

Total marks — 40  
Attempt ALL questions

1. Evaluate  $2\frac{1}{6} \div \frac{8}{9}$ .

Give your answer in its simplest form.

2

$$\begin{aligned}
 2\frac{1}{6} &= \frac{8}{9} \\
 &= \frac{13}{6} \times \frac{9}{8} \\
 &= \frac{39}{16}
 \end{aligned}$$

2. Expand and simplify  $(x+7)^2 + 6(x^2 - 10)$ . 3

	$x$	$+7$
$x$	$x^2$	$+7x$
$+7$	$+7x$	$+49$

$$\begin{aligned}
 &= x^2 + 14x + 49 + 6x^2 - 60 \\
 &= \underline{7x^2 + 14x - 11}
 \end{aligned}$$

[Turn over



3. Solve, algebraically, the system of equations

$$2x + 3y = 8 \quad (1)$$

$$5x + 2y = -2 \quad (2)$$

$$(1) \times 2 \quad 4x + 6y = 16 \quad (3)$$

$$(2) \times 3 \quad 15x + 6y = -6 \quad (4)$$

$$(4) - (3) \quad 11x = -22$$

$$x = -2$$

sub -2 for x in (1)

$$-4 + 3y = 8$$

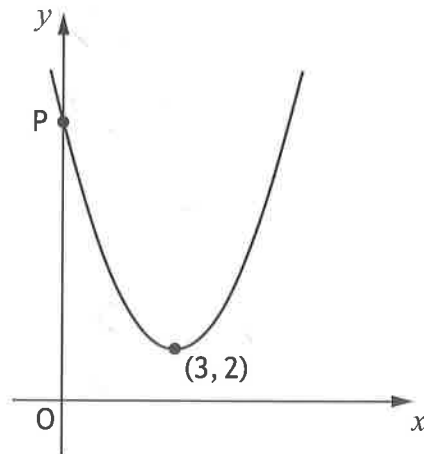
$$3y = 12$$

$$y = 4$$

$$x = -2, y = 4$$



4. The graph below shows part of a parabola of the form  $y = (x+a)^2 + b$ .



(a) (i) State the value of  $a$ .

1

$$a = -3$$

(ii) State the value of  $b$ .

1

$$b = 2$$

(b) P is the point  $(0, c)$ .

Find the value of  $c$ .

1

$$\begin{aligned} x=0 \quad \therefore y &= (0-3)^2 + 2 \\ &= 11 \\ \therefore c &= \underline{11} \end{aligned}$$

[Turn over



5. Determine the nature of the roots of the function  $f(x) = 4x^2 + 6x - 1$ .

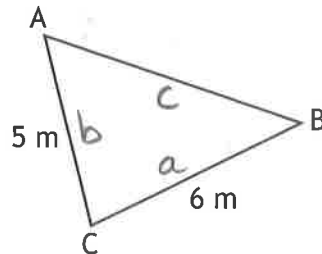
$$\begin{aligned} a &= 4 & b^2 - 4ac &= 6^2 - 4(4)(-1) \\ b &= 6 & &= 36 + 16 \\ c &= -1 & &= 52 \end{aligned}$$

$b^2 - 4ac > 0$ ,  $\therefore$  roots are real and unequal.



6. In triangle ABC:

- AC = 5 metres
- BC = 6 metres
- $\cos C = \frac{1}{5}$ .



Calculate the length of AB.

3

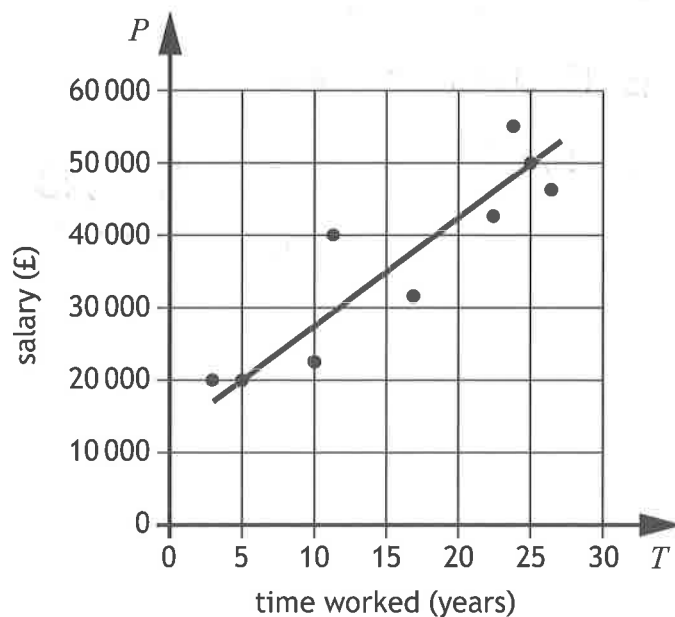
$$\begin{aligned}
 c^2 &= a^2 + b^2 - 2ab \cos C \\
 &= 6^2 + 5^2 - 2(6)(5)\left(\frac{1}{5}\right) \\
 &= 36 + 25 - 60 \times \frac{1}{5} \\
 &= 61 - 12 \\
 &= 49 \\
 c &= \sqrt{49} \\
 &= 7 \quad \therefore \underline{AB = 7 \text{ m}}
 \end{aligned}$$

[Turn over



7. A business recorded the salaries of a sample of its employees and the length of time they have worked for the business.

