

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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# GCSE MATHEMATICS

# H

Higher Tier

Paper 1 Non-Calculator

Date of Exam

Morning

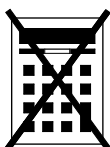
Time allowed: 1 hour 30 minutes

### Materials

For this paper you must have:

- mathematical instruments.

You must **not** use a calculator.



### Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

### Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

### Advice

- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

**1** What is the area, in  $\text{cm}^2$ , of a semicircle of radius 6 cm?

Circle your answer.

[1 mark]

$6\pi$

$12\pi$

$18\pi$

$36\pi$

**2** Expand  $3x^2(2x - 5)$

Circle your answer.

[1 mark]

$-9x$

$6x^3 - 5$

$5x^3 - 8x^2$

$6x^3 - 15x^2$

**3** Circle the solution of  $2x + 8 > 4$

[1 mark]

$x > -6$

$x > -2$

$x > 2$

$x > 6$

4 Circle the calculation that increases 50 by 200%

[1 mark]

$50 \times 1.2$

$50 \times 2$

$50 \times 2.2$

$50 \times 3$

5 Solve  $\frac{x}{3} - 9 = 12$

[2 marks]

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$x = \underline{\hspace{10em}}$

Turn over for the next question

Turn over ►

**6** The air pressure in a tyre measures 7.2 bar.  
Air is leaking out at the rate of 0.2 bar per day.

**6 (a)** Assume that the air continues to leak at the same rate.  
After how many days will the pressure measure 4.8 bar?

**[2 marks]**

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Answer \_\_\_\_\_

**6 (b)** In fact, the rate that the air leaks out increases each day.  
How does this affect your answer to part (a)?

**[1 mark]**

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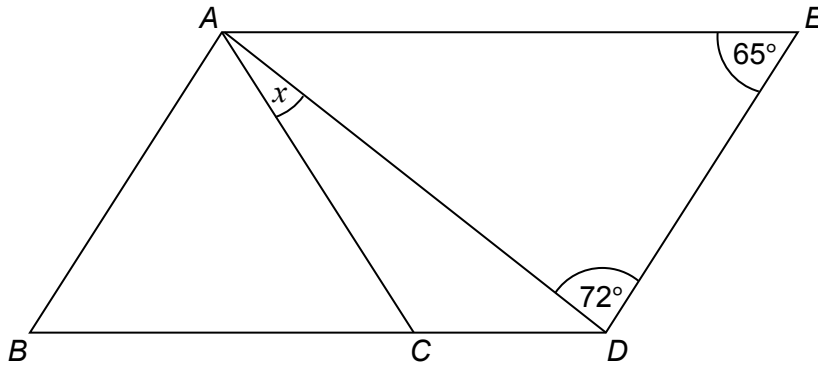
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7  $ABDE$  is a parallelogram.

$$AB = AC$$

Not drawn  
accurately



Show that  $x = 22^\circ$

[3 marks]

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Turn over ►

**8 (a)** Here are the fourth and fifth terms of a Fibonacci-type sequence.

\_\_\_\_\_ 28 43

Each term is the sum of the previous two terms.

Show that the first term is 2

**[2 marks]**

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**8 (b)** Here are the first and third terms of a different Fibonacci-type sequence.

$a$  \_\_\_\_\_  $b$  \_\_\_\_\_

Each term is the sum of the previous two terms.

Work out an expression in terms of  $a$  and  $b$  for the fifth term.

**[3 marks]**

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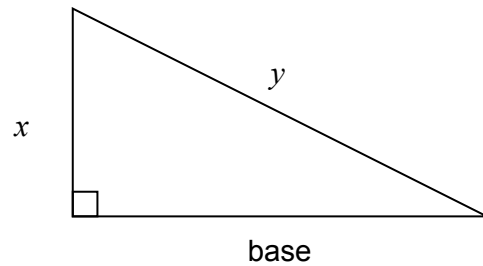
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Answer \_\_\_\_\_

- 9 Noah is attempting to work out the base of **different** right-angled triangles.



Not drawn  
accurately

Here is his method with the working for  $y = 10$  and  $x = 6$

Work out the value of  $y^2$   $10^2 = 100$

Work out the value of  $x^2$   $6^2 = 36$

Work out the value of  $y^2 - x^2$   $100 - 36 = 64$

The base is  $\sqrt{y^2 - x^2}$  base =  $\sqrt{64}$

Tick the correct statement.

