



Name : _____ ()

Class : Sec 1-____

Second Semester Examination 2017
Secondary 1 Express

Mathematics

4016/1

Paper 1

Monday 9th Oct 2017

1 hour
7.45 am – 8.45 am

Additional materials:

Nil

INSTRUCTIONS TO CANDIDATES

Write your name, class and register number in the spaces provided on the paper/answer booklet.

Answer **All** questions.

All necessary working must be shown.

Omission of essential working will result in loss of marks.

ELECTRONIC CALCULATORS CAN BE USED IN THIS PAPER.

INFORMATION FOR CANDIDATES

The number of mark is given in brackets [] at the end of each question or part question.

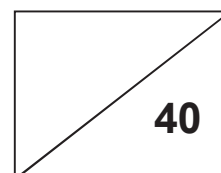
You should not spend too much time on any one question.

The total marks for this paper is **40**.

If the degree of accuracy is not specified in the question and if the answer is not exact, the answer should be given to three significant figures. Answers in degrees should be given to one decimal place.

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

MARKS:



This question paper consists of 8 printed pages including the cover page.



Mathematical Formulae

Compound Interest

$$\text{Total amount} = P \left(1 + \frac{r}{100} \right)^n$$

Mensuration

$$\text{Curve surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3} \pi r^3$$

$$\text{Volume of triangle ABC} = \frac{1}{2} ab \sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Area of sector} = \frac{1}{2} r^2 \theta \text{ where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2}$$



Answer **all** questions.

1. Without using a calculator, estimate each of the following.

(a) 998×72

(b) $\sqrt[3]{995} + \sqrt{50}$

Ans: (a) _____ [2]

(b) _____ [2]

2. Use your calculator to find the value of $\frac{\sqrt[3]{1798 \times 0.045}}{6.31 - 5.5}$. Give your answer correct to 4 significant figures.

Ans: _____ [2]

3. Express each of the following in the respective units.

(a) 72 km/h to m/s

(b) 2 400 000 cm³ to m³

Ans: (a) _____ m/s [2]

(b) _____ m³ [2]



4. Consider the following number sequence.

$$-6, -1, 4, 9, 14, \dots$$

- (a) Write down the next two terms for the following sequence.
- (b) Express T_n in terms of n .
- (c) Find the 100th term.

Ans: (a) _____ [1]

(b) _____ [1]

(c) _____ [2]

5. 3 drones can deliver 9 packages in 2 hours. Assuming that the packages are identical and the drones work at the same rate, how long will it take 5 drones to deliver 30 packages?

Ans: _____ hours [2]



6. Clare needs to pack 108 chocolate chip cookies, 162 oatmeal cookies and 54 macadamia nut cookies into identical boxes so that each type of cookies is equally distributed. Find
- (a) the largest number of boxes that can be packed,
 - (b) the total number of cookies in each box.

Ans: (a) _____ boxes [2]

(b) _____ cookies [1]

7. Expand and simplify each of the following.

(a) $2a - \frac{3}{5}(15b - 10a)$

(b) $4(c + 3d) + 7(2c - d)$

Ans: (a) _____ [2]

(b) _____ [2]



8. Factorise each of the following expressions completely.

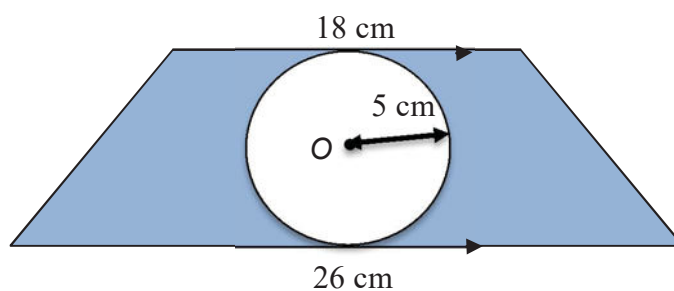
(a) $24x - 34xy$

(b) $12ab - 15a + 24ac$

Ans: (a) _____ [1]

(b) _____ [1]

