

## ***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*

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

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

Answer **all** the questions.

- 1 (a) Evaluate the following to 1 significant figure  $\sqrt{\frac{36.45 \times 108.96}{9.56}}$ .

*Answer* ..... [2]

- (b) Find the percentage difference between the value found in part (a) and the actual value of  $\sqrt{\frac{35.45 \times 105.96}{9.56}}$ , correcting your answer to 2 decimal places.

*Answer* .....% [2]

- 2 A regular n-sided polygon has an interior angle of  $135^\circ$ . Find n.

*Answer* ..... [2]

- 3 Furniture cost \$6 680.

Mr Koh paid a 25% deposit and then \$220 per month for 2 years.

How much did he pay in total?

*Answer* ..... [2]

4 (a) Find the highest common factor of 40 and 300.

*Answer* ..... [2]

(b) The square root of  $k$  is  $2 \times 3^2 \times 5$   
Find  $k$  as the product of its prime factors.

*Answer* ..... [1]

5  $x$  is an even number.

The sum of the next two consecutive numbers has a maximum value of 135.

(a) Form an inequality in terms of  $x$ .

*Answer* ..... [1]

(b) Find the largest possible even number for  $x$ .

*Answer* ..... [2]

6 (a) Simplify  $y \div \frac{y^2}{5}$

Answer ..... [1]

(b) Expand and simplify  $5y\left(x + \frac{3y}{5}\right) + 2y(3 - x)$

Answer ..... [2]

7 Given that  $16^x = 2^4 \times \sqrt{4^x}$ , find  $x$ .

Answer ..... [3]

- 8 (a)** Elaine saved \$50 000 in a bank. Elaine's savings was compounded at 3% for every 6 months.

Calculate the value of the savings after 10 years.

*Answer* ..... [3]

- (b)** John borrowed a sum of money from a bank at 9.8% simple interest per year for 2 years. He repaid the amount of \$2499 after interest.

Find the sum of money borrowed.

*Answer* ..... [2]

- 9** A formula is given as  $T = \frac{4 - x}{2x + 1}$ .

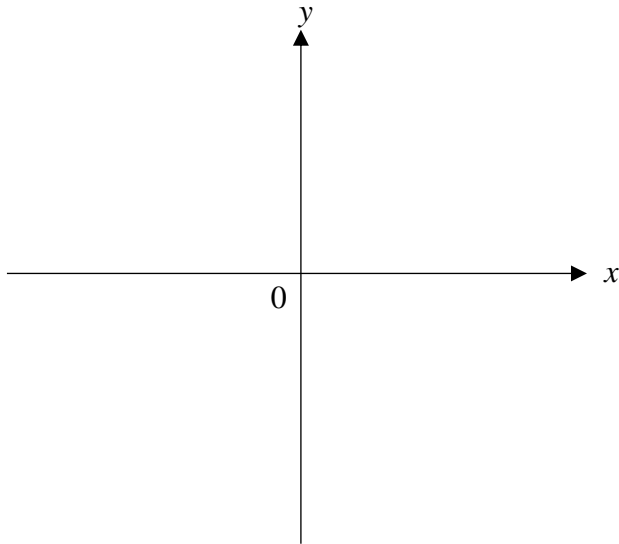
- (a)** Find  $T$  when  $x = -3$ .

*Answer* ..... [1]

- (b)** Express  $x$  in terms of  $T$ .

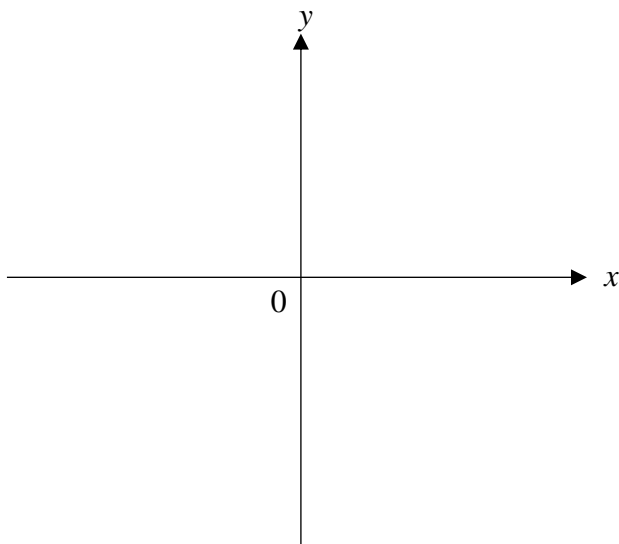
*Answer* ..... [2]

10 (a) Sketch the graph of  $y = (x + 2)^2 - 5$ .



