $r = 8 \text{ cm}$ ,  $V = 256 \text{ cm}^3$ .

(a) Find a formula connecting  $V$  and  $r$ .

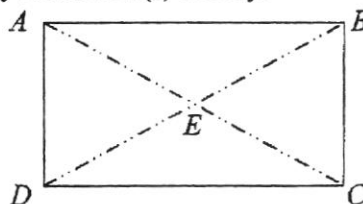
Answer (a) ..... [2]

(b) Find the new volume when the radius is doubled.

Answer (b) .....  $\text{cm}^3$  [1]

- 15 A factory produces rectangular gift boxes. The diagram below shows the top view of each box. Two lines were printed, joining  $A$  to  $C$  and  $B$  to  $D$ . They intersect at  $E$ .

(a) Given that  $\angle DAE = 67.4^\circ$ , find  $\angle AEB$ . State your reason(s) clearly.



Answer (a) .....  $^\circ$  [2]

(b) A box was selected from the production line, and checked for quality by determining whether  $ABCD$  is a rectangle.

It was found that  $AB = 24 \text{ cm}$ ,  $BC = 10 \text{ cm}$  and  $AC = 27 \text{ cm}$ .

Would you accept or reject this box? Justify your decision mathematically.

Answer (b) .....

.....

.....

..... [3]

For  
Examiner's  
Use

- 16 A 9-sided polygon has 6 interior angles of  $100^\circ$  each. Given that the remaining 3 interior angles are equal, find the size of each of the remaining 3 interior angles.

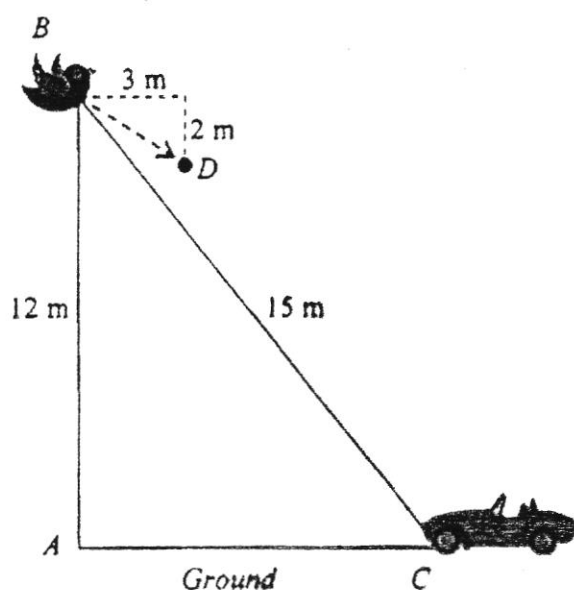
For  
Examiner's  
Use

Answer ..... [2]

- 17 The diagram shows the position of a bird,  $B$ , and a car,  $C$ . Point  $A$  is vertically below  $B$ . The bird is 12 m above the ground and 15 m from the car.

(a) Find the value of  $\tan \angle ABC$ .

- (b) The bird flew 2 m lower vertically and 3 m towards the car horizontally. Its new position is indicated by point  $D$ . Find the angle of depression of the car from the bird's new position.



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

(b) ..... [2]