[3 marks]

The method will **always** give an answer which is a whole number.

The method will **sometimes** give an answer which is a whole number.

The method will **never** give an answer which is a whole number.

Show working to support your answer.

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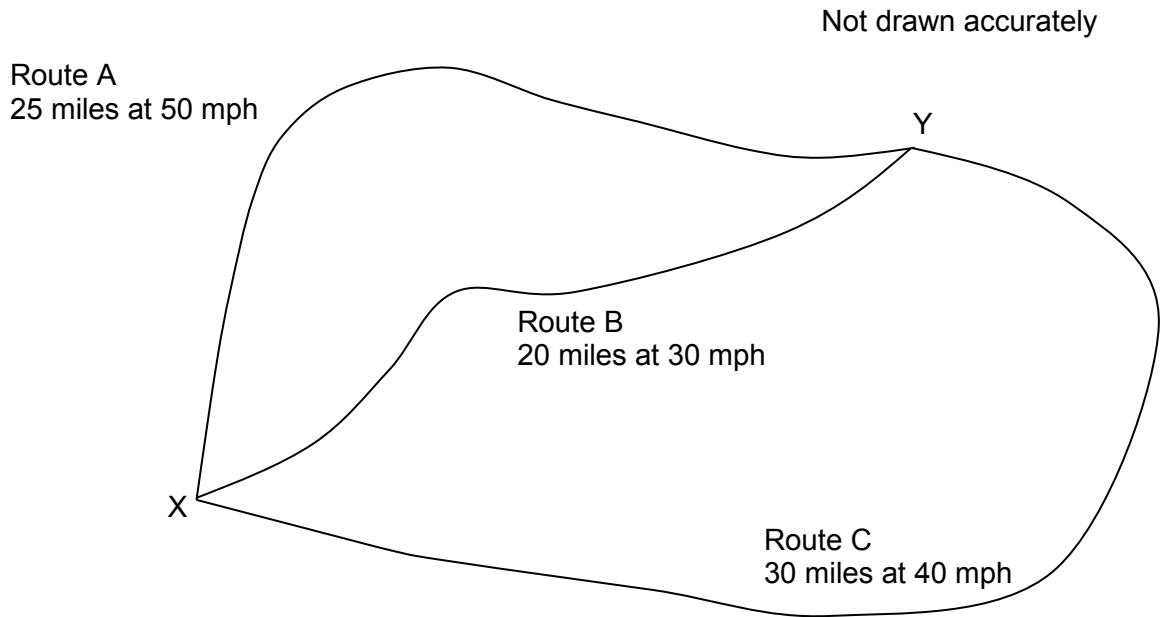
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Turn over ►

- 10** The diagram shows three routes, A, B and C, between two towns, X and Y.  
The distance and average speed for each route is shown.



- 10 (a)** Which of the three routes takes the longest time?

Assume the average speeds given.

You **must** show your working.

**[4 marks]**

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Answer \_\_\_\_\_



**10 (b)** Jon and Matt take the same time to travel from X to Y.

Jon travels along route B at 10 mph **faster** than the average speed.

Matt travels along route C.

Does Matt travel faster or slower than the average speed for route C, and by how much?

You **must** show your working.

**[3 marks]**

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Tick a box.

