



**JUNYUAN SECONDARY SCHOOL  
END OF YEAR EXAMINATION 2017  
SECONDARY ONE EXPRESS**

CANDIDATE NAME

CLASS

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INDEX NUMBER

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**MATHEMATICS**

**4048/01**

Paper 1

9 October 2017

**1 hour**

Candidates answer on the 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, 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.

**The use of calculator is not allowed for this paper.**

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 50.

**For Examiner's Use**

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This document consists of **12** printed pages (including the Cover Sheet).

**[Turn over**

**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 The numbers 540 and 7056, written as a product of their prime factors, are

$$540 = 2^2 \times 3^a \times 5 \quad \text{and} \quad 7056 = 2^4 \times 3^2 \times 7^2.$$

Find

- (a) the value of  $a$ ,

*Answer*  $a = \dots\dots\dots$  [1]

- (b)  $\sqrt[3]{7056}$ .

*Answer*  $\dots\dots\dots$  [1]

- 2 Factorise completely  $4ax + 12by - 16ay - 3bx$ .

*Answer*  $\dots\dots\dots$  [2]



- 5 Keith keeps track of his monthly business profits and losses over a period of five months given in the table below.

Month	Profit
April	-\$2800
May	-\$1200
June	\$900
July	\$1500
August	\$1000

- (a) Find his total losses from April to August.

*Answer* \$..... [1]

- (b) If he makes a total profit of \$2000 from April to September, what is his profit for September?

*Answer* \$..... [2]

- 6 Mr Tan is presently 4 times as old as his son Kenneth.

- (a) If Kenneth is  $x$  years old now, write down Mr Tan's age in terms of  $x$ .

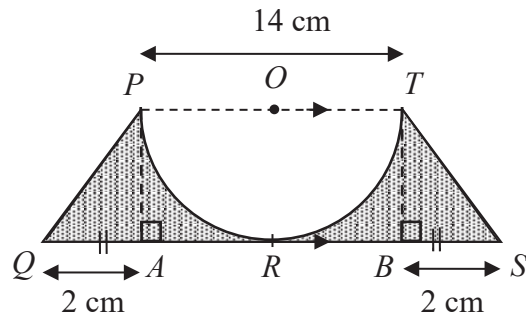
*Answer* ..... years old [1]

- (b) In 20 years' time, Mr Tan will be 2 times as old as Kenneth.

Form an equation in  $x$ , and hence find Mr Tan's age in 20 years' time?

*Answer* ..... years old [2]

- 7 The figure below shows a trapezium  $PQST$ .



$PT$  is the diameter of a circle with centre  $O$ .  
 $PT = 14$  cm,  $QA = BS = 2$  cm.

Find the area of the shaded region. Take  $\pi = \frac{22}{7}$ .

Answer ..... cm<sup>2</sup> [3]

- 8 Emilia took  $\frac{1}{3}$  h to cycle from her house to the library at a speed of 12 km/h.

Upon reaching the library, she suddenly remembered that she has forgotten to feed her cat. She rushed home at double the speed which she cycled from her house to the library.

- (a) Find the distance between Emilia's house and the library.

*Answer* ..... km [1]

- (b) Find the average speed for Emilia's entire journey.

*Answer* ..... km/h [2]

- 9 (a) Solve the inequality  $3x + 16 \geq -5x + 24$ .

*Answer* ..... [2]

- (b) Hence, write down

- (i) the smallest odd number,

*Answer* ..... [1]

- (ii) the smallest prime number.

*Answer* ..... [1]

- 10** At a bakery, the prices of a plain waffle and a peanut butter waffle are in the ratio 5 : 6.
- (a)** Given that the prices of a plain waffle and a chocolate waffle are in the ratio 3 : 4, find the ratio of the price of a peanut butter waffle to the price of a chocolate waffle.  
Give your answer in the simplest form.

*Answer* ..... : ..... [2]

- (b)** The difference in price between the plain waffle and the peanut butter waffle is \$0.30.  
Find the price of a peanut butter waffle.

*Answer* \$..... [2]



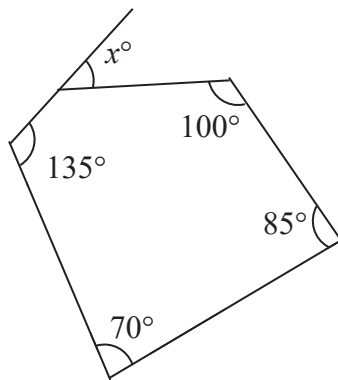
11 (a) Solve the equation  $4x - 5 = 3(3 + 2x)$ .

