Collins

AQA

GCSE

Mathematics

H

SET B – Paper 3 Higher Tier

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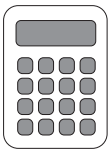
Materials

Time allowed: 1 hour 30 minutes

For this paper you must have:

- calculator
- mathematical instruments



Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer **all** questions.
- You must answer the questions in the space provided.
- In all calculations, show clearly how you work out your answer.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may use additional paper, graph paper and tracing paper.

Name: .....

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

1 Which of the following is used to work out pressure?

Circle your answer.

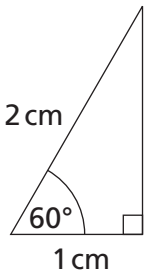
[1 mark]

Force × Area Area ÷ Force

Force ÷ Area Force ÷ Area^2

2 The diagram shows a right angled triangle.

One of the other angles is 60°.



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Circle the **exact** value of sin 60°.

[1 mark]

$\frac{1}{2}$ $\frac{\sqrt{3}}{2}$ 0.866 $\frac{2}{\sqrt{3}}$

3 Circle the cube number.

[1 mark]

81 225 729 1024

4 Circle the power of 5.

[1 mark]

55 100 125 225

5 (a) Simplify $x^3 \times x^6$

[1 mark]

Answer .....

5 (b) Simplify $x^{12} \div x^2$

[1 mark]

Answer .....

6 Here are two column vectors:

$$\mathbf{a} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \qquad \mathbf{b} = \begin{pmatrix} 6 \\ -2 \end{pmatrix}$$

Work out 2**a** + **b.**

[2 marks]

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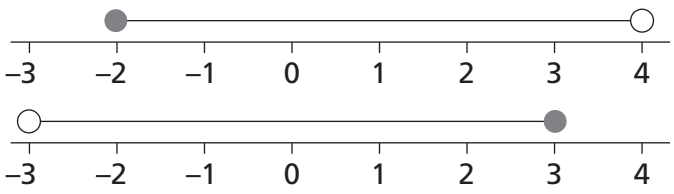
Answer .....

7 Two inequalities are shown.

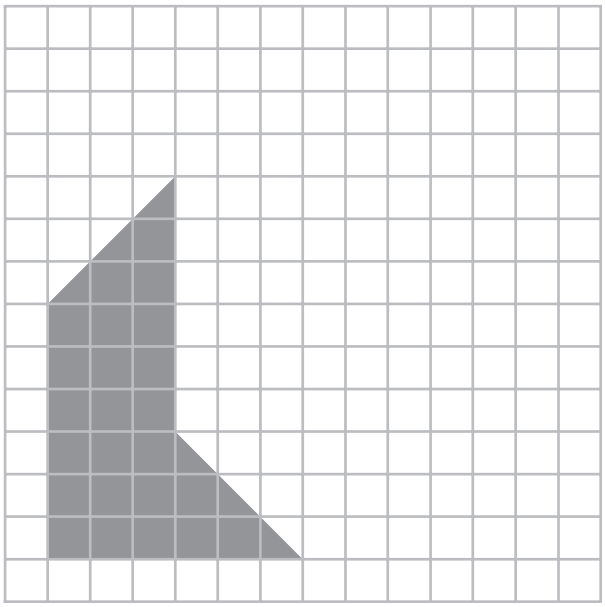


Write down the integers that are in **both** inequalities.

[2 marks]

8 Enlarge the shape by a scale factor of $\frac{1}{3}$

[2 marks]



9 A large candle exerts a pressure of 2 Pa on its base.

As the candle burns the pressure decreases.

After 2 hours the pressure is 0.5 Pa

Work out the rate of change of pressure.

Give your answer in Pa/hour.

[2 marks]

Answer ..... Pa/hour

10 A bag contains 10 balls.

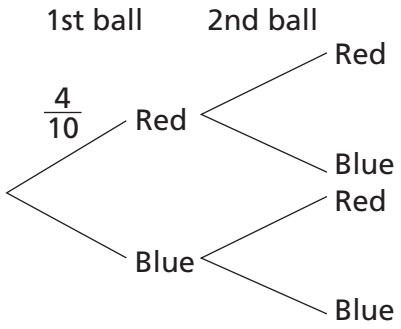
4 of the balls are red and 6 are blue.

