

## *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*

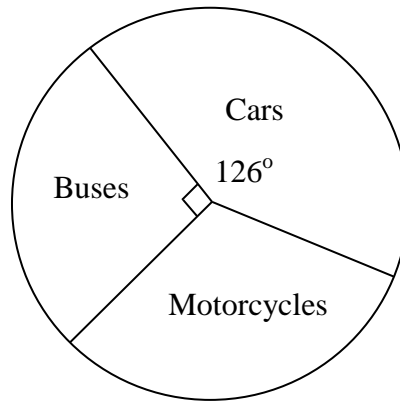
$$\text{Mean} = \frac{\sum fx}{\sum f}$$

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

**Section A** (52 marks)

Answer **all** the questions in this section.

- 1 The pie chart represents the record of 2200 vehicles travelling down a particular road.



How many motorcycles travelled down that particular road? [2]

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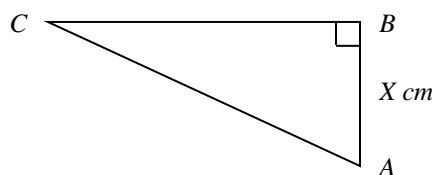
- 2 Tom and Robin shared profits from sales of their product together in the ratio 3 : 7.

(a) In 2014, they made a profit of \$10400. How much did Tom receive in 2014? [1]

(b) In 2015, there was a 25% increase in the profit from 2014.  
How much did Robin receive in 2015? [2]

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- 3 The diagram shows a right-angled triangle  $ABC$ . The length of  $AB$  is  $x$  centimetres.  
 $BC$  is 6 cm longer than  $AB$ .



(a) Write down the length of  $BC$  in terms of  $x$ . [1]

(b) Given that the area of the triangle is  $56 \text{ cm}^2$ , find the value of  $x$ . [2]

(c) Find the perimeter of the triangle. [2]

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4 Julia opened a savings account and deposited \$800 into it.

Giving both answers to the **nearest cents**, calculate

(a) the amount of simple interest she earned after 16 months at 1.3% per annum. [2]

(b) amount of interest she earned after 16 months at 1.3% per annum **compounded monthly**. [3]

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5  $y$  is inversely proportional to  $x^3$ .

When  $x = 2$ ,  $y = 100$ .

(a) Find an equation connecting  $x$  and  $y$ . [2]

(b) Find the value of  $y$  when  $x = 4$ . [1]

(c) Find the value of  $x$  when  $y = 6.4$  [2]

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6 (a) Make  $r$  the subject of the formula  $V = \frac{4}{3}\pi r^3$ . [2]

(b) Solve the following simultaneous equations.

$$\begin{aligned} 2x &= 5y + 10 \\ x + 2y &= 23 \end{aligned} \quad [3]$$

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7 **Answer the whole of this question on a single sheet of blank paper.**

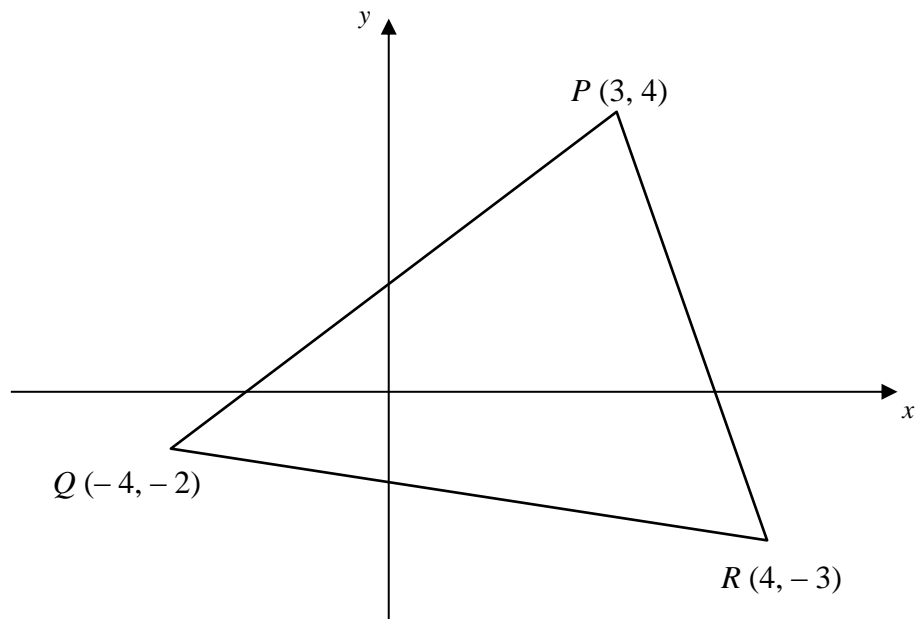
(a) Given that  $AB = 4$  cm,  $AC = 10$  cm and  $\angle ABC = 120^\circ$ , construct triangle  $ABC$ . [2]

(b) Construct the bisector of  $\angle BAC$ . [1]

(c) Construct the perpendicular bisector of  $AB$ . [1]

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- 8 The diagram shows triangle  $PQR$ .  
 $P$  is the point  $(3, 4)$ ,  $Q$  is the point  $(-4, -2)$  and  $R$  is the point  $(4, -3)$ .



