Calculator Model: (*if applicable*)



## Paya Lebar Methodist Girls' School (Secondary) Preliminary Examination 2017 Secondary 4 Express / 5 Normal Academic

Name: (				(	)		Cla	SS:		
Centre Number	S						Index Number			

### MATHEMATICS

Paper 1

Candidates answer on the Question Paper.

# 2 hours

16 August 2017

4048/01

#### **READ THESE INSTRUCTIONS FIRST**

Write your Centre number, index number, name and class on all the work you hand in. Write in dark blue or black pen.

You may use a HB pencil for any diagrams or graphs.

Do not use staples, paper clips, 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 a 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 of the marks for this paper is 80.

My Target is:

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This paper consists of **17** pages, including this cover page.

#### Mathematical Formulae

Compound interest

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

Mensuration

Curved surface area of a cone  $= \pi r l$ Surface area of a sphere  $= 4\pi r^2$ Volume of a cone  $= \frac{1}{3}\pi r^2 h$ Volume of a sphere  $= \frac{4}{3}\pi r^3$ Area of triangle  $ABC = \frac{1}{2}ab \sin C$ 

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

Sector area =  $\frac{1}{2}r^2\theta$ , where  $\theta$  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** 

Mean = 
$$\frac{\Sigma f x}{\Sigma f}$$

Standard deviation = 
$$\sqrt{\frac{\Sigma f x^2}{\Sigma f} - \left(\frac{\Sigma f x}{\Sigma f}\right)^2}$$

	Answer <b>all</b> the questions.	For Examiner's Use
1	(a) Simplify $3(3x+y)-2(x-5)$ . <i>Answer</i> [1] (b) Factorise $(2x-1)^2-36$ .	1]
	Answer [1	1]
2	Factorise completely $15ax + 21bx - 14by - 10ay$ .	
	Answer [2	2]
3	(a) On the Venn diagram, shade the region that represents $A' \cup B'$ . $\xi \qquad \qquad$	1]
	Answer [1	1]

4 *n* is a positive integer.

Show that, for all *n*,  $(4n+3)^2 - (16n^2+5)$  is divisible by 4.

Answer

5 The volume of a rectangular prism is 288 cm<sup>3</sup>. The height of the prism is 9 cm. The length of the rectangular base is twice its width. Find the length of the rectangular base of the prism. Answer \_\_\_\_\_ cm [2] 6 In triangle *XYZ*, angle  $XYZ = 52^{\circ}$ . XY = 17.4 cm and XZ = 13.8 cm. Find the two possible sizes of angle *XZY*. Answer \_\_\_\_\_ ° or \_\_\_\_\_ 0 [2]

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[2]

7 The diagram shows a pyramid of height 45 cm.



The volume of the liquid in the pyramid is two-third the volume of the pyramid.

Calculate the depth, *h* centimetres, of the liquid. Give your answer correct to 2 decimal places.

Answer h = [2]

8 Jim draws this graph to show the mass of food waste for the last four years.



State one feature of the graph that may be misleading and explain how this may lead to a misinterpretation of the graph.

Answer \_\_\_\_\_ [2]

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[Turn over



11	(a)	Express $15 - 12x + x^2$ in the form $(x + p)^2 + q$ .		For Examiner Use
		Answer	[1]	
	(b)	Hence write down the minimum value of $15-12x + x^2$ .		
		Answer	[1]	
	(c)	Write down the equation of the line of symmetry of the graph of $y=15-12x+x^2$ .		
		Answer	[1]	
12	The give	formula to estimate the pressure under sea at different depths below the sea level is n as		
		$P = 1.01 \times 10^5 + 10094d$ ,		
		where $P$ is the pressure in Newton per square metre, and $d$ is the depth, in metres, below the sea level.		
	(a)	A scuba diver experienced a pressure of $2.22 \times 10^5$ N/m <sup>2</sup> when under the sea.		
		Use this formula to estimate the depth of the diver below the sea level.		
		Answer m	[1]	
	(b)	Two scuba divers are at different depths below the sea level. The difference in pressure at their two depths is $3.5 \times 10^5$ N/m <sup>2</sup> .		
		Estimate the difference between the depths of the two divers.		
		Answer m	ı [2]	

For 13 In Singapore, Lim pays \$567.40 for 10 grams of gold. Examiner's On a visit to Los Angeles, he paid 1275.10 US dollars for 1 ounce of gold. Use1 US dollar = 1.382 Singapore dollars. 1 ounce of gold = 31.10 grams of gold. Is gold cheaper in Singapore or Los Angeles? You must show your calculations. Answer [3] 14 The diagram shows a rectangle and a square. The sides are horizontal and vertical. The length of the rectangle is the same as the side of the square. The width of the rectangle is half of the side of the square. Point *A* has coordinates (14, 16) and *B* has coordinates (30, 8). y С *A*(14, 16) *B*(30, 8) 0 х Find the coordinates of *C*. Answer C (\_\_\_\_\_\_, ) [2]