[2]

(b) (i) Sketch the graph of  $y = (x + 3)(4 - x)$ .

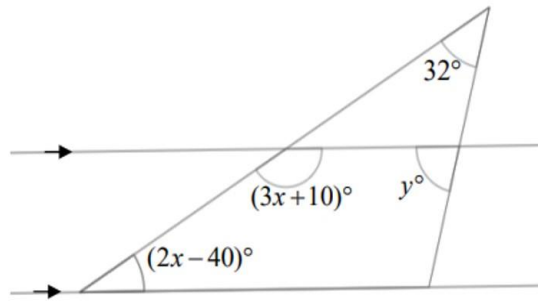


[2]

(ii) State the equation of the line of symmetry of  $y = (x + 3)(4 - x)$ .

Answer ..... [1]

11



(a) Calculate the value of  $x$ .

Answer ..... [2]

11 (b) Calculate the value of  $y$ .

Answer ..... [2]

**12** The distance between two towns on a map is 31.2 cm.

The scale of the map is 1 : 20 000.

(a) Find the actual distance between the towns. Give your answer in kilometres.

*Answer* .....*km* [2]

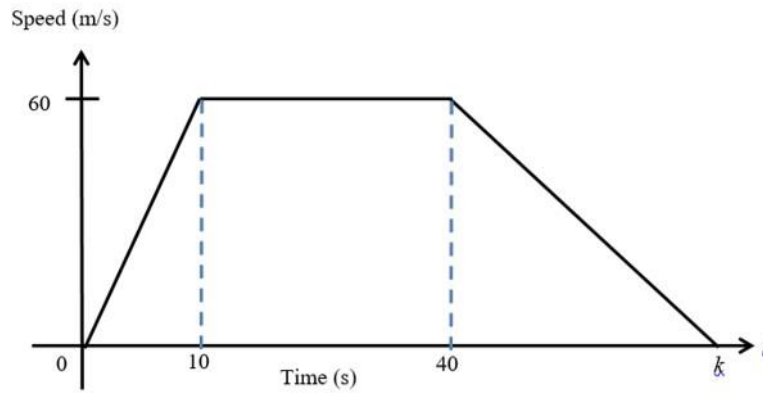
(b) The actual area of a field is 300 000 m<sup>2</sup>.

Find the area of the field on the map in cm<sup>2</sup>.

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



13 The diagram below shows the speed-time graph of a car over a period of time.



(a) Describe the movement of the car between  $t = 10$  and  $t = 40$ .

*Answer:*  
.....  
..... [1]

(b) Calculate the acceleration of the car for the first 10 seconds.

*Answer* .....  $m/s^2$  [1]

(c) Evaluate the distance travelled in the first 40 seconds.

*Answer* .....  $m$  [2]

**13 (d)** Calculate the value of  $k$  for the car to come to rest if the deceleration is  $3\text{m/s}^2$ .

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

**14** Brandon has a bag containing 4 blue balls and 3 red balls.  
He selects a ball at random.  
He returns the first ball into the bag and selects a second ball at random.

What is the probability that Brandon chooses

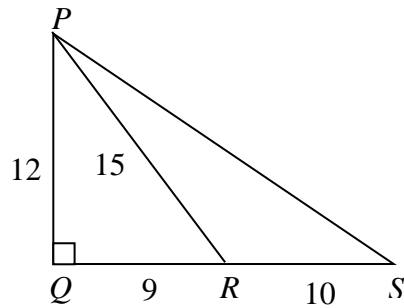
**(a)** two balls of the same colour,

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

**(b)** one ball of each colour?

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

- 15** In the diagram below,  $QRS$  is a straight line and  $\angle PQR = 90^\circ$ .  
 $PQ = 12$  cm,  $QR = 9$  cm,  $PR = 15$  cm and  $RS = 10$  cm.



- (a)** Evaluate the length of  $PS$ .