**End of Paper**

## Answers

	Solution						
1(a)	0.3551						
1(b)	0.36						
2(a)	15.583						
2(b)	$-4^2, \sqrt[3]{-3900}, 151.8\%, 15\frac{7}{12}$						
3(a)	Moscow						
3(b)	-13, 4, -8, -8						
4(b)	2						
5	<table border="1"> <thead> <tr> <th>Feature</th> <th>Effect</th> </tr> </thead> <tbody> <tr> <td>Missing Years</td> <td>Unable to determine trend</td> </tr> <tr> <td>Biased Title</td> <td>Reader unable to make own decision / judgement</td> </tr> </tbody> </table>	Feature	Effect	Missing Years	Unable to determine trend	Biased Title	Reader unable to make own decision / judgement
Feature	Effect						
Missing Years	Unable to determine trend						
Biased Title	Reader unable to make own decision / judgement						
6(a)	$(2x+1)(x-y)$						
6(b)	$\frac{(2x+1)}{2x}$						
7(a)	$-8qr^7$						
7(b)	3						
8(a)	$5.18 \times 10^6$						
8(b)	3695000, 3704999						
9(a)	$x = 8, y = -1.$						
10	$x = 3$						
11(a)	$1 \leq x \leq 5$						
11(b)	2, 3 and 5						
12(a)	72						
14(a)	$V = 4r^2$						
14(b)	1024						
15(a)	$134.8^\circ$						
16	220						
17(a)	$\frac{3}{4}$						
17(b)	$59.0^\circ$						



**TANJONG KATONG SECONDARY SCHOOL**  
**Mid-Year Examination 2017**  
**Secondary 2**

CANDIDATE  
NAME

CLASS

INDEX NUMBER

**MATHEMATICS**

**4048/02**

Paper 2

Tue 9 May 2017

2 hours

Additional Materials:    Writing Paper  
    Graph Paper

**READ THESE INSTRUCTIONS FIRST**

Write your name, class and register 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 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.

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 three significant figures. Give answers in degrees to one decimal place.

For  $\pi$ , use either your calculator value or 3.142, unless the question requires the answer in terms of  $\pi$ .

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 of the marks for this paper is 80.

This document consists of 6 printed pages.

[Turn over

1. (a) Solve the following equations.

(i)  $a^2 = 2\frac{1}{4}$  [2]

(ii)  $b^2 - 9b = 0$  [2]

(b) (i) Solve the equation  $x^2 + 3x - 4 = 0$ . [3]

(ii) Hence, solve the equation  $(y-1)^2 + 3(y-1) - 4 = 0$ . [2]

2. The numbers, 180 and 280, written as the products of factors, are

$$180 = 2^2 \times 3^2 \times 5$$

$$280 = 2^3 \times 5 \times 7.$$

(a) Find

(i) the smallest integer  $x$  such that  $180x$  is a perfect cube, [2]

(ii) the greatest integer that will divide both 180 and 280 exactly, [2]

(iii) the smallest integer that is divisible by both 180 and 280. [2]

(b) (i) Express 150 as product of its prime factors. [1]

(ii) Hence, find the smallest integer  $y$  such that  $150y$  is a multiple of 180. [1]

(c) A number has an odd number of factors. Two of the factors are 2 and 3.  
Write down a possible answer of the number. [1]

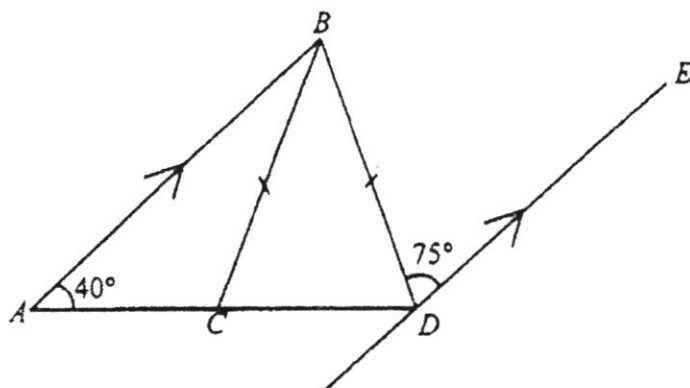
3. (a) Factorise  $32y^2 - 18$  completely. [2]

(b) Simplify  $\frac{7}{(2x+1)(5x-1)} + \frac{2}{1-5x}$ . [4]

(c) (i) Given that  $\sqrt{2m+n} = 1+p$ , express  $n$  in terms of  $m$  and  $p$ . [2]

(ii) Given that  $a = \frac{b(1+2c)}{3c-d}$ , express  $c$  in terms of  $a$ ,  $b$  and  $d$ . [4]

4. (a) In the diagram,  $ACD$  is a straight line,  $AB$  is parallel to  $DE$ ,  $BC = BD$ ,  $\angle BAC = 40^\circ$  and  $\angle BDE = 75^\circ$ .



