

## *Mathematical Formulae*

### *Compound interest*

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

### *Mensuration*

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

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

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

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

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

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

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

### *Trigonometry*

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

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

### *Statistics*

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

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

# PAPER 1

Answer **all** the questions.

1. (a) Calculate  $\frac{649.4}{33.56 \times 12.98}$ , giving your answer correct to 3 decimal places.

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

- (b) Simplify  $\left(\frac{3x^2}{5yz}\right) \div \left(\frac{9x}{15y}\right)$ .

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

- (c) Write the following numbers in order of size, starting with the smallest.

$$0.5, 0.5^2, \frac{5}{11}, \frac{5}{9}$$

*Answer (c)* ....., ....., ....., ..... [1]

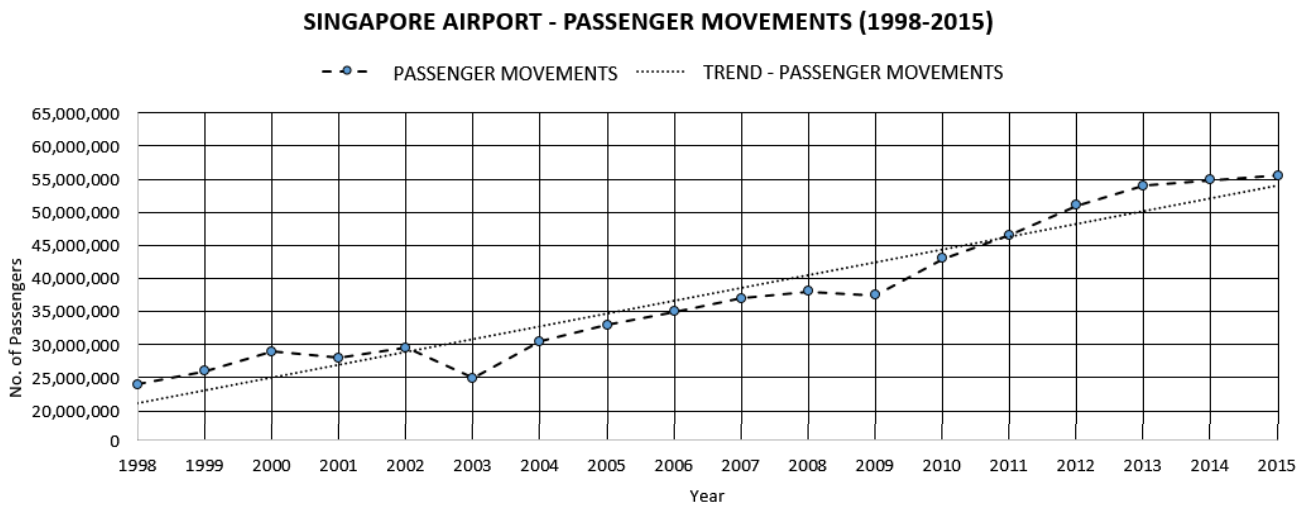
2. (a) The temperature at the foot of Mount Zeta was  $7^{\circ}\text{C}$ .  
 The temperature at its peak was  $-28^{\circ}\text{C}$ .  
 Find the difference between the two temperatures.

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

- (b) 1 light year =  $9.46 \times 10^{15}$  metres.  
 The distance of the star Alpha Centauri from the Sun is 4.2 light years.  
 Calculate the distance, in kilometres, of Alpha Centauri from the Sun.  
 Give your answer in standard form.

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

3. The graph shows yearly passenger movements in Changi Airport, Singapore.



Explain one way in which the graph is misleading.

*Answer* .....

.....

..... [2]

4. (a) Express  $x^2 + 5x - 1$  in the form  $(x + p)^2 + q$ .

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

(b) **Hence**, solve the equation  $x^2 + 5x - 1 = 0$ ,  
giving your answers correct to two decimal places.

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

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5. (a) Express 132 as the product of its prime factors.

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

(b) Given that  $132k$  is a perfect cube,  
write down the smallest possible value of  $k$ .

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

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6. One solution of  $x^2 - 3 = q - 6x$  is  $x = -2$ .

(a) Find the value of  $q$ .

*Answer (a)*  $q = \dots\dots\dots$  [1]

(b) Find the other solution of the equation.

*Answer (b)*  $x = \dots\dots\dots$  [2]

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7. (a) If  $\mathbf{L} = \begin{pmatrix} 2 & 3 \\ -1 & 1 \end{pmatrix}$  and  $\mathbf{M} = \begin{pmatrix} 6 & 0 \\ 3 & -4 \end{pmatrix}$ , evaluate  $\mathbf{N} = \mathbf{L} + \mathbf{M}^2$ .