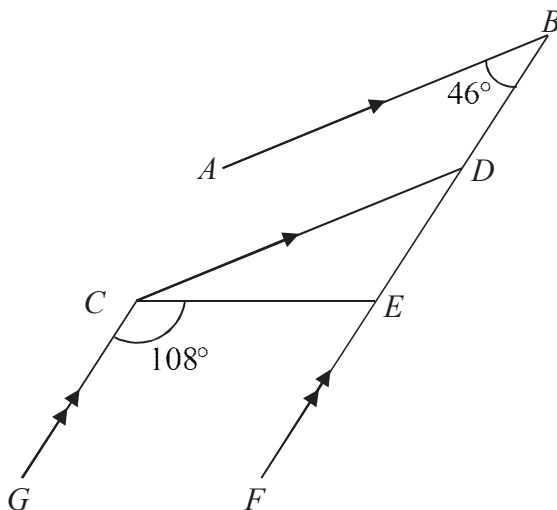
9. For the following figure, consisting of a trapezium and a circle, find the area of the shaded region, where O is the centre of the circle.



Ans: _____ cm^2 [3]



10. In the given diagram, AB is parallel to CD and CG is parallel to BF ,
 $\angle ABF = 46^\circ$ and $\angle GCE = 108^\circ$.



State with reasons clearly, find the value of the following.

- (a) $\angle CED$
- (b) $\angle CDB$
- (c) reflex $\angle DCG$

Ans: (a) _____[°] [2]
(b) _____[°] [2]
(c) _____[°] [3]



11. The sum of the interior angles of a regular polygon is 1080° . Find the size of one exterior angle.

Ans: _____ [3]

12. Emma and Rupert each conduct a survey among 100 people to find out their most commonly used form of transportation. The information they gathered is shown in the table below.

	Emma	Rupert
Car	67	9
Public Transport	26	71
Walking	7	20

Give two reasons to account for the differences in their results.

Ans: Reason 1: _____ [2]

Reason 2:

– End of paper –



Name : _____ ()

Class : Sec 1-____

Second Semester Examination 2017
Secondary 1 Express

Mathematics
Paper 2

4016/2

Monday 2nd October 2017

1 hour 15 minutes
10.05 am – 11.20 am

Additional materials:

3 sheets of writing paper , 1 sheet of blank paper and 1 sheet of graph paper

READ THESE INSTRUCTIONS FIRST

Write your Name and Index Number on all the work you hand in.

Write in dark blue or black pen.

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.

You are expected to use an electronic calculator to evaluate explicit numerical expressions. If the degree of accuracy is not specified in the question, and if the answer is not, give the exact answer to three significant figures. Give answers in degrees to one decimal place.

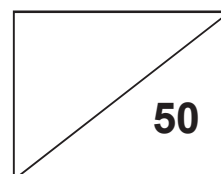
For π , use either your calculator value or 3.142, unless the question requires the answer in term of π .

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**.

MARKS:



This question paper consists of **6** printed pages including the cover page.



Mathematical Formulae

Compound interest

$$\text{Total amount} = P \left(1 + \frac{r}{100} \right)^n$$

Mensuration

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2} ab \sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2} r^2 \theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

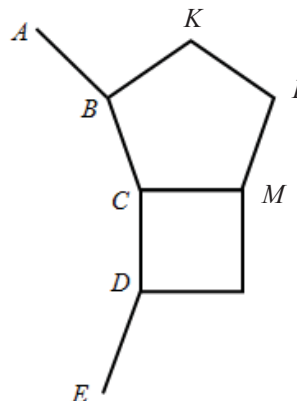
Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2}$$



1. (a) Solve the following equations.
- (i) $-13x - 3 + 5x = 5$ [2]
- (ii) $\frac{5x}{2} - \frac{x+2}{3} = 5$ [3]
- (b) (i) Solve the inequality $32 + 3x \leq 23$. [2]
- (ii) Hence, find the biggest possible value of x if x is an even number. [1]
2. Nathiel walks from home at a speed of 60 m/min to school at 0630 in the morning to school. After walking for 12 minutes he stopped by 7-eleven for 5 minutes to buy some snacks. Nathiel then continues to walk at the same speed for another 8 minutes before reaching school.
- (a) Express Nathiel's walking speed in km/h. [2]
- (b) What is the distance, in metres, of the school from his home? [1]
- (c) What is the average speed, in m/min, of the whole journey? [2]
- (d) Allen cycles at a speed of 12 km/h from home which is 4 km away from school. He leaves home at 0640 in the morning. Who will reach school first, Nathiel or Allen? [2]
3. The diagram below is made up of a square, a regular pentagon and a regular polygon of n sides. ABCDE shows part of the n -sided polygon.