- (i) Stating your reasons clearly, find  
 (a)  $\angle ABD$ ,  
 (b)  $\angle BCD$ . [4]
- (ii) What is angle  $ABE$  if  $ABED$  is a parallelogram? Explain clearly. [2]

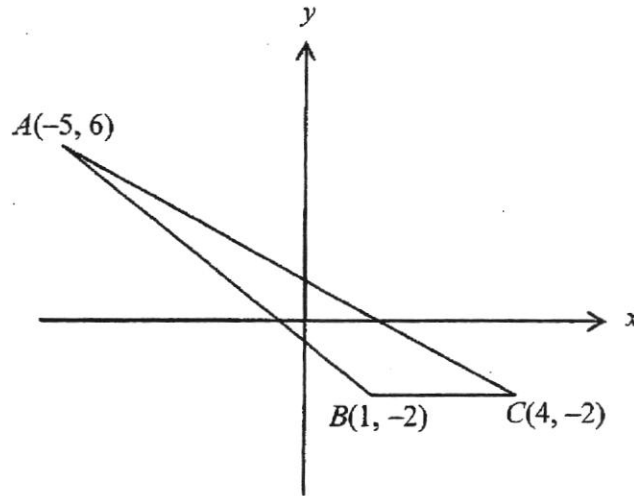
- (b) The following table shows the number pattern of the Pythagorean triples.

Row	Pythagorean Triples
1	$3^2 + 4^2 = 5^2$
2	$5^2 + 12^2 = 13^2$
3	$7^2 + 24^2 = 25^2$
4	$9^2 + 40^2 = 41^2$
5	$a^2 + 60^2 = c^2$
⋮	⋮
$n$	$x^2 + y^2 = z^2$

- (i) Write down the values of  $a$  and  $c$ . [2]  
 (ii) Express  $x$  in terms of  $n$ . [1]  
 (iii) Is it possible for the value of  $y$  to be 1990? Explain. [1]

Solutions to this question by accurate drawing will not be accepted.

5. The points  $A(-5, 6)$ ,  $B(1, -2)$  and  $C(4, -2)$  are shown in the diagram.



- (a) Find
- (i) the gradient  $AC$ , [2]
  - (ii) the equation of line  $AC$ . [2]
- (b) Given that  $BC = CD$  and  $CD$  is parallel to the  $y$ -axis, find the two possible coordinates of  $D$ . [2]
- (c) Given that a point  $E$  has positive  $x$ -coordinate such that  $AB = AE$  and  $AE$  is parallel to the  $x$ -axis, find
- (i) the coordinates of  $E$ , [3]
  - (ii) the area of quadrilateral  $ABCE$ . [2]
6. A non-hybrid car uses  $x$  litres ( $l$ ) of fuel to travel 800 km.  
A hybrid car uses 8 litres of fuel lesser than a non-hybrid car to travel the same distance
- (a) Find, in terms of  $x$ , the amount of fuel used by the hybrid car to travel 800km. [1]
- (b) Find, in terms of  $x$ , the rate of fuel consumption, in  $\text{km}/l$ , by the
- (i) non-hybrid car, [1]
  - (ii) hybrid car. [1]
- (c) Given that the rate of fuel consumption by the hybrid car is 5  $\text{km}/l$  better than the non-hybrid car, form an equation and show that it can be simplified to
- $$x^2 - 8x - 1280 = 0. \quad [3]$$
- (d) Solve the equation  $x^2 - 8x - 1280 = 0$ . [3]
- (e) Find the fuel consumption rate by the hybrid car. [1]

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

The variables  $x$  and  $y$  are connected by the equation

$$y = 2x^2 + 8x - 7$$

Some of the corresponding values of  $x$  and  $y$  are given in the following table.