Faster  Slower

Answer \_\_\_\_\_ mph

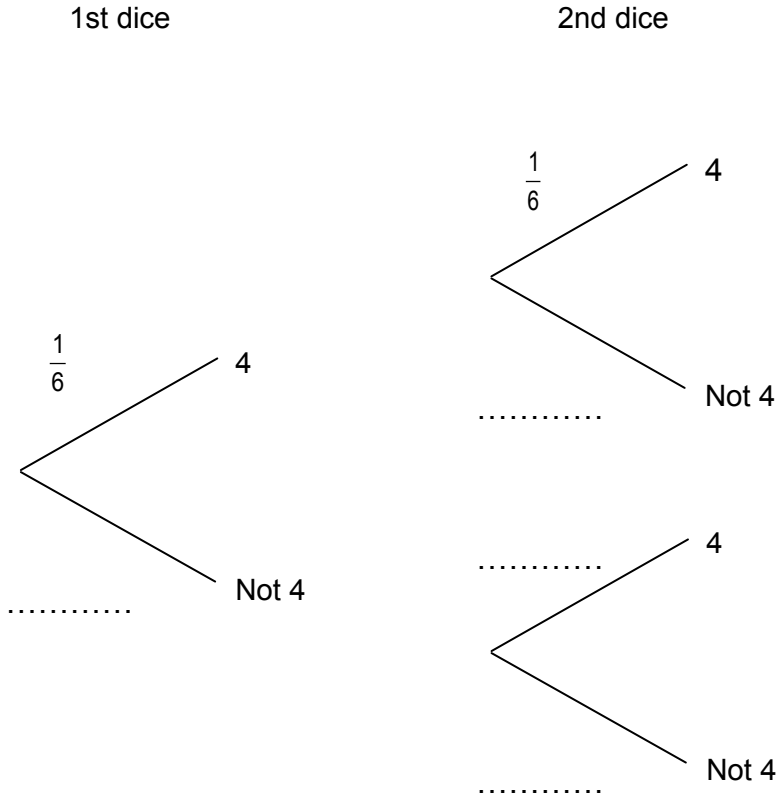
**Turn over for the next question**

**Turn over ►**

11 Two ordinary fair dice are rolled.

11 (a) Complete the tree diagram.

[1 mark]



11 (b) Circle the probability that **both** dice land on 4

[1 mark]

$\frac{1}{4}$        $\frac{2}{12}$        $\frac{2}{6}$        $\frac{1}{12}$        $\frac{1}{36}$

11 (c) Work out the probability that at least one of the dice does **not** land on 4

[2 marks]

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Answer \_\_\_\_\_

**12**  $A = \frac{(x-4)(x+3)}{x(x-1)}$

**12 (a)** Work out the value of  $A$  when  $x = -1$

[1 mark]

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Answer \_\_\_\_\_

**12 (b)** When  $2 < x < 4$   
Circle your answer.

[1 mark]

$A$  is positive

$A$  is zero

$A$  is negative

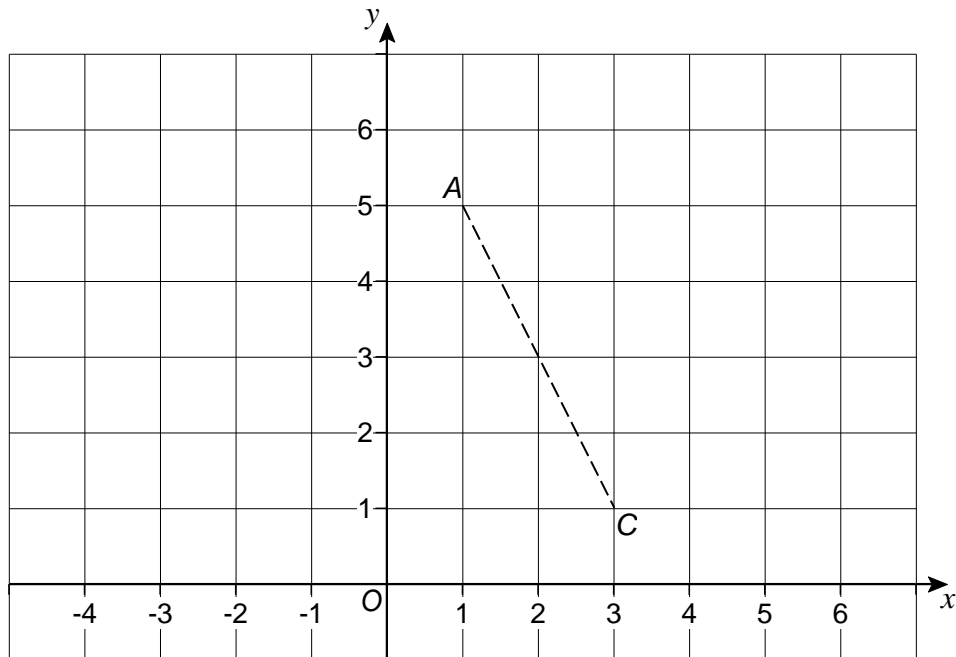
$A$  could be positive or  
negative or zero

**Turn over for the next question**

**13 (a)**  $AC$  is a diagonal of kite  $ABCD$ .

$A$  is the point  $(1, 5)$

$C$  is the point  $(3, 1)$



The diagonals of the kite intersect at  $M$ , the midpoint of  $AC$ .

$$AM = BM$$

$$BM : MD = 1 : 2$$

Work out possible coordinates of  $B$  and  $D$ .