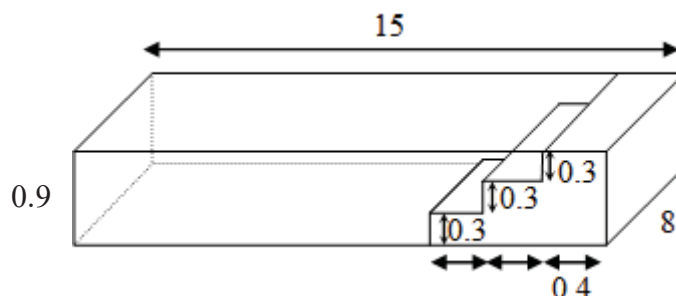
- Find
- (a) $\angle BCM$ [2]
- (b) the interior angle of n -sided polygon $\angle BCD$ [2]
- (c) the number of sides n [2]



4. (a) The tickets to *Thomas & Friends the Musical* were sold at \$30, \$50 and \$100. The number of \$30-tickets sold was thrice the number of \$50-tickets. The number of \$100-tickets sold was 100 less than the number of \$50-tickets. The number of \$50-tickets sold was x . The total number of the tickets sold were 2605.
- (i) Write down an expression, in terms of x , for the total number of tickets sold. [1]
- (ii) Hence, find the value of x . [1]
- (iii) The following year, the tickets to *Thomas & Friends the Musical* were sold at \$33, \$55 and \$110. Find the percentage increase in price for each ticket. [2]
- (b) Selina Kyle, a cat burglar broke into Wayne Enterprise and stole a diamond pendant worth 12 million dollars. She then sells the diamond pendant at 240% of the original value on the black market. Find the price of the diamond pendant on the black market. [2]
- (c) The price of *My Melody* figurine toy in the month of October was \$ m . During a toy fair in November, the price increased by 25%. After the toy fair, the sales of the figurine dropped by 25% in March. After the sales, did the price of the figurine dropped back to its original price? Explain your answer. [2]



5. The figure below shows a rectangular children's swimming pool that is 15 m long, 8 m wide and 0.9 m deep. On one end of the pool, along the width, a flight of three steps is built. Each step is 0.3 m in height and 0.4 m in width.



Find the

- (a) depth of the swimming pool, [1]
(b) volume of water needed to fill the pool [3]
(c) total surface area of the water in contact with the sides of the pool. [2]
6. **Answer the whole of this question on the graph paper provided.**

Given the equation $y = 2x$,

x	0	4	8
y	0	a	16

- (a) Find the value of a . [1]
(b) Using a scale of 2 cm to represent 1 unit on the x-axis and 1 cm to represent 1 unit on the y-axis, draw the graph of $y = 2x$ for $0 \leq x \leq 8$. [3]
(c) From the graph, find the value of x when $y = 5$. [1]
(d) Find the gradient of the graph. [1]



7. **Answer the whole of this question on the blank paper provided.**

Indiana Jeromes was looking for a treasure chest buried in a field $ABCD$. His father Benry decided to help him map out the dimensions of the field $ABCD$. The dimensions are as follow. $AB = 9$ cm, $BC = 4$ cm, $AD = 7$ cm, $\angle ABC = 60^\circ$ and $\angle BAD = 90^\circ$

- (a) Construct the quadrilateral field $ABCD$ on your writing paper [4]
- (b) (i) Draw the angle bisector of $\angle BAD$, [2]
- (ii) Draw the perpendicular bisector of AB . [2]
- (iii) The treasure chest is located at the intersection of the 2 [1]
bisectors. Label the location of the treasure chest as T and
measure the length of BT .