A ball is taken at random from the bag.

The ball is replaced and another ball is taken at random from the bag.

10 (a) Complete the tree diagram.

[1 mark]



10 (b) Use the tree diagram, or otherwise, to work out the probability that both balls were the same colour.

[3 marks]

Answer .....

11 Solve the simultaneous equations

$3x + 2y = 2$

$x + 4y = 9$

[3 marks]

$x =$ .....

$y =$ .....

12 **(a)** Factorise $x^2 - 25$

[1 mark]

Answer .....

12 **(b)** Show that $(x + 2)^2 - (x + 1)^2 \equiv 2x + 3$ **[3 marks]**

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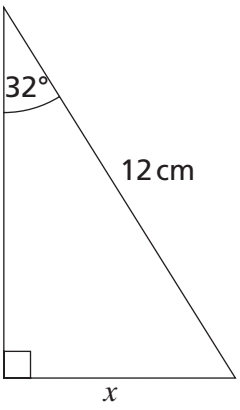
13 **(a)** Show that the length x in the triangle below is 6.36 cm to 2 decimal places.



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[1 mark]

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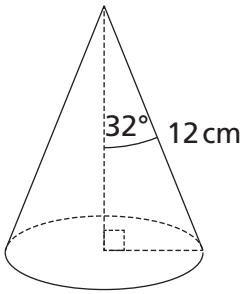
13 **(b)** A cone has a half vertical angle of 32° and a slant height l of 12 cm.



Work out the curved surface area of the cone.

The formula for the curved surface area of a cone is

Curved surface area = π × radius of base × slant height

[2 marks]

Answer ..... cm^2

14 A seal colony has 6000 seals.

It is declining at a rate of 8% per year.

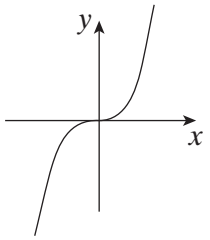
How long will it be before the colony is half its original size?

[3 marks]

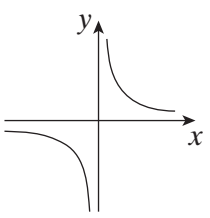
Answer ..... years

15 Match each graph to the equations. **[2 marks]**

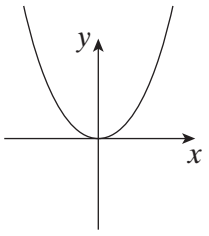
Graph A



Graph B



Graph C



$y = \tan x$ matches graph .....

$y = 2^x$ matches graph .....

$y = \frac{1}{x}$ matches graph .....

16 Simplify $(2x^2y^3)^2$

[2 marks]

.....

.....

Answer .....

17 Here are the equations of four lines.

Line A: $y = 3x + 3$ Line B: $y = \frac{1}{4}x - 3$

Line C: $y = \frac{1}{3}x + 3$ Line D: $y = -4x - 4$

17 (a) Which two lines are perpendicular?

[1 mark]

Answer ..... and .....

17 (b) Which two lines intersect on the x-axis?

[1 mark]

Answer ..... and .....

18 (a) Write down the next two terms of this quadratic sequence.

[2 marks]

3	5	8	12	17	23	…	…

Answer ..... and .....

18 (b) Work out the nth term of the quadratic sequence.

6	10	16	24	34	46	…

[4 marks]