**[2 marks]**

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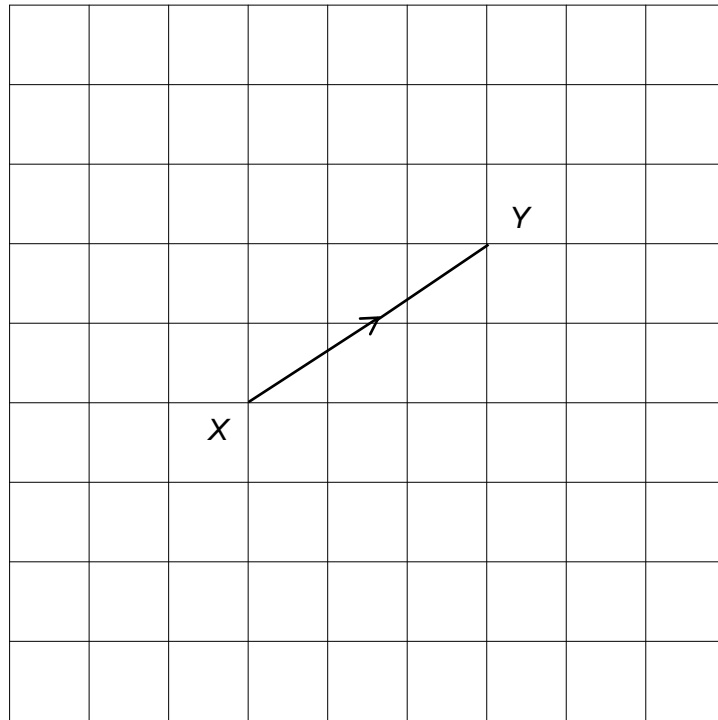
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$B$ ( \_\_\_\_\_ , \_\_\_\_\_ ) and  $D$ ( \_\_\_\_\_ , \_\_\_\_\_ )

13 (b)  $\vec{XY}$  is the vector  $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$  on this square grid.



Write down a vector that is

the same size as  $\vec{XY}$

and perpendicular to  $\vec{XY}$

[2 marks]

Answer  $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$

Turn over for the next question

14 Estimate the value of  $19.4^2 + 30\sqrt{104}$

[3 marks]

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Answer \_\_\_\_\_

15 Circle the expression that is equivalent to  $\frac{2x^2 + 1}{x}$  where  $x$  is not equal to 0

[1 mark]