– END OF PAPER –

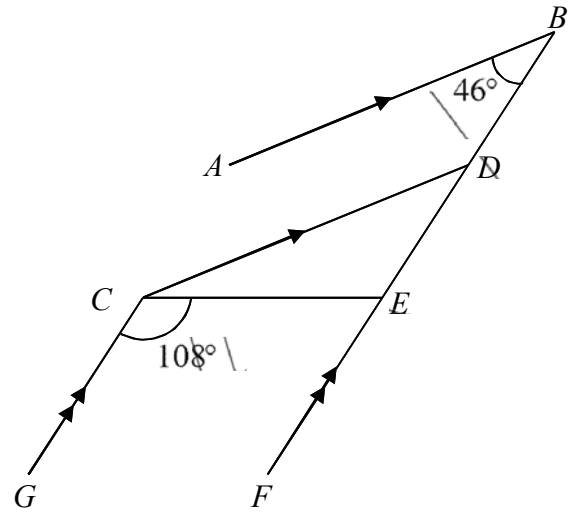
Please check your work.



MARK SCHEME

1(a)	$998 \times 72 \approx 1000 \times 72$ or $\approx 1000 \times 70$ $= 72000$ $= 70000$	M1 A1																				
(b)	$\sqrt[3]{995} + \sqrt{50} = \sqrt[3]{1000} + \sqrt{49}$ $= 10 + 7 = 17$	M1 A1																				
2	$\frac{\sqrt[3]{1798 \times 0.045}}{6.31 - 5.5} = 5.3396859\dots$ $= 5.340$	M1 A1																				
3(a)	$72 \text{ km/h} = \frac{72 \text{ km}}{1 \text{ h}} = \frac{72 \times 1000 \text{ m}}{1 \times 60 \times 60 \text{ s}}$ $= 20 \text{ m/s}$	M1 A1																				
(b)	$2400000 \text{ cm}^3 = 2400000 \div 100 \div 100 \div 100$ $= 2.4 \text{ m}^3$	M1 A1																				
4(a)	19, 24	B1																				
(b)	$T_1 = 5(1) - 11 = -6$ $T_2 = 5(2) - 11 = -1$ ⋮ $T_n = 5n - 11$	B1																				
(c)	$T_{100} = 5(100) - 11$ $= 489$	M1 A1 ECF																				
5	<table border="1"> <thead> <tr> <th>Drones</th> <th>Packages</th> <th>Hours</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>9</td> <td>2</td> </tr> <tr> <td>5</td> <td>15</td> <td>2</td> </tr> <tr> <td>5</td> <td>30</td> <td>4</td> </tr> </tbody> </table> <p>Answer : 4</p>	Drones	Packages	Hours	3	9	2	5	15	2	5	30	4	M1 A1								
Drones	Packages	Hours																				
3	9	2																				
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6(a)	<table border="1"> <tbody> <tr> <td>2</td> <td>108</td> <td>162</td> <td>54</td> </tr> <tr> <td>3</td> <td>54</td> <td>81</td> <td>27</td> </tr> <tr> <td>3</td> <td>18</td> <td>27</td> <td>9</td> </tr> <tr> <td>3</td> <td>6</td> <td>9</td> <td>3</td> </tr> <tr> <td></td> <td>2</td> <td>3</td> <td>1</td> </tr> </tbody> </table> <p>HCF = 54</p>	2	108	162	54	3	54	81	27	3	18	27	9	3	6	9	3		2	3	1	M1 A1
2	108	162	54																			
3	54	81	27																			
3	18	27	9																			
3	6	9	3																			
	2	3	1																			
(b)	Total number of cookies in each box = $2 + 3 + 1 = 6$	B1																				