[3]

Answer \_\_\_\_\_ cm<sup>2</sup>

16	BA a Ang	B D C $125^{\circ}$ E E $120^{\circ}$ G and <i>DC</i> are parallel. the <i>ABC</i> = 115°, angle <i>BCF</i> = 125° and angle <i>EFG</i> = 120°.		For Examiner's Use
	(a)	Find angle <i>DCB</i> .		
		Answer	° [1]	
	(b)	Explain why <i>EF</i> is parallel to <i>BA</i> .  Answer		
			[2]	
17	(a)	Express 540 as a product of its prime factors.		
		Answer	[2]	
	<b>(b)</b>	Using your answer to <b>part</b> ( <b>a</b> ), explain why 540 is not a perfect cube.		
			[1]	
	(c)	<i>m</i> and <i>n</i> are both prime numbers. Find the possible values of <i>m</i> and <i>n</i> so that $540 \times \frac{m}{n}$ is a perfect square.		
		Answer $m =$		
		n =	[2]	

18 The sketch, not drawn to scale, shows the graph of  $y = ax^2 + bx$ . The points A(-1, -3) and B(3, 33) lie on the graph.



(a) Find the values of *a* and *b*.



Answer

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[2]

20

Carpark A	Carpark B	
<u>7.00 a.m. to 6.00 p.m.</u>		
\$2.20 for 1 <sup>st</sup> hour or part thereof	\$0.04 for every minute	
\$1.20 for every subsequent $\frac{1}{2}$ hour		
or part thereof		
After 6.00 p.m.		
\$3.00 per entry		
Tou must show your calculations.		
Tou must show your calculations.		
Tou must show your calculations.	Answer Carpark	[2]
A map has a scale of 1 : 20 000.	Answer Carpark	[2]
A map has a scale of 1 : 20 000. (a) The actual distance between Town	Answer Carpark X and Town Y is 66 km.	

Answer \_\_\_\_\_ cm [2]

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(b) On the map, a lake in Town X has an area of 0.34 cm<sup>2</sup>.
 A lake in Town Y has an area 50% larger than that of the lake in Town X.

Calculate, in square kilometres, the actual area of the lake in Town Y.

Answer \_\_\_\_\_ km<sup>2</sup> [2]

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[3]

21

- 22 Ann, Bernice and Carol are the three players of a game. Ann and Carol have the same probability of winning and each is twice as likely to win as Bernice.
  - (a) Complete the probability table.

Player	Ann	Bernice	Carol
Probability of winning			

(b) Find the probability that Bernice or Carol wins the game.

- Answer [1]
- (c) Ann, Bernice and Carol played the game twice. Find the probability that a player wins both games.

*Answer* [2]

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[1]

23	The	position vectors of points <i>P</i> and <i>Q</i> are $\begin{pmatrix} -3 \\ 4 \end{pmatrix}$ and $\begin{pmatrix} k \\ 0 \end{pmatrix}$ respectively.	For Examiner's Use
	(a)	Find $\overrightarrow{PQ}$ in terms of k.	
		Answer [1	]
	<b>(b)</b>	<i>OP</i> and <i>OQ</i> are two sides of a rhombus.	
		Find the values of <i>k</i> .	
		Answer $k = $ or [2]	2]
	(c)	Find the coordinates of point <i>R</i> such that $\overrightarrow{OR} = 3\overrightarrow{PO}$ .	
			_
		Answer R (,) [1	]

[Turn over



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Use

In bookstore A, a pencil costs \$1.60, a correction tape costs \$2.80 and a ruler costs \$0.70. In bookstore B, the same pencil costs \$0.10 less, the same correction tape costs \$0.25 less and the same ruler costs \$0.20 more. А В (1.6 −0.1) P This information can be represented by the matrix  $\mathbf{M} = \begin{vmatrix} 2.8 & -0.25 \end{vmatrix} \mathbf{C}$ . 0.7 0.2 | R Ben buys 3 pencils, 2 correction tapes and 1 ruler. **(a)** Charles buys 1 pencil and 4 rulers. Represent their purchases in a  $2 \times 3$  matrix **N**. **N** = Answer [1] (b) Evaluate the matrix  $\mathbf{T} = \mathbf{N}\mathbf{M}$ . **T** = Answer [1] (c) Describe the information represented by the first row of **T**. Answer [1] (d) How much money would Charles have to pay if he makes his purchases at bookstore B? Answer \$ [1] Bookstore A increases the price of all items by 10% but gives a 3% discount on **(e)** all purchases. How much does Ben pay altogether for 3 pencils, 2 correction tapes and 1 ruler? Answer \$ [2]

25

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