*Answer*  $x = \dots\dots\dots$  [2]

(b) Simplify  $\frac{3n - m}{4} - \frac{2n - m}{3}$ .

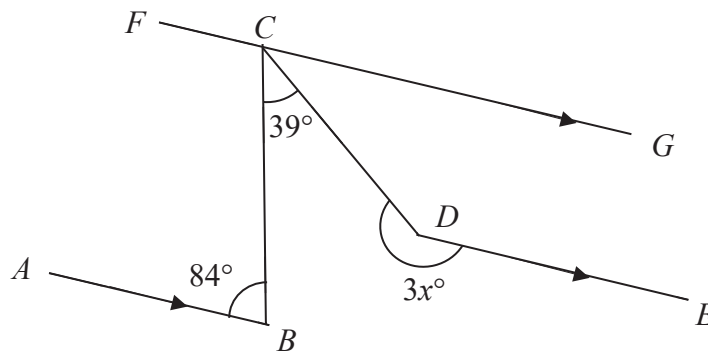
*Answer*  $\dots\dots\dots$  [2]

- 12 (a) Find the value of  $x$  in the diagram shown below.



Answer  $x = \dots\dots\dots$  [2]

- (b) In the diagram, lines  $AB$ ,  $DE$  and  $FCG$  are parallel.  
 $\angle ABC = 84^\circ$  and  $\angle BCD = 39^\circ$ .



Find the value of  $x$ , stating all reasons clearly.

Answer  $x = \dots\dots\dots$  [3]

13 The birth weight of a newborn baby girl is 2 800 g.  
 During the first year, her weight increases by 480 g every month.

(a) Write down her weight when she is

(i) 1 month old,

*Answer* ..... g[1]

(ii) 2 months old.

*Answer* ..... g[1]

(b) Find an expression for her weight when she is  $n$  months old.

*Answer* ..... g[1]

(c) If the girl weighs 8.0 kg when she is  $m$  months old, find the value of  $m$ .

*Answer*  $m =$  ..... [1]

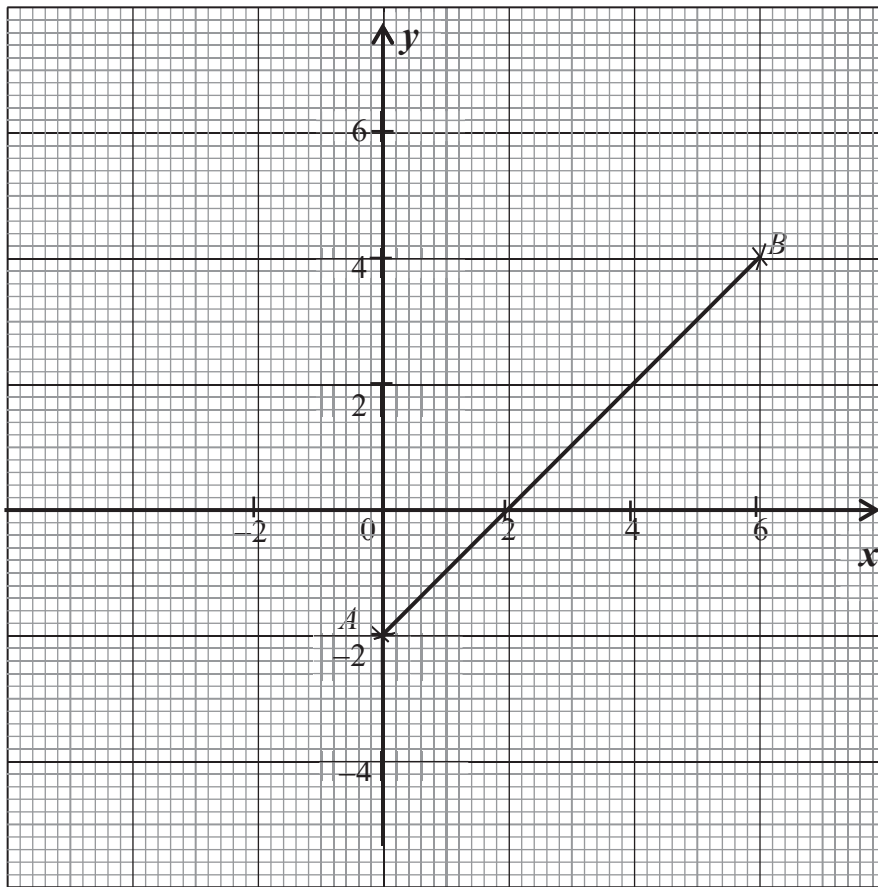
(d) Explain why the expression in (b) is not used to find the weight of the girl when she is 10 years old.