Answer .....cm [1]

- (b)** Write as a fraction

**(i)**  $\tan \angle QSP$ ,

Answer ..... [1]

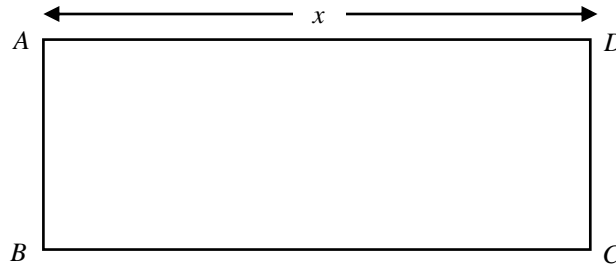
**(ii)**  $\sin \angle QPR$ ,

Answer ..... [1]

**(iii)**  $\cos \angle PRS$ .

Answer ..... [1]

- 16** The diagram shows a rectangle,  $ABCD$ , with  $AD = x$  centimetres.  
The perimeter of the rectangle is 100 cm.



- (a) Write an expression in its simplest form, in terms of  $x$ , for
- (i) the length of  $AB$ ,

*Answer* ..... cm [1]

- (ii) the area of the rectangle,

*Answer* .....  $\text{cm}^2$  [1]

- (b) The area of the rectangle is  $350 \text{ cm}^2$ .  
Show that  $x^2 - 50x + 350 = 0$ .

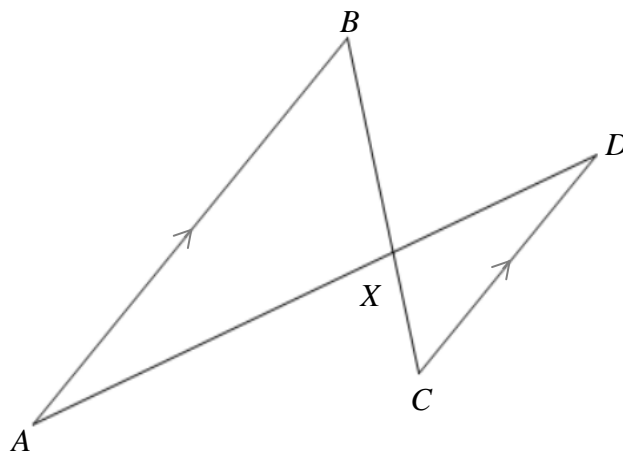
*Answer*

*Answer* ..... [2]

16 (c) Solve the equation  $x^2 - 50x + 350 = 0$  to find the value of  $x$  if  $AD > AB$ .

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

17 Triangle  $ABX$  is similar to triangle  $DCX$ .  
 $AB = 12.5$  cm,  $CD = 7.5$  cm and  $AX = 9$  cm.



(a) Calculate the length of  $XD$ .

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

17 (b) Find the scale factor for the enlargement of  $CXD$  to triangle  $BXA$ .

Answer ..... [1]

18 The equation of the line  $l$  is  $3x+4y=2$ .

(a) (i) State the gradient of the line.

Answer ..... [1]

(a) (ii) Given that line  $l$  crosses the  $x$ -axis and  $y$ -axis at points  $A$  and  $B$  respectively, find the coordinates of the points  $A$  and  $B$ .

Answer  $A$  ( ..... , ..... )

$B$  ( ..... , ..... ) [2]

(b) Find the area of the triangle  $AOB$ .

Answer ..... units<sup>2</sup> [2]

(c) (i) Given that the gradient of another line  $h$  is 0.75 and it passes through the point  $C(2, 5)$ , find the equation of line  $h$ .

Answer ..... [2]

**18 (c) (ii)** Find the length of  $BC$ .

*Answer* ..... units [2]

**19** Observe the sequence below.

$$1^2 - 0^2 = 1$$

$$2^2 - 1^2 = 3$$

$$3^2 - 2^2 = 5$$

$$\vdots \quad \vdots \quad \vdots$$

**(a)** Write down the 5<sup>th</sup> line of the sequence.

*Answer* ..... [1]

**(b)** Write down an expression, in terms of  $n$ , for the  $n^{\text{th}}$  line of the sequence.

*Answer* ..... [1]

**(c)** Evaluate 25<sup>th</sup> line of the sequence.

*Answer* ..... [1]

**20** The line  $BC$  is drawn below.



- (a) Where  $AB = 10$  cm and  $\hat{ABC} = 40^\circ$ . Construct the triangle  $ABC$ . [1]
- (b) Construct the perpendicular bisector of  $BC$ . [1]
- (c) Construct the bisector of  $\hat{ACB}$ . [1]

*End of Paper*