$2x + 1$

$2x^2 + \frac{1}{2}$

$2x + \frac{1}{x}$

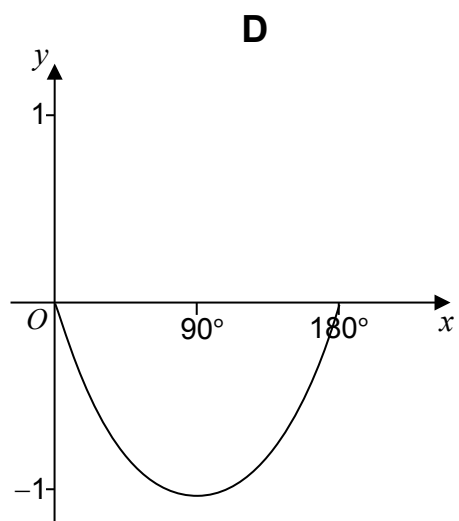
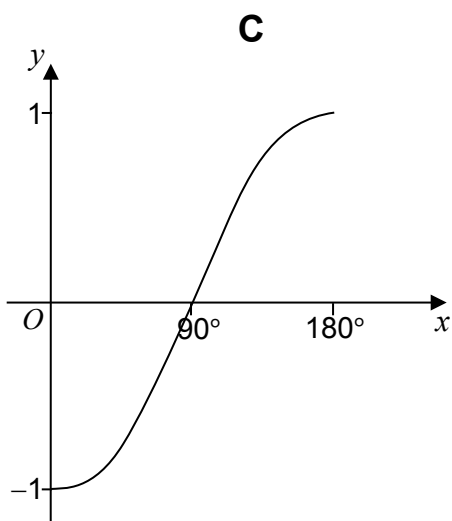
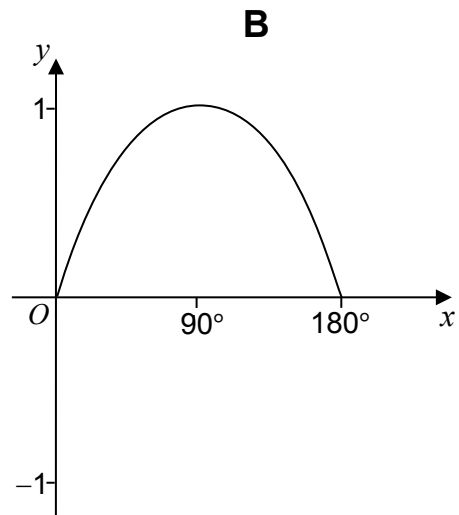
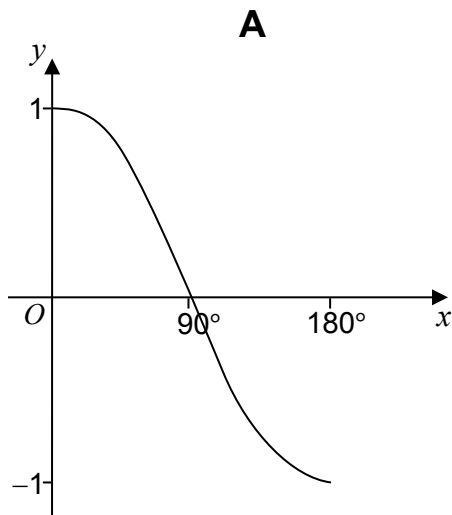
$4x + \frac{1}{x}$

16 One of these is a sketch of  $y = \cos x$  for  $0^\circ \leq x \leq 180^\circ$

Which one?

Circle the correct letter.

[1 mark]