*Answer*.....

..... [1]

14 In the diagram below, the points  $A$  and  $B$  are  $(0, -2)$  and  $(6, 4)$  respectively.

Answer (b) and (c)



(a) Find the gradient of the line  $AB$ .

Answer ..... [1]

(b) On the same diagram, draw the lines  $y = -2$  and  $x = 6$ .

[2]

(c) Point  $C$  is the point of intersection between the lines  $y = -2$  and  $x = 6$ .

Mark and label point  $C$  on the diagram.

[1]

(d) Hence, calculate the area of triangle  $ABC$ .

Answer .....  $\text{unit}^2$  [2]

**End of Paper**



**JUNYUAN SECONDARY SCHOOL  
END OF YEAR EXAMINATION 2017  
SECONDARY ONE EXPRESS**

CANDIDATE NAME

CLASS

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INDEX NUMBER

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**MATHEMATICS**

**4048/02**

Paper 2

13 October 2017

**1 hour 30 minutes**

Additional Materials: Writing paper (6 sheets)  
Graph paper (1 sheet)  
1 String

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**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 on both sides of the paper.  
You may use an HB pencil for any diagrams or graphs.  
Do not use 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.

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  $\pi$ , 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 number of marks for this paper is 50.

Hand in your question paper and answer scripts **SEPARATELY**.

**Mathematical Formulae***Compound interest*

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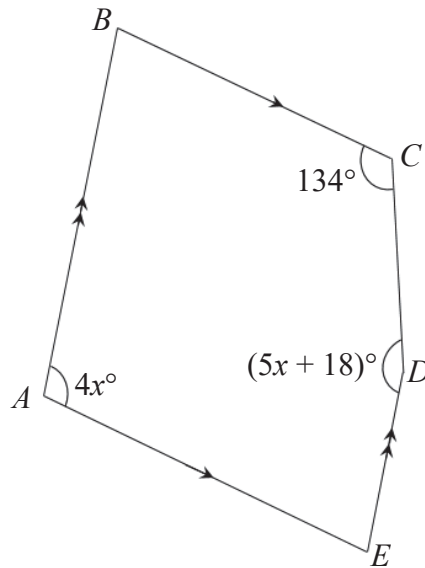
$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left( \frac{\sum fx}{\sum f} \right)^2}$$

- 1 (a) Express 1296 as a product of its prime factors. [1]
- (b) Find the largest integer, which is both a factor of 1296 and 672. [2]
- 

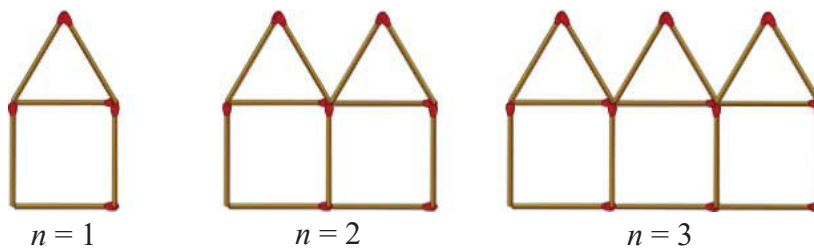
- 2 The diagram below shows a 5-sided polygon.  
 $AB$  is parallel to  $DE$ , and  $AE$  is parallel to  $BC$ .  
 $\angle BAE = 4x^\circ$ ,  $\angle BCD = 134^\circ$  and  $\angle CDE = (5x + 18)^\circ$ .

Find the value of  $x$ .