$x$	-6	-5	-4	-3	-2	-1	0	1	2
$y$	17	3	$p$	-13	-15	-13	-7	3	17

- (a) Find the value of  $p$ . [1]
- (b) Using a scale of 2 cm to 1 unit, draw a horizontal axis for  $-6 \leq x \leq 2$ .  
Using a scale of 2 cm to 5 units, draw a vertical axis for  $-20 \leq y \leq 20$ .  
On your axes, plot the points given in the table and join them with a smooth curve. [3]
- (c) State the minimum point. [1]
- (d) Write down the equation of the line of symmetry. [1]
- (e) Using your graph, solve
- (i)  $2x^2 + 8x - 7 = 5$ , [1]
- (ii)  $2x^2 + 7x - 6 = 0$ . [3]

8. (a) Brand A toilet roll has increased the price from \$5.20 to \$6.50. Find the percentage increase in the price. [2]
- (b) In this question the toilet roll can be modelled as a cylinder. Each roll of toilet paper is individually wrapped as shown in Diagram 1.
- (i) Find the volume of the toilet roll. [2]
- (ii) Find the amount of wrapping paper needed to wrap one roll completely. [2]

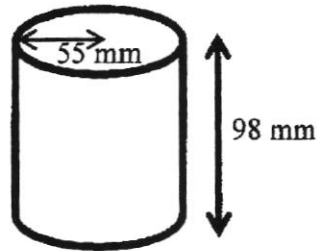


Diagram 1

- (c) Each toilet roll has 220 sheets of a length of 114 mm each as shown in Diagram 2. The toilet roll inner cardboard has a diameter of 40 mm, including the thickness of the cardboard. Find the thickness of each sheet. [3]