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

(b) The table below shows the results for two football teams and the points awarded.

	Won	Drawn	Lost
<i>Wochester</i>	5	2	7
<i>Stomapool</i>	4	6	6

	Points
Won	3
Drawn	1
Lost	0

(i) Find  $\begin{pmatrix} 5 & 2 & 7 \\ 4 & 6 & 6 \end{pmatrix} \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix}$ .

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

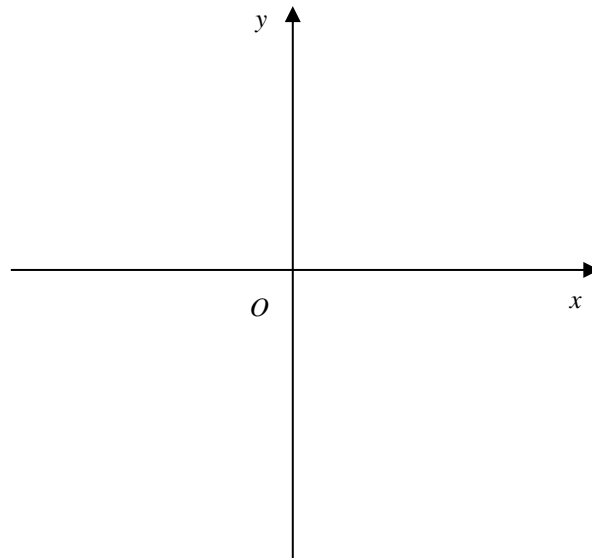
(ii) Explain what your answer to (b)(i) represents.

Answer (b)(ii) .....

..... [1]

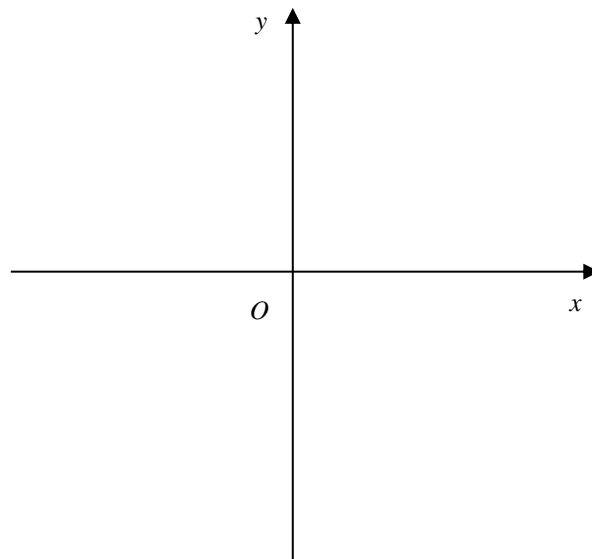
8. (a) Sketch the graph of  $y = 3 - (x - 2)^2$ .

[2]



(b) (i) Sketch the graph of  $y = (x - 2)(x + 3)$ .

[2]



(ii) Write down the equation of the line of symmetry of  $y = (x - 2)(x + 3)$ .

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

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9.  $\mathcal{E} = \{x : 1 \leq x \leq 19\}$   
 $A = \{x : x \text{ is a factor of } 36\}$   
 $B = \{x : x \text{ is a multiple of } 3\}$

(a) Draw a Venn diagram to illustrate this information.

*Answer (a)* [2]

(b) (i) Write down  $n(A \cap B)$ .

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

(ii) List the elements contained in the set  $A \cup B$ .

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

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10. Adrian, Beth and Cindy shared a box of sweets in the ratio 5 : 7 : 11.  
Beth had 12 more sweets than Adrian.  
How many sweets did Cindy have?

*Answer* ..... [2]

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11. (a) Solve the inequalities  $\frac{1}{2}(x-16) < 7x \leq 4x+14$ .

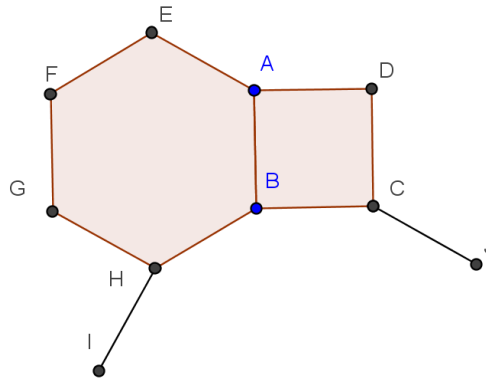
*Answer (a)* ..... [2]

- (b) Write down the biggest and smallest integers which satisfy  $\frac{1}{3}(x-1) < 7x \leq 4x+14$ .