[3]



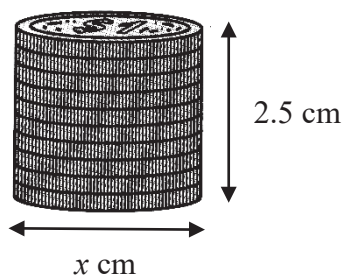
- 3 The diagram shows a sequence of figures formed by matchsticks, where  $n$  is the figure number.



- (a) Draw the figure for  $n = 4$ . [1]
- (b) If  $T_n$  is the number of matchsticks in the  $n$ th figure, state  $T_1$ ,  $T_2$ ,  $T_3$  and  $T_4$ . [2]
- (c) Hence, or otherwise, find the general term  $T_n$  in terms of  $n$ . [1]
- (d) Explain why 99 could not be a possible number for  $T_n$ . [1]

- 4 (a) Given that  $a = -2$ ,  $b = -\frac{1}{2}$  and  $c = \frac{27}{64}$ , evaluate  $b^2 - 3a^3 + \sqrt[3]{c}$ . [1]
- (b) (i) Solve the inequality  $3x + 1 \leq \frac{3x - 7}{2}$ . [3]
- (ii) Illustrate your solution in (b)(i) on a number line. [1]
- (iii) Find the smallest value of  $x^2$ . [1]
- 

- 5 A stack of ten \$1 coins forms a cylinder of base diameter  $x$  cm and height 2.5 cm.



- (a) If the volume of the stack is  $11.9 \text{ cm}^3$ , find  $x$ . [2]
- (b) Find the total surface area of the stack. [2]
- (c) If six more of the identical \$1 coins are added to the stack, find the percentage increase of the total surface area of the stack. [3]
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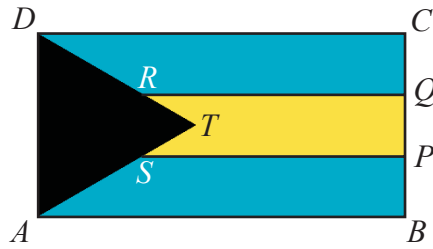
- 6 In a chemical reaction, the volume  $V \text{ cm}^3$  of a crystal at time  $t$  minutes is given by the function  $4V = 3t + 8$  for  $0 \leq t \leq 8$ .  
The table below shows some corresponding values of  $t$  and  $V$ .

$t / \text{min}$	0	1	2	3	4	5	6	7	8
$V / \text{cm}^3$	2	2.75	3.5	4.25	5	5.75	6.5	7.25	8

- (a) Using a scale of 2 cm to 1 unit on both  $t$ - and  $V$ -axes, draw the graph of  $4V = 3t + 8$  for  $0 \leq t \leq 8$ . [2]
- (b) Using your graph, find the time that the volume of the crystal is  $5.5 \text{ cm}^3$ . [1]
- (c) (i) Find the gradient of the graph. [2]
- (ii) Suggest a physical meaning of the gradient in this graph. [1]
- (d) Suggest what the  $V$ -intercept represents in this graph. [1]
-



- 7 The picture below shows the national flag of Bahamas.  $ABCD$  is a rectangle,  $CDRQ$  and  $ABPS$  are identical trapeziums and  $ADT$  is an equilateral triangle.



The ratio of  $AB$  to  $BC$  is  $3 : 2$ ,  $BP = \frac{1}{3}BC$  and  $QR = \frac{4}{5}CD$ .

It is given that  $AB = 54$  cm.

- (a) Find the lengths of  $BC$ ,  $BP$  and  $QR$ . [3]
- (b) Find the area of  $CDRQ$ . [1]
- (c) Find the ratio of the area of  $CDRQ$  to the area of the flag. [2]
- (d) If the area of  $PQRTS$  is  $216 \text{ cm}^2$ , find the height of the triangle  $ADT$ . [2]

- 8 The table below shows the pricing of three taxi companies in Singapore.

GrabCar Economy	Basic fare: \$3.00 Every kilometer or less: \$0.80
Uber X	Basic fare: \$3.00 Every kilometer or less: \$0.45 Per minute: \$0.20
ComfortDelGro	1km or less: \$3.20 Every 400 m thereafter or less up to 10 km: \$0.22 Every 300 m thereafter or less up to 10 km: \$0.22 Every 45 seconds of waiting or less: \$0.22

- (a) Mrs Lim travels from home to work every morning. The distance between her home and work is 6.4 km.