The scattergraph shows the relationship between their salary,  $P$  pounds, and the length of time,  $T$  years, they have worked.



A line of the best fit has been drawn.

- (a) Find the equation of the line of best fit in terms of  $P$  and  $T$ .  
Give the equation in its simplest form.

3

$$(5, 20000)$$

$$(25, 50000)$$

$$m = \frac{50000 - 20000}{25 - 5}$$

$$= \frac{30000}{20}$$

$$= 1500$$

$$y - b = m(x - a)$$

$$y - 20000 = 1500(x - 5)$$

$$y - 20000 = 1500x - 7500$$

$$y = 1500x + 12500$$

$$\therefore P = 1500T + 12500$$



\* X 8 4 7 7 5 0 1 0 8 \*

7. (continued)

- (b) Use your equation from part (a) to estimate the salary of an employee who has worked for the business for 8 years.

1

$$\begin{aligned}
 P &= 1500(8) + 12500 \\
 &= 12000 + 12500 \\
 &= 24500
 \end{aligned}$$

£24500

8. Express  $\frac{12}{\sqrt{15}}$  with a rational denominator.

Give your answer in its simplest form.

2

$$\begin{aligned}
 \frac{12}{\sqrt{15}} \times \frac{\sqrt{15}}{\sqrt{15}} &= \frac{12\sqrt{15}}{15} \\
 &= \frac{4\sqrt{15}}{5}
 \end{aligned}$$

[Turn over



9. A magazine company conducted a survey of the ages of its readers. A sample of ten readers' ages, in years, are shown below.

~~33~~ ~~55~~ ~~38~~ ~~47~~ ~~36~~ ~~41~~ ~~42~~ ~~41~~ ~~35~~ ~~31~~

- (a) Calculate the median and interquartile range of the ages of readers for this sample.

3

31 33 (35) 36 38 41 41 (42) 47 55  
 $Q_1$   $Q_2$   $Q_3$

$$\text{Median} = \underline{\underline{39.5}}$$

$$\text{IQR} = \frac{42 - 35}{2}$$

$$= \underline{\underline{3.5}}$$

A newspaper company also conducted a survey of the ages of its readers.

The median age of a sample of its readers was 41 years and the interquartile range was 9 years.

- (b) Make two valid comments comparing the ages of the readers of the magazine and the ages of the readers of the newspaper.

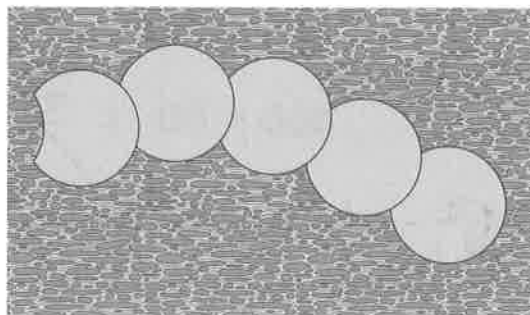
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- Magazine readers are younger as  $39.5 < 41$
- Ages of magazine readers are more consistent as  $3.5 < 9$ .

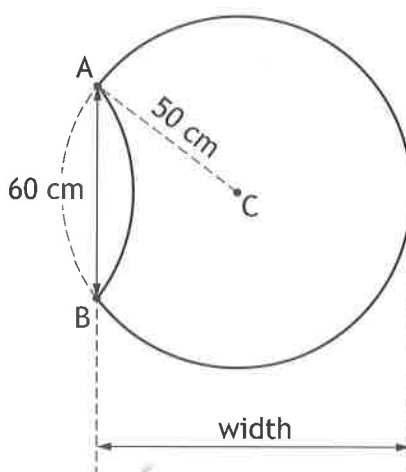




10. Alan buys some identical paving slabs to make a path.  
Each slab is part of a circle.



The diagram below shows a single slab.

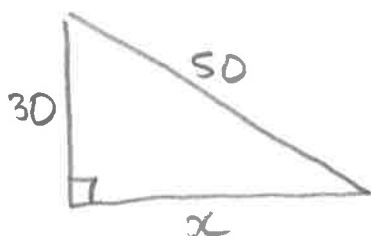


The circle, centre C, has a radius of 50 centimetres.

Length AB is 60 centimetres.

Calculate the width of the paving slab.