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

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12.



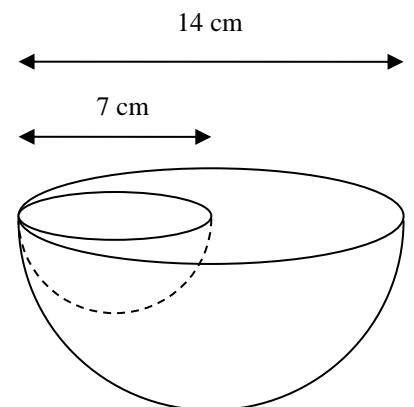
$ABCD$  is a square and  $ABHGFE$  is a regular hexagon.

$IHBCJ$  is an incomplete regular polygon of  $n$  sides.

Find the value of  $n$ .

*Answer* ..... [2]

13. The object below is made from a solid hemisphere of diameter 14 cm with a hole dug out in the shape of a hemisphere of diameter 7 cm. Find the volume of the object.



*Answer* ..... [2]

14. (a) Mr Tan invested \$20 000 in a bank.  
The bank pays 3.5% compound interest per annum compounded every 3 months.  
Calculate the total amount he has in the bank after  $2\frac{1}{4}$  years.

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

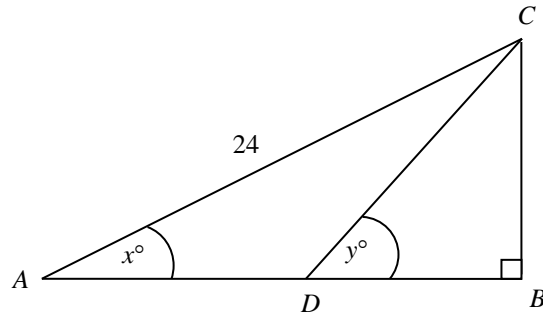
- (b) Geraldine wanted to buy a TV set priced at \$1250.  
She paid a down payment of 20%.  
She also paid the remaining amount via 12 equal monthly instalments,  
with interest charged at 3.5% per annum.  
(i) Find the amount of down payment.

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

- (ii) Find the amount of each monthly instalment.

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

15.



In the diagram  $ADB$  is a straight line.  $AC = 24$  cm,  $\sin x^\circ = \frac{1}{3}$  and  $\sin y^\circ = \frac{4}{5}$ .

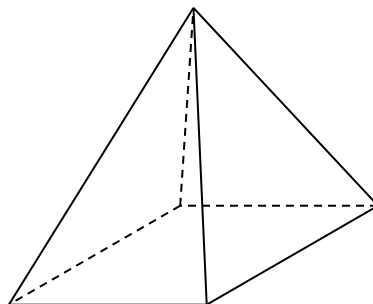
(a) Calculate the length of  $CD$ .

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

(b) Write down the value of  $\cos \angle ADC$ .

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

16. A pyramid is made of a square base, and four equilateral triangles.  
The square has sides 7 cm.



- (a) Find the area of one triangular face of the pyramid.

- (b) Find the total surface area of the pyramid.

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

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

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17. The  $n^{\text{th}}$  term of a sequence is given by  $3n^2 + 2$ .

- (a) Write down the first four terms of the sequence.

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

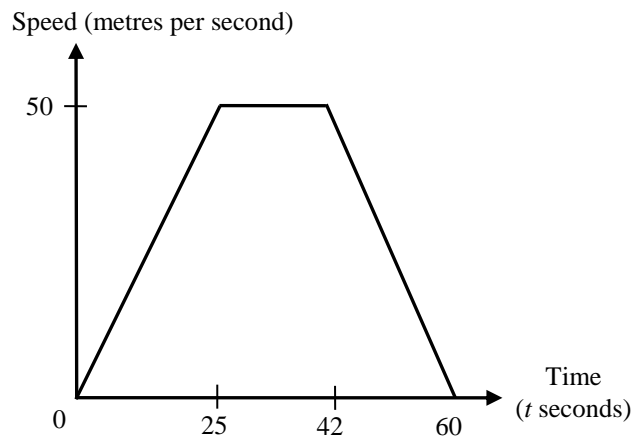
- (b) The first 4 terms of another sequence are 1, 10, 25, 46,...

By comparing this sequence with your answer to (a),  
write down the  $n^{\text{th}}$  term of the new sequence.

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

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18. The diagram shows the speed - time graph of a car's journey.



(a) Calculate the acceleration when  $t = 13$ .

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

(b) Calculate the speed when  $t = 13$ .

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

(c) Calculate the time taken by the car to travel the first 1.2 km.