Find how much Mrs Lim pays every morning if she were to travel by GrabCar Economy. [1]

- (b) Michael leaves his house at 0837 and travels by Uber X to Changi Airport, which is 15.5 km away from his house.

(i) If he arrives at the airport at 0902, find the average speed at which Michael travels, in km/h. [2]

(ii) Find how much Michael has to pay for his trip. [1]

- (c) ComfortDelGro imposes peak period surcharges as follows.

Monday to Friday 0600 – 0929	25 % of metered fare
Monday to Sunday & Public Holidays 1600 – 2359	

Find how much Michael in (b) has to pay if he were to travel by ComfortDelGro to Changi Airport. [2]

- (d) Khairul wishes to travel from Tampines MRT to ION Orchard, which is 16 km away. The average speed a taxi travels is 80 km/h during non-peak period.

Find which taxi company Khairul should choose for the cheapest fare. [4]

- (e) State any assumption(s) made in your calculations in (d). [1]

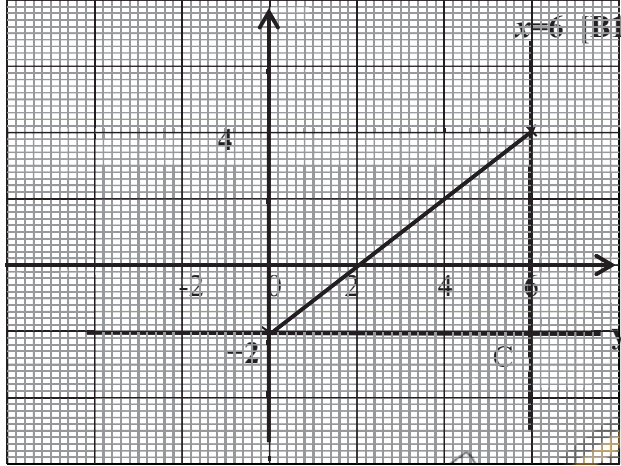
**End of Paper**



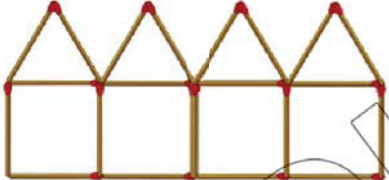
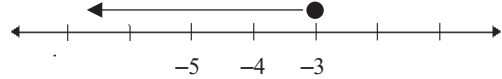
**Junyuan Secondary Secondary School**  
**End of Year 2017**  
**Secondary 1 Express**  
**Marking Scheme**

1	(a)	$a = 3$	B1	
	(b)	$2^2 \times 3 \times 7 = 84$	B1	
2	(a)	$4ax - 16ay + 12by - 3bx$ $4a(x - 4y) + 3b(4y - x)$ $4a(x - 4y) - 3b(x - 4y)$ $(x - 4y)(4a - 3b)$	$4ax - 3bx - 16ay + 12by$ or $x(4a - 3b) - 4y(4a - 3b)$ $(x - 4y)(4a - 3b)$	M1 A1
3	(a)	0.0023	<del>M1</del> A1	
	(b)	$0.4^2$ $\frac{1}{4}$ 44% $0.\dot{4}$	<del>B1</del> B2	Any mistake - 1m.
4	(a)	$21 = 3 \times 7$ $18 = 2 \times 3^2$ $\text{LCM} = 2 \times 3^2 \times 7 = 126$ $\frac{126}{21} = 6$ <i>twenty - cents coins</i> $\frac{126}{18} = 7$ <i>five - pence coins</i>	M1 (LCM) A1 A1	
5	(a)	$-2800 + (-1200) + 900 + 1500 + 1000 = -\$600$ Total loss = \$600	B1	Follow through from (a)
	(b)	$2000 - (-600)$ $= \$2600$ Profit for Sep = \$2600	M1 A1	
6	(a)	$4x$	B1	
	(b)	$4x + 20 = 2(x + 20)$ $4x + 20 = 2x + 40$ $2x = 20$ $x = 10$ $\therefore 20 \text{ years time} = 4(10) + 20 = 60 \text{ years old}$	M1 A1	
7		Area of trapezium $PQST$ $= \frac{1}{2} \times (14 + 18) \times 7$ $= 112 \text{ cm}^2$ . Area of semi-circle $PRT$ $= \frac{1}{2} \times \frac{22}{7} \times 7^2$ $= 77 \text{ cm}^2$ . Area of shaded region $= 112 - 77 = 35 \text{ cm}^2$	M1 M1 A1	