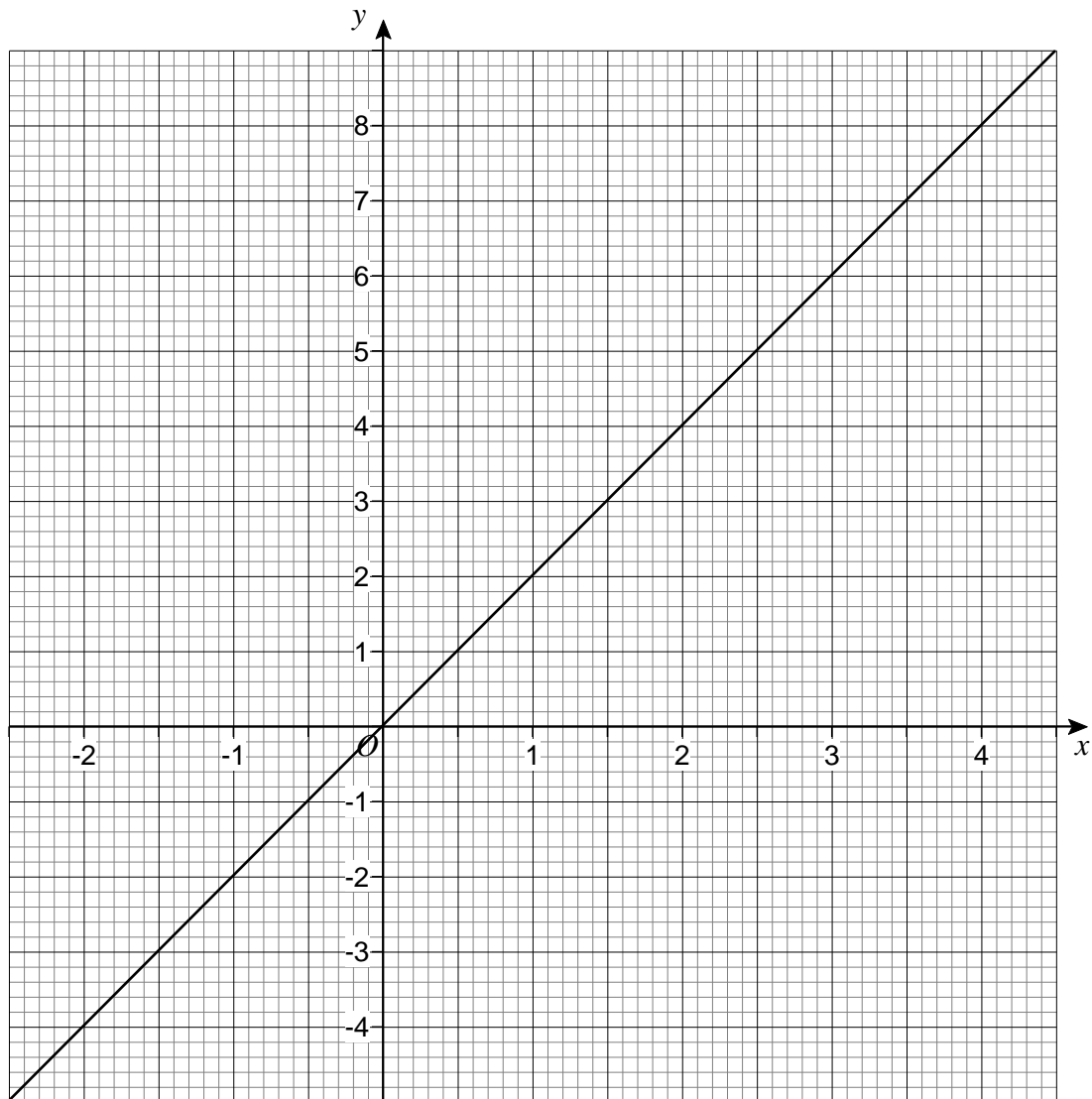
Turn over for the next question

Turn over ►





18 The graph of  $y = 2x$  is shown.



By drawing the graph  $y = 3x^2 - 4$  on the grid,  
work out approximate solutions to  $3x^2 - 4 = 2x$

[4 marks]

Answer \_\_\_\_\_

**19 (a)** Work out the value of  $(\sqrt{2})^4$

**[1 mark]**

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Answer \_\_\_\_\_

**19 (b)** Expand and simplify  $(\sqrt{2} + 3)^2$

**[2 marks]**

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Answer \_\_\_\_\_

**20** Work out the value of  $9^{-\frac{1}{2}}$

**[2 marks]**

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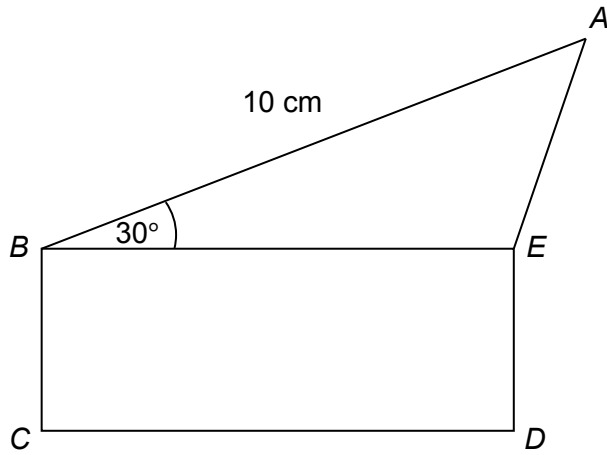
Answer \_\_\_\_\_

21

The diagram shows a triangle  $ABE$  and a rectangle  $BCDE$ .

$$\text{area } ABE = \text{area } BCDE$$

$BC$  is 2 cm shorter than  $BE$ .



Not drawn  
accurately

Work out the length of  $BE$ .