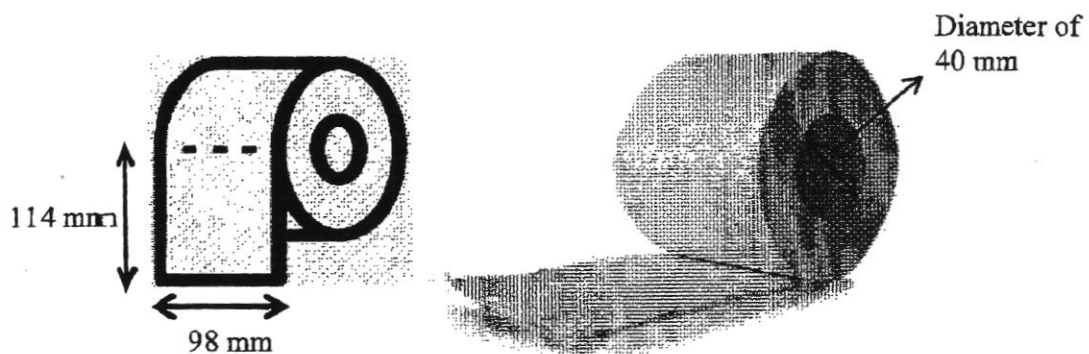


Diagram 2

End of Paper

Qn	Answers		
1a(i)	$a = \pm 1.5$	7(a)	-7
(ii)	0 or 9	(c)	(-2, -15)
b(i)	$x = -4, 1$	(d)	$x = -2$
(ii)	$x = -3, 2$	e(i)	$x = -5.2$ to $-5.15$ $x = 1.15$ to $1.2$
2a(i)	150	(ii)	$2x^2 + 8x - 7 = x - 1$ Draw $y = x - 1$ $x = -4.25(\pm 0.05)$ $x = 0.75(\pm 0.05)$
(ii)	20	8(a)	25%
(iii)	2520	b(i)	Volume = $931000\text{mm}^3$
b(i)	$150 = 2 \times 3 \times 5^2$	(ii)	Area = $52900\text{mm}^2$
(ii)	6	(c)	0.329
(c)	36, 144, 324, 576, 900		
3(a)	$2(4y + 3)(4y - 3)$		
b(i)	$\frac{5 - 4x}{(2x + 1)(5x - 1)}$		
c(i)	$n = (1 + p)^2 - 2m$		
(ii)	$c = \frac{b + ad}{3a - 2b}$		
4a(i)(a)	$75^\circ$ (alt angles)		
(i)(b)	65		
(ii)	Since $AD$ is parallel $BE$ , $\angle ABE = 180 - 40 = 140$		
b(i)	$a = 11, c = 61$		
(ii)	$x = 2n + 1$		
(iii)	No. 1990 is not a multiple of 4.		
5a(i)	$m = -\frac{8}{9}$		
(ii)	$y = -\frac{8}{9}x + \frac{14}{9}$		
(b)	(4,1) and (4,-5)		
c(i)	$E = (5,6)$		
(ii)	52 units <sup>2</sup>		
6(a)	$(x - 8)$ litres		
6b(i)	$\frac{800}{x}$		
(ii)	$\frac{800}{x - 8}$		
(d)	$x = 40, -32$		
(e)	25 km/l		

Secondary Two Mathematics  
Mid-Year Examination 2017  
Paper 1 Marking Scheme

	Solution	Marks	Remarks
1(a)	0.3551	B1	
1(b)	0.36	$\sqrt{\quad}$ B1	
2(a)	15.58 $\dot{3}$	B1	
2(b)	$-4^2, \sqrt[3]{-3900}, 151.8\%, 15\frac{7}{12}$	B2	Deduct 1 mark per error
3(a)	Moscow	B1	
3(b)	-13, 4, -8, -8	B2	B1 – Digits, B1 – Signs Or -1m for 1 mistake
3(c)	12 am in Paris, 12°C or 8°C  It should be cooler at midnight than at noon (as the sun is present at noon).	B1  B1	Any acceptable answer  Accept warmer at noon than midnight, etc.
4(a)	The bigger the diameter, the further the distance travelled by the wheel / bicycle.	B1	Accept diameter is directly proportional to the distance travelled.
4(b)	Let $n$ be the number of revolutions  $\frac{n2\pi(40)}{n2\pi(16)} = \frac{x}{x-12}$ $x = 2$	M1  A1	Any acceptable method (ratio, forming equation, etc)
5	Feature	Effect	B1 B1 B1 Feature Effect
	Missing Years	Unable to determine trend	
	Biased Title	Reader unable to make own decision / judgement	
6(a)	$2x(x-y) + (x-y)$ $= (2x+1)(x-y)$	M1  A1	$2x(x-y)$
6(b)	$\frac{(2x+1)(x-y)}{4} \times \frac{2}{x(x-y)}$ $= \frac{(2x+1)}{2x}$	M1  A1	Correct factorization + reciprocal

7(a)	$p^2q \times p^{-2}r \times (-2r^2)^3 = qr \times -8r^6$ $= -8qr^7$	M2 A1	-8 or $r^6$ seen for M1 $p^0 = 1$ (s.o.i) for M1
7(b)	$7^{3x-7} = 7^2$ $x = 3$	M1 A1	Common base s.o.i
8(a)	$5.18 \times 10^5$	B1	
8(b)	3695000, 3704999	B2	
9(a)	Elimination or Substitution Method (must be clearly labelled) $x - 8, y = -1.$	M1 A2	
10	Drawing $y = -x + 7$ $x = 3$	L1 A1	Line must be accurate.
11(a)	$3 - 2x < 4x - 3$ and $4x - 3 \leq 17$ $x \geq 1$ $x \leq 5$ $1 \leq x \leq 5$	M1 M1 A1	Splitting, -1m for 'or' Either solution is correct Combining answers
11(b)	2, 3 and 5	√B1	
12(a)	$a + b = \frac{-18}{3}$ $= -6$ $2(a + b)^2 = 72$	B1 M1 A1	$a^2 - b^2 = (a + b)(a - b)$ seen (or better) -6
12(b)	$(a + b)^2$ can never be negative. Hence, $2(a + b)^2$ can never be negative.	B1	Accept $(a + b)^2 \geq 0$ $2(a + b)^2 \geq 0$ or $(a + b)^2$ is always positive or equal to zero, hence $2(a + b)^2 \geq 0$ is always positive or equal to zero.
13	Construction Question (see attached)	6 marks	
14(a)	$256 = k(8)^2$ $V = 4r^2$	M1 A1	Correct substitution or $k = 4$
14(b)	1024	A1	