4



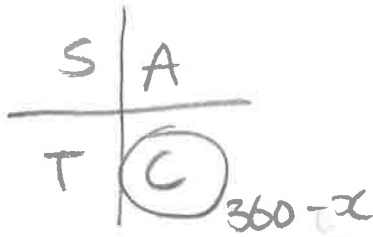
$$\begin{aligned}
 x^2 &= 50^2 - 30^2 \\
 &= 2500 - 900 \\
 &= 1600 \\
 x &= \sqrt{1600} \\
 &= 40
 \end{aligned}$$

$$\begin{aligned}
 \text{width} &= 50 + 40 \\
 &= \underline{\underline{90 \text{ cm}}}
 \end{aligned}$$



11. Given that  $\sin 30^\circ = 0.5$ , state the value of  $\sin 330^\circ$ .

1



$\sin 330^\circ = \text{NEGATIVE (Q4)}$   
 $360 - 30 = 330$   
 SO  $\sin 330 = \underline{\underline{-0.5}}$

12. Simplify  $\frac{5c^{-2}}{c^3 \times c^4}$ .

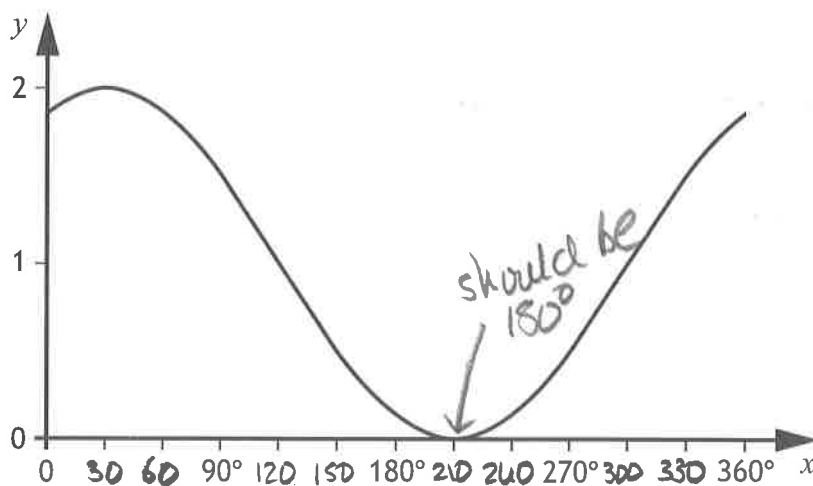
Give your answer with a **positive** power.

3

$$\begin{aligned} \frac{5c^{-2}}{c^3 \times c^4} &= \frac{5c^{-2}}{c^7} \\ &= 5c^{-9} \\ &= \underline{\underline{\frac{5}{c^9}}} \end{aligned}$$



13. Part of the graph of  $y = \cos(x+a)^\circ + b$  is shown.



(a) State the value of  $a$ .

1

$$a = 1$$

(b) State the value of  $b$ .

1

$$30^\circ \text{ right} \Rightarrow b = -30$$

[Turn over



\* X 8 4 7 7 5 0 1 1 3 \*

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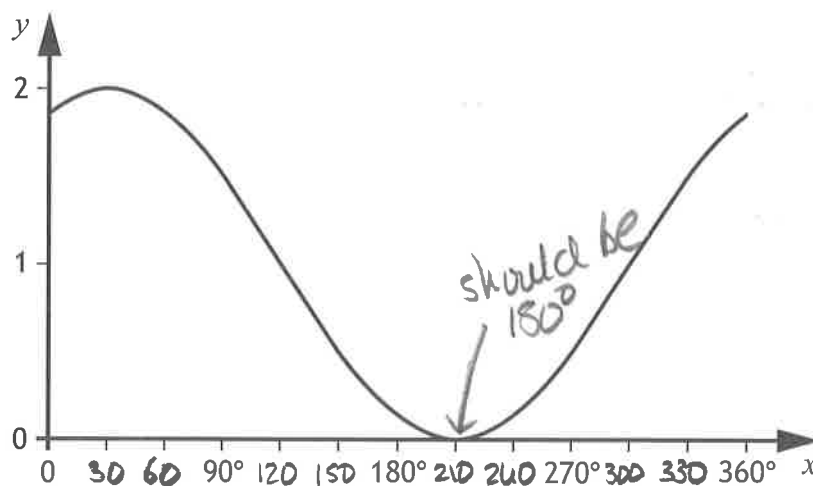
$$\frac{5c^{-2}}{c^3 \times c^4} = \frac{5c^{-2}}{c^7}$$

$$= 5c^{-9}$$

$$= \underline{\underline{\frac{5}{c^9}}}$$



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[Turn over



14. Solve, algebraically, the inequation  $\frac{x+1}{3} - 2 > \frac{3x}{5}$ .

$$\frac{x+1}{3} - 2 > \frac{3x}{5}$$

$$\frac{x+1}{3} - \frac{6}{3} > \frac{3x}{5}$$

$$\frac{x+1-6}{3} > \frac{3x}{5}$$

$$\frac{x-5}{3} > \frac{3x}{5}$$

$$5(x-5) > 3(3x)$$

$$5x - 25 > 9x$$

$$5x - 9x > 25$$

$$-4x > 25$$

$$x < \underline{\underline{-\frac{25}{4}}}$$

[END OF QUESTION PAPER]



\* X 8 4 7 7 5 0 1 1 4 \*