- (a) The points  $P$ ,  $Q$ ,  $R$  and  $S$  are the vertices of a parallelogram.  
Find the coordinates for all three possible positions of  $S$ . [3]
- (b) Find the equation of the line  $PQ$ . [3]
- (c) Find the coordinates of the points where the line  $PQ$  intersects the  $x$  and  $y$  axes. [2]
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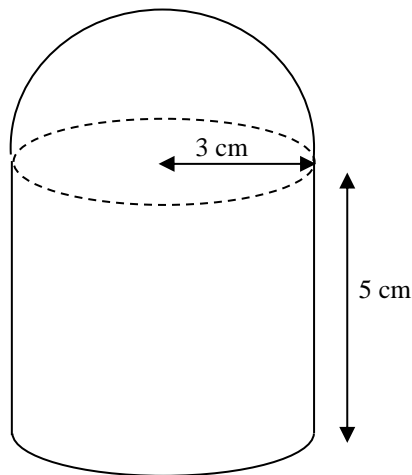
**9 Answer the whole of this question on a single sheet of graph paper.**

The table of values below is for the curve  $y = 20 + 12x - x^3$ .

$x$	-3	-2	-1	0	1	2	3	4
$y$	11	$p$	9	20	31	36	29	4

- (a) Calculate the value of  $p$ . [1]
- (b) Draw the graph of  $y = 20 + 12x - x^3$  for  $-3 \leq x \leq 4$ . Use a scale of 2 cm to 1 unit on the  $x$ -axis and 2 cm to 5 units on the  $y$ -axis. [3]
- (c) Use your graph to find
- i) the value of  $y$  when  $x = -1.5$ , [1]
  - ii) the value of  $x$  when  $y = 26$ , [1]
  - iii) the gradient of the curve by drawing a tangent at  $x = 2.5$ . [2]
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- 10** The diagram below shows Chinese stone seal which is shaped like a cylinder, 5 cm in height, with a hemispherical top of radius 3 cm.



- (a) Calculate the total surface area of the seal excluding its base. Leave your answer in terms of  $\pi$ . [2]
- (b) Express the volume of the seal in terms of  $\pi$ . [3]
- (c) The seal must not have a mass greater than 650 grams

Three types of stones are available.

The table shows these stones and their densities.

Stone	Agate	Shoushan	Jade
Density ( $\text{g/cm}^3$ )	2.64	3.34	3.25

Which of these stone(s) could be used to make the seal?

Show your working.

[2]

**Section B** (8 marks)

Answer **one** question from this section. Each question carries 8 marks.

- 11 (a)** The weights of students from a class A are shown below.

Weight (kg)	$30 < x \leq 40$	$40 < x \leq 50$	$50 < x \leq 60$	$60 < x \leq 70$
Frequency	1	12	17	3

- (i) Calculate an estimate of the mean weight. [2]
- (ii) Calculate an estimate of the standard deviation. [2]
- (iii) The weights of students from class B's mean and standard deviation are shown below:

Mean = 58.1
Standard Deviation = 6.5

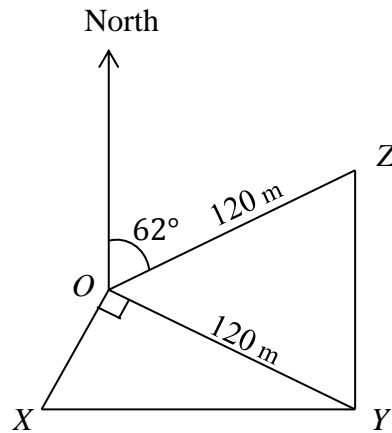
Compare the weights of students of class A with class B. [1]

- (b) A bag contains 14 green balls and 16 red balls. Two balls are selected without replacement.

Calculate the probability that the balls selected are of different colours. [3]

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- 12  $O, X, Y$  and  $Z$  are four points on level ground.  $Z$  is on a bearing of  $062^\circ$  from  $O$ .  $Y$  is due east of  $X$  and south of  $Z$ .  $OY = OZ = 120$  m and  $\angle XOY = 90^\circ$ .



Calculate

- (a) the bearing of  $X$  from  $O$ , [2]  
(b) the distance  $YZ$ , [2]  
(c) the area of triangle  $OYZ$ , [2]  
(d) the shortest distance from  $Z$  to  $OY$ . [2]

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~ End of Paper II ~