15(a)	$\angle AED = 180 - 2(67.4)$ <p style="text-align: center;">(base of isosceles)</p> $= 45.2^\circ$ $\angle AEB = 180 - 45.2$ <p style="text-align: center;">(adj. angles on a straight line)</p> $= 134.8^\circ$ <p>Alternatively,</p> $\angle EAB = 90 - 67.4$ <p style="text-align: center;">(prop. of rectangle)</p> $= 22.6^\circ$ $\angle EAB = 180 - 2(22.6)$ <p style="text-align: center;">(angles sum of triangle)</p> $= 134.8^\circ$	M1          A1	Any acceptable method + correct reason(s) stated          Final Answer
15(b)	$10^2 + 24^2 = 676$ $27^2 = 729$ <p>Since the lengths do not obey/satisfy/follow Pythagoras Theorem, <math>ABC</math> is not a right-angled triangle.</p> <p>I will reject this box as it is not a rectangular box (or angle <math>ABC</math> is not a right angle).</p>	B1   B1   B1	Converse of PT Do not accept $10^2 + 24^2 = 27^2$
16	$\frac{7(180) - 600}{3} = 220$	M1  A1	7(180)
17(a)	$AC = \sqrt{15^2 - 12^2}$ $= 9 \text{ cm}$ $\tan \angle ABC = \frac{3}{4}$	M1      $\sqrt{\quad}$ A1	By PT, s.o.i      Accept 0.75 or $\frac{AC}{12}$
17(b)	$\tan \angle ACD = \frac{10}{6}$ $\angle ACD = 59.0^\circ$	M1   A1	$\frac{10}{AC - 3}$ <p>Award no marks for <math>59^\circ</math></p>

END OF PAPER

Qn	Solutions	Marks	Remarks
1a(i)	$a = \pm 1.5$	B2	Reject $\frac{3}{2}$
(ii)	0 or 9	B2	
b(i)	$(x+4)(x-1) = 0$ $x = -4, 1$	M1 A2	Attempt to factorise
(ii)	$x = y - 1$ $x = -3, 2$	B1 VB1	Soi their b(i) + 1
2a(i)	$2 \times 3 \times 5^2$ $= 150$	B1 B1	2, 3 or $5^2$ seen (soi)
(ii)	$2^2 \times 5$ $= 20$	M1 A1	2 and 5 seen (common factor)
(iii)	$2^3 \times 3^2 \times 5 \times 7$ $= 2520$	M1 A1	Finding LCM
b(i)	$150 = 2 \times 3 \times 5^2$	B1	$150 = 2 \times 3 \times 5 \times 5$ ok
(ii)	6	B1	
(c)	36, 144, 324, 576, 900	B1	Multiple of 36 with a perfect sq number
3(a)	$2(4y+3)(4y-3)$	B1 B1	Factorise 2
b	$\frac{7}{(2x+1)(5x-1)} - \frac{2}{5x-1}$ $= \frac{7-4x-2}{(2x+1)(5x-1)}$ $= \frac{5-4x}{(2x+1)(5x-1)}$	B1  M1 M1 A1 (accept expanded form or isw)	Change of sign  Combine to a single fraction Expand correctly $\frac{4x-5}{(2x+1)(1-5x)}$
c(i)	$2m+n = (1+p)^2$ $n = (1+p)^2 - 2m$	M1 A1	Square both sides Ignore subsequent working
(ii)	$3ac - ad = b + 2bc$ $3ac - 2bc = b + ad$ $c = \frac{b+ad}{3a-2b}$	M1 M1 M1 A1	Get rid of fractions Either correct expansion Group like terms (terms with c)
4a(i)(a)	$75^\circ$ (alt angles)	B1	
(i)(b)	$\angle BCD = \angle BDC$ $= 180 - 75 - 40 = 65$	M1 A1 B1	Int angles, base angles of isos triangle  Reasons given
(ii)	Since AD is parallel BE, $\angle ABE$ $= 180 - 40 = 140$	VB1 B1	$v(BDC + 75^\circ)$ Int angles/ opposite angles of parallelogram