8	(a)	Distance = $12 \times \frac{1}{3} = 4\text{km}$	B1	
	(b)	Return speed = 24 km/h Time taken for return journey = $\frac{4}{24} \text{ hr} = \frac{1}{6} \text{ hr}$ Speed = $\frac{4 \times 2}{\frac{1}{6} + \frac{1}{3}}$ = 16 km / h	M1  A1	
9	(a)	$8x \geq 8$ $x \geq 1$	M1 A1	
	(b)	1	B1	
	(c)	2	B1	
10	(a)	P : PB : C 5 : 6 3 : 4 15 : 18 : 20 <b>9 : 10</b>	M1 A1	
	(b)	1 unit $\rightarrow$ \$0.30 6 units $\rightarrow$ \$1.80	M1 A1	
11	(a)	$4x - 5 = 9 + 6x$ $-2x = 14$ $x = -7$	M1 A1	
	(b)	$\frac{3n-m}{4} - \frac{2n-m}{3}$ $= \frac{9n-3m-8n+4m}{12}$ $= \frac{n+m}{12}$	M1  A1	
12	(a)	Sum of interior angles of pentagon <del><math>= (5-2) \times 180^\circ</math></del> <del><math>= 540^\circ</math></del> $135 + 100 + 85 + 70 + 180 - x = 540$ $540 = 570 - x$ $x = 30^\circ$	M1  A1	
	(b)	$\angle BCG = 84^\circ$ (alternate angles, parallel lines) $\angle DCG = 84 - 39 = 45^\circ$ $\angle CDE = 180 - 45$ (interior angles, parallel lines) = $135^\circ$ $3x + 135 = 360$ (angles at a pt) $x = 75$	M1  M1 A1	Deduct 1 mark if any reason is not provided
13	(a)(i)	$2800 + 480 = 3280\text{g}$	B1	
	(a)(ii)	$3280 + 480 = 3760\text{g}$	B1	
	(b)	$2800 + 480n$	B1	

	(c)	$2800 + 480(m) = 8000$ $m = 10.3$ (3 s.f)	B1	
	(d)	The expression should only be used to find his weight for the first year. It is unrealistic to say that the weight of the girl still increases by 480 g every month at age of 10.	B1	
14	(a)	 <p>By drawing a suitable triangle under the straight line.</p> $\text{gradient} = \frac{6}{6} = 1$		B1 -Correctly indicated C  B1
	(d)	$\frac{1}{2} \times 6 \times 6 \text{ units}^2$ $= 18 \text{ units}^2$	M1 A1	

Junyuan Secondary School  
 End-of-Year Examinations 2017  
 Mathematics Paper 2  
**Marking Key**  
 Secondary One Express

1	(a)	$1296 = 2^4 \times 3^4$	[B1]
	(b)	$672 = 2^5 \times 3 \times 7$ $\text{HCF} = 2^4 \times 3$ $= 48$	[M1] [A1]
2		$\angle ABC = \angle AED = (180 - 4x)^\circ$ (int. $\angle$ s, $AB \parallel DE$ , $BC \parallel AE$ ) Sum of int. angles of pentagon $= (5 - 2) \times 180^\circ$ $= 540^\circ$ $2(180 - 4x) + 4x + 5x + 18 + 134 = 520$ $x = 28^\circ$	[M1] [M1] [A1]
3	(a)		[B1]
	(b)	$T_1 = 6$ $T_2 = 11$ $T_3 = 16$ $T_4 = 21$	[B2] [SC1] for 2 or 3 correct answers
	(c)	$T_n = 5n + 1$	[B1] Accept $T_n = 6 + 5(n - 1)$
	(d)	$5n + 1 = 99$ $n \neq \text{integer}$	[B1] Accept any logical reasoning for $n$ must be an integer
4	(a)	$(-\frac{1}{2})^2 - 3(-2)^3 + \sqrt[3]{\frac{27}{64}} = 25$	[B1]
	(b)(i)	$3x + 1 \leq \frac{3x - 7}{2}$ $6x + 2 \leq 3x - 7$ $3x \leq -9$ $x \leq -3$	[M1] [A1]
	(b)(ii)		[B1]
	(b)(iii)	9	[B1]