*Answer (c)* ..... [3]

19. In sector  $AOB$ ,  $OA = OB = 7$  cm and chord  $AB = 5$  cm.

The side  $OA$  is drawn in the answer space below.

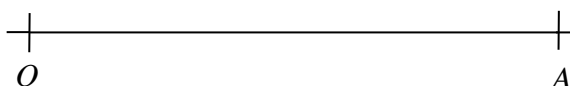
(a) Construct ONE possible sector. Label the position of  $B$  clearly. [2]

(b) For the sector drawn in part (a),

(i) construct the perpendicular bisector of  $OB$ , [1]

(ii) construct the line which is equidistant from the lines  $OA$  and  $OB$ . [1]

(iii) Hence, mark the point  $C$  in the sector which is equidistant from the points  $O$  and  $B$ , and equidistant from the lines  $OA$  and  $OB$ . [1]



20.  $OABC$  is a parallelogram such that  $O$  is the point of origin,  $\overline{AB} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$  and  $A$  is  $(4, 1)$ .

(a) Express  $\overline{CA}$  as a column vector.

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

(b) The point  $Q$  lies on  $CA$  produced and  $\overline{AQ} = k\overline{CA}$ .

(i) Show that  $\overline{OQ} = \begin{pmatrix} 4+k \\ 1-k \end{pmatrix}$ .

*Answer (b)(i)* [1]

(ii) Given that  $Q$  lies on the  $x$ -axis, find the value of  $k$ .

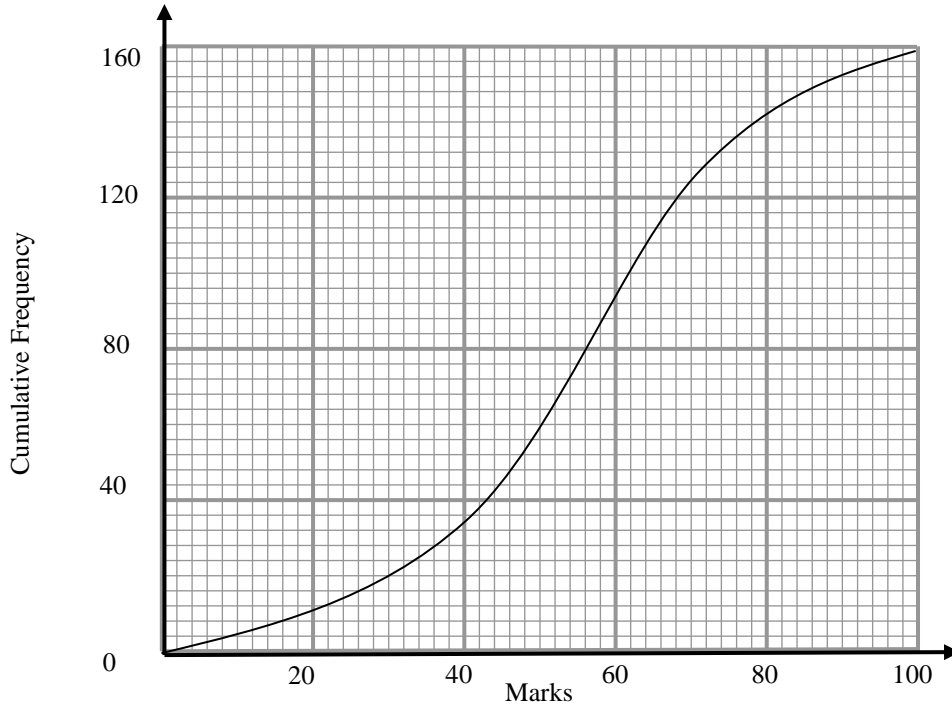
*Answer (b)(ii)* ..... [1]

(iii) Hence, find the coordinates of  $Q$ .

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



21. The cumulative frequency graph below shows Mathematics marks scored by 160 students.



- (a) Using the above cumulative frequency curve, find the
- (i) the percentage of students who scored less than 50 marks.

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

- (ii) number of students who scored distinctions if the distinction mark is 74 and above.

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

- (iii) inter-quartile range.

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

- (b) In a Science examination, the same students had a median mark of 51. The inter-quartile range for the Science examination is 22 marks. Which paper, Mathematics or Science, was an easier paper? Give a reason for your answer.

*Answer (b)* .....

..... [1]

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22. Given that  $A(5, 3)$  and  $B(-3, -2)$ .

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

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

(b) Find the value of  $k$  if the point  $\left(k, 1\frac{1}{2}\right)$  lies on the line  $AB$ .

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

(c) Find the length of  $AB$ .

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

(d) Find the equation of another line parallel to  $3x + y = 6$  and passing through point  $A$ .

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