b(i)	$a = 11, c = 61$	B2	
(ii)	$x = 2n + 1$	B1	Don't accept $2xn+1$ Accept $3+2(n-1)$
(iii)	No. 1990 is not a multiple of 4.	B1	
5a(i)	$m = \frac{6+2}{-5-4}$ $m = -\frac{8}{9}$	M1 A1	Knowing $y/x$ with substitution
(ii)	$6 = -\frac{8}{9}(-5) + c$ $c = \frac{14}{9}$ $y = -\frac{8}{9}x + \frac{14}{9}$	M1 A1	Attempt to solve $c$
(b)	$(4, 1)$ and $(4, -5)$	B2	
c(i)	$AB = \sqrt{6^2 + 8^2} = 10$ $E = (5, 6)$	M1 A2	Finding length A1 - 5, A1 - 6 Must be coordinates
(ii)	$\frac{1}{2}(3 + \text{their } AD)(8) = 52 \text{ units}^2$	M1 A1	Finding area
6(a)	$(x - 8)$ litres	B1	
6b(i)	$\frac{800}{x}$	B1	
(ii)	$\frac{800}{x-8}$	VB1	$\frac{800}{\text{their } (a)}$
(c)	$\frac{800}{x-8} - \frac{800}{x} = 5$ $880x - 800(x-8) = 5x(x-8)$ $5x^2 - 40x - 6400 = 0$ $x^2 - 8x - 1280 = 0$	M1 M1 A1	Form equation (ii) - (i) = 5 Get rid of fraction With simplified equation seen
(d)	$(x - 40)(x + 32) = 0$ $x = 40, -32$	M1 A2	Attempt to factorise Both answers seen Ignore if reject
(e)	25 km/l	VB1	$\frac{800}{\text{their } (a)}$
7(a)	-7	B1	
(b)		P2 C1	Any wrong points -1m Smooth curve seen
(c)	$(-2, -15)$	B1	
(d)	$x = -2$	B1	
e(i)	$x = -5.2 \text{ to } -5.15$ $x = 1.15 \text{ to } 1.2$	A1	Both correct answers
(ii)	$2x^2 + 8x - 7 = x - 1$ Draw $y = x - 1$ $x = -4.25(\pm 0.05)$	B1 B1 B1	Manipulation seen Line drawn Both correct answers

	$x = 0.75(\pm 0.05)$		
8(a)	$\frac{6.5 - 5.2}{5.2} \times 100\% = 25\%$	B1 B1	$\frac{6.5 - 5.2}{5.2}$
b(i)	Volume = $\pi(55)^2(98) = 931000mm^3$	B1 B1	
(ii)	Area = $2\pi(55)^2 + 2\pi(55)(98) = 52900mm^2$	B1 B1	
(c)	$\pi(55)^2 - \pi(20)^2 = 114 \times 220 \times x$ $x = 0.329$  OR $height = \frac{98\pi(55)^2 - 98\pi(20)^2}{114 \times 220 \times 98}$ $= 0.329$	B1, B1 B1	Finding the areas in 2 ways