[4 marks]

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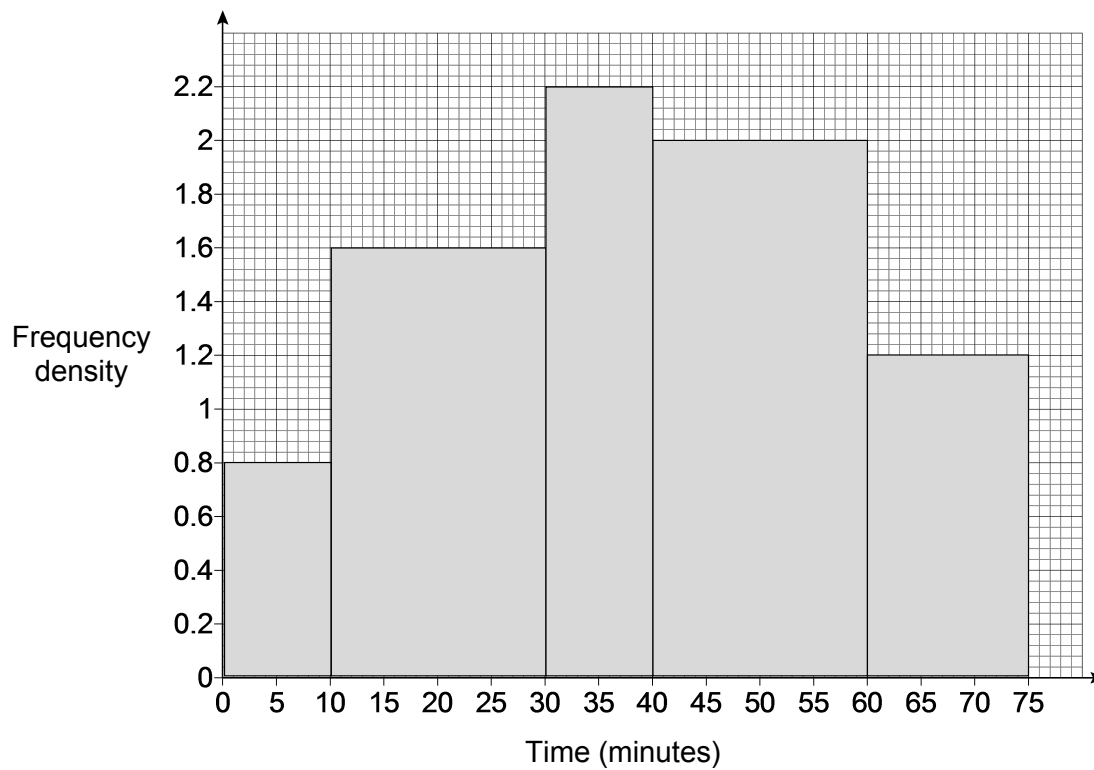
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Answer \_\_\_\_\_ cm

Turn over ►

22

The histogram shows information about the times some students revised for a test.  
The first bar represents students who revised for less than 10 minutes.



Estimate the number of students who revised for less than 45 minutes.

[3 marks]

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Answer \_\_\_\_\_

23 Work out the value of  $\frac{5}{\sqrt{3}} - \sqrt{6\frac{3}{4}}$

Give your answer in the form  $k\sqrt{3}$

[4 marks]

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Answer \_\_\_\_\_

24 Convert  $0.\dot{2}8$  to a fraction.  
Give your answer in its simplest form.

[3 marks]

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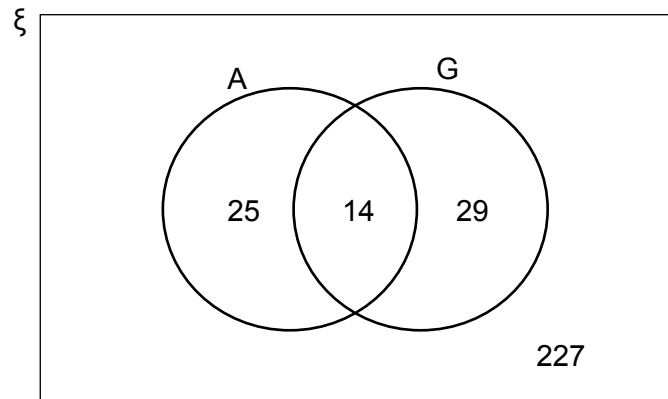
Answer \_\_\_\_\_

**25** In the Venn diagram

$\xi$  = 295 students in a college

A = students who take Art

G = students who take Geography



**25 (a)** One student is chosen at random.

Work out the probability the student takes Art.

[1 mark]

Answer \_\_\_\_\_

**25 (b)** One student who takes Geography is chosen at random.

Work out the probability the student **also** takes Art.