5	(a)	$\pi r^2 h = 11.9$ $r = 1.2309 \text{ cm}$ $x = (2)(1.2309)$ $= 2.46 \text{ cm (3 s.f.)}$	[M1] [A1]
	(b)	$\text{surface area} = 2\pi r^2 + 2\pi r h$ $= 2\pi(1.2309)^2 + 2\pi(1.2309)(2.5)$ $= 9.52 + 19.335$ $= 28.9 \text{ cm}^2$	[M1] [A1]
	(c)	$\text{height of one \$1 coin} = \frac{2.5}{10}$ $= 0.25 \text{ cm}$ $\text{increase in surface area} = (2.4618)(\pi)(0.25)(6)$ $= 11.601 \text{ cm}^2$ $\text{increase in percentage} = \frac{11.601}{28.88} \times 100\%$ $= 40.2\% \text{ (3 s.f.)}$	[M1] [M1] [A1]
6	(a)		
	(b)	By calculation: 4.67 min (3 s.f.) Therefore, accept 4.6, 4.65 and 4.7 min only.	[B1]
	(c)(i)	$\text{gradient} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{3}{4}$	[M1] Correct co-ordinates substituted into formula [A1]



	(c)(ii)	Every minute, the volume of the crystal increases by $\frac{3}{4} \text{ cm}^3$ .	[B1]
	(d)	The initial volume of the crystal is $2 \text{ cm}^3$ .	[B1] Accept “initial volume of crystal”, “volume of crystal at the beginning/start”.
7	(a)	$BC = \left(\frac{2}{3}\right)(54)$ $= 36 \text{ cm}$ $BP = \left(\frac{1}{3}\right)(36)$ $= 12 \text{ cm}$ $QR = \left(\frac{4}{5}\right)(54)$ $= 43.2 \text{ cm}$	[B1] [B1] [B1]
	(b)	$\text{Area of } CDRQ = \frac{1}{2}(43.2 + 54)(12)$ $= 583.2 \text{ cm}^2$	[B1]
	(c)	$\text{Area of flag} = (54)(36)$ $= 1944 \text{ cm}^2$ $CDRQ : \text{flag}$ $= 583.2 : 1944$ $= 3 : 10$	[M1] [A1]
	(d)	<del><math>\text{Area of } ADT = (54)(36) - (583.2)(2) = 216</math></del> $= 561.6 \text{ cm}^2$ $\frac{1}{2} \times \text{base} \times \text{height} = 561.6$ $36 \times \text{height} = 1123.2$ $\text{height} = 31.2 \text{ cm}$	[M1] [A1]
8	(a)	$\$3.00 + \$0.80(7) = \$8.60$	[B1]
	(b)(i)	$0837 \Rightarrow 0902: 25 \text{ minutes}$ $\text{Speed} = \frac{15.5}{25/60}$ $= 37.2 \text{ km/h}$	[M1] [A1]
	(b)(ii)	$\$3.00 + \$0.45(16) + \$0.20(25) = \$15.20$	[B1]
	(c)	$\text{Fare without surcharge} = \$3.20 + \$0.22\left(\frac{10000}{400}\right) + \$0.22\left(\frac{4500}{300}\right)$ $= \$12.00$ $\text{Fare with surcharge} = (\$12.00)(1.25)$ $= \$15.00$	[M1] [A1]



			Accept answer $\geq$ \$15 if student consider waiting time at \$0.22 per minute.
	<b>(d)</b>	$\text{GrabCar} = \$3.00 + (16)(\$0.80) = \$15.80$ $\text{Time taken} = \frac{16}{80}$ $= 0.2 \text{ h}$ $= 12 \text{ min}$ $\text{Uber X} = \$3.00 + (16)(\$0.45) + (12)(\$0.20) = \$12.60$ $\text{ComfortDelGro} = \$3.20 + \left(\frac{10000}{400}\right)(\$0.22) + \left(\frac{5100}{300}\right)(\$0.22)$ $= \$12.44$ <p>From above, ComfortDelGro offers the cheapest fare.</p>	[B1]  [B1]  [B1] [B1]
	<b>(e)</b>	Assume there is smooth traffic / no jam / no waiting of traffic light.	[B1] Accept any logical answer.