7(a)	$2a - \frac{3}{5}(15b - 10a)$ $= 2a - 9b + 6a$ $= 8a - 9b$	M1 A1
(b)	$4(c + 3d) + 7(2c - d)$ $= 4c + 12d + 14c - 7d$ $= 18c + 5d$	M1 A1
8(a)	$24x - 34xy = 2x(12 - 17y)$	B1
(b)	$12ab - 15a + 24ac = 3a(4b - 5 + 8c)$	B1
9	<p>Area of Circle = $\pi r^2 = \pi(5)^2 = 78.54 \text{ cm}^2$ Area of trapezium = $\frac{18+26}{2} \times 10 = 220 \text{ cm}^2$ Area of shaded region = $220 - 78.54 \approx 141 \text{ cm}^2$</p>	M1 M1 A1
10	 <p>(a) $\angle CED = \angle GCE$ (alt \angles, $GC // FB$) $\hat{=} 108^\circ$</p> <p>(b) $\angle CDB = 180^\circ - \angle DBA$ (int \angles, $CD // AB$) $= 180^\circ - 46^\circ$ $= 134^\circ$</p> <p>(c) $\angle DCG = \angle CDB$ (alt \angles, $GC // FB$) $= 134^\circ$ reflex $\angle DCG = 360^\circ - 134^\circ$ (\angles at a pt) $= 226^\circ$</p>	Deduct one mark overall if no reasons given. M1 A1 M1 A1 M1 M1 A1
11	<p>Sum of int. angles = $(n - 2) \times 180^\circ$ $1080^\circ = (n - 2) \times 180^\circ$ $n - 2 = \frac{1080^\circ}{180^\circ}$ $n = 6 + 2$ $n = 8$</p>	M1 M1



	$1 \text{ ext. angle} = \frac{360^\circ}{8}$ $= 45^\circ$	A1
12	Location: Emma conducted her survey near an office while Rupert was near a school/interchange. People surveyed: Emma chose mostly working adults to survey while Rupert chose students.	B1 for each correct reason, up to B2



MARK SCHEME

1(a)(i)	$-8x = 8$ $x = -1$	M1 A1
(a)(ii)	$\frac{15x}{6} - \frac{2x+4}{6} = 5$ $\frac{15x-2x-4}{6} = 5$ $13x - 4 = 30$ $13x = 34$ $x = 2\frac{8}{13}$ (or 2.62)	M1 M1' A1
(b)(i)	$3x \leq -9$ $x \leq -3$	M1' A1.
(b)(ii)	-4	B1
2(a)	60m/min 3600m/hr 3.6 km/hr	M1 A1
(b)	$12\cancel{+}8\cancel{=} 20$ $20\cancel{x}60$ $= 1200\cancel{m}$	B1
(c)	$\frac{1200}{12\cancel{+}5\cancel{+}8}$ $= 48\cancel{m} \cancel{/min}$	M1 A1
(d)	$60 \times \frac{4}{12}$ $= 20 \text{ min}$ $0640 + 20 = 0700$ Nathiel reached first	M1 A1
3	$(5-2)180$ $= 540$ $540/5$ $= 108$	M1 A1



(b)	$360 - 108 - 90$ $=162$	M1 A1
(c)	$180 - 162$ $=18$ $360/18$ $=20$	M1 A1
4(a)	$3x + x + x - 100$ $5x - 100$	B1
(ii)	$5x - 100 = 2605$ $x = 541$	B1
(iii)	$\frac{3}{30} \times 100\%$ $= 10\%$ 10% same throughout	M1 A1
b)	$\frac{240}{100} \times 12$ $= 28.8 \text{ million}$ or 28800000	M1 A1
(c)	Nov toy price ₹ 1.25m After discount $= 0.75$ (₹.25m) 0.9375m It became cheaper	M1 A1
5(a)	0.9m	B1
(ii)	Volume of steps in water $= 0.3 \times 0.4 \times 3 \times 8$ 2.88 Volume of water $(13.8 \times 8 \times 0.9) - 2.88$ $= 102.24$ Accept other ways: 1m for calculation of water above steps 1m for calculation of cuboid pool excluding steps 1m for final ans	M1 M1 A1
iii)	Surface are $(14.6 \times 8) + 2(14.6 \times 0.9 - 0.3 \times 0.4 \times 3) + 2(0.9 \times 8)$ $= 157$ (3sf)	M1 A1



6a)	$a = 8$	B1
(b)	<p>1m for correct plot with label 1m for correct scale x axis 1m for correct scale y axis</p>	
(c)	$x = 2.5$	B1
d)	2	B1
7(a)		