[1 mark]

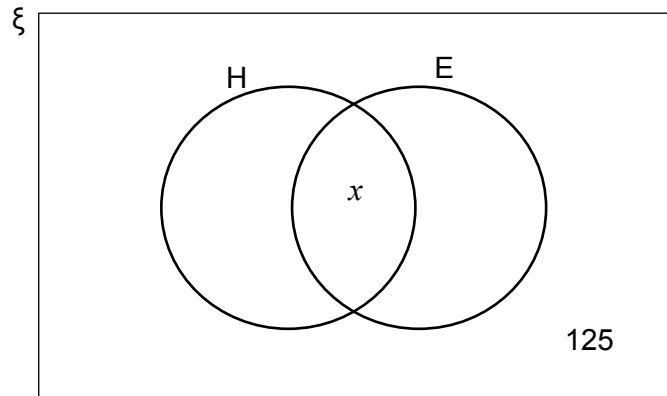
Answer \_\_\_\_\_

**25 (c)** In this Venn diagram

$\xi$  = 295 students in the college

H = students who take History

E = students who take English



One-half of the students who take History also take English.

The number who take English is twice the number who take History.

Work out the value of  $x$ .

**[3 marks]**

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Answer \_\_\_\_\_

**Turn over for the next question**

**Turn over ►**

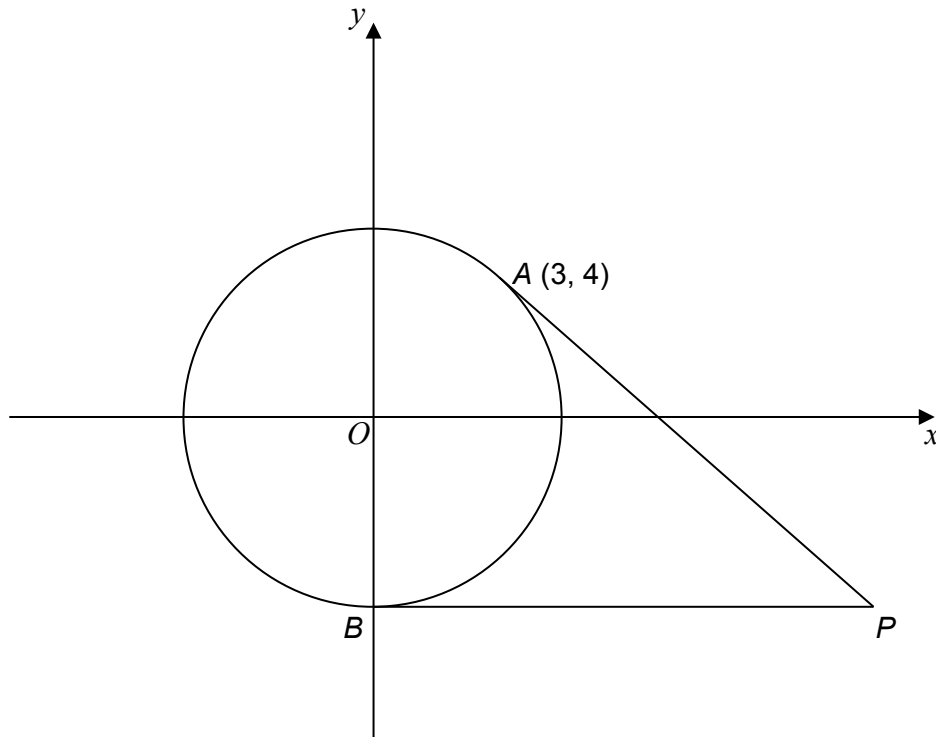
26

$A$  and  $B$  are points on the circle with equation  $x^2 + y^2 = 25$

$A$  is  $(3, 4)$

$B$  is a point on the  $y$ -axis.

$PA$  and  $PB$  are tangents.



**26 (a)** Show that the coordinates of  $B$  are  $(0, -5)$

[1 mark]

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**26 (b)** Give a reason why  $PA = PB$

[1 mark]

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**26 (c)**  $P$  is the point  $(a, b)$

Work out the values of  $a$  and  $b$ .

**[4 marks]**

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$a =$  \_\_\_\_\_

$b =$  \_\_\_\_\_

**END OF QUESTIONS**

**There are no questions printed on this page**

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