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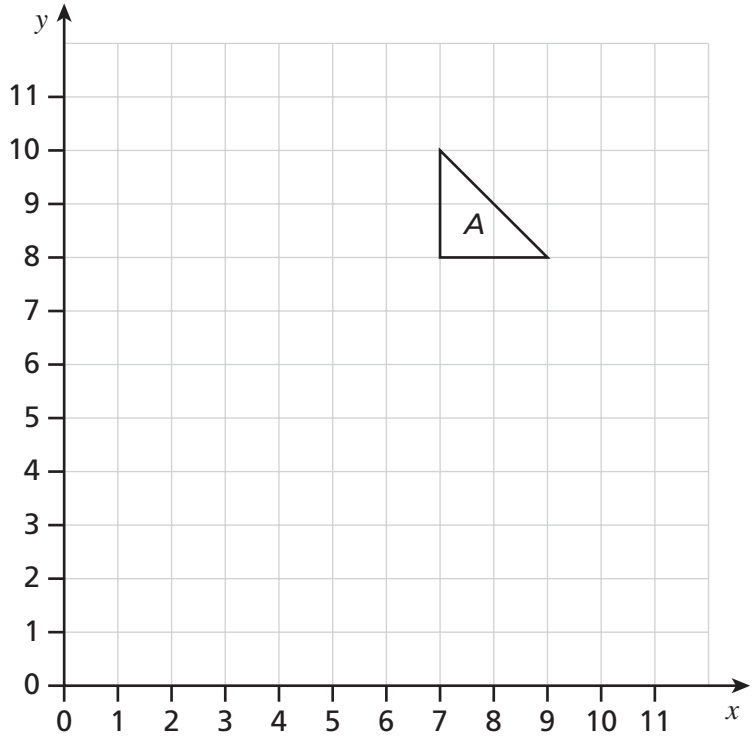
Answer .....

19 The triangle *A*, shown, is reflected in $y = 6$

Call this triangle *B*.

Triangle *B* is then reflected in $x = 5$

Call this triangle *C*.



Describe the **single** transformation that will map triangle *C* to triangle *A*.

[4 marks]

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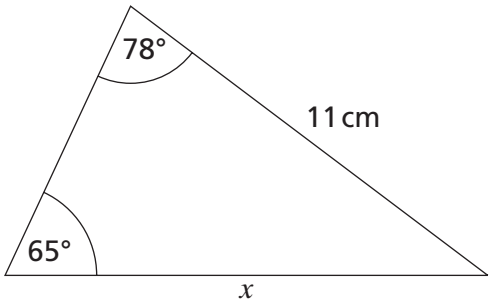
Answer .....

20 Work out the length x in the triangle.

[3 marks]



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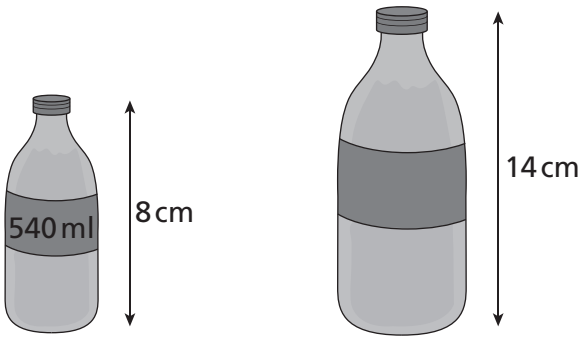
x = ... cm

21 These two bottles are similar in shape.



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Work out the volume of the large bottle.

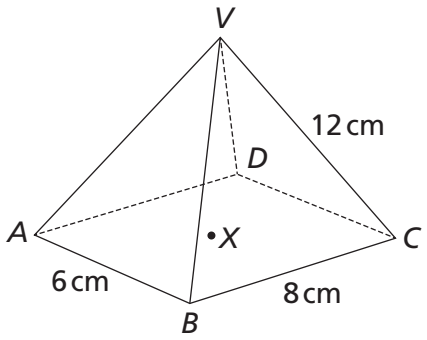
Give your answer to 3 significant figures.

[3 marks]

Answer ..... ml

22 A pyramid has a rectangular base *ABCD*.

The vertex is directly over the midpoint, *X*, of the base.



Calculate the angle between the side *VC* and the base *ABCD*.

[5 marks]

Answer ..... °

23 **(a)** Rearrange the equation $b^3 - 2a + 3 = 0$ to make b the subject.

[1 mark]

Answer .....

23 **(b)** One solution of the equation $x^3 - 2x + 3 = 0$ can be found with the iterative formula

$x_{n+1} = \sqrt[3]{2x_n - 3}$

Starting with $x_0 = 1$, write down the value of x_1

[1 mark]

Answer .....

23 **(c)** Continue the iteration to find the solution.

Give your answer to 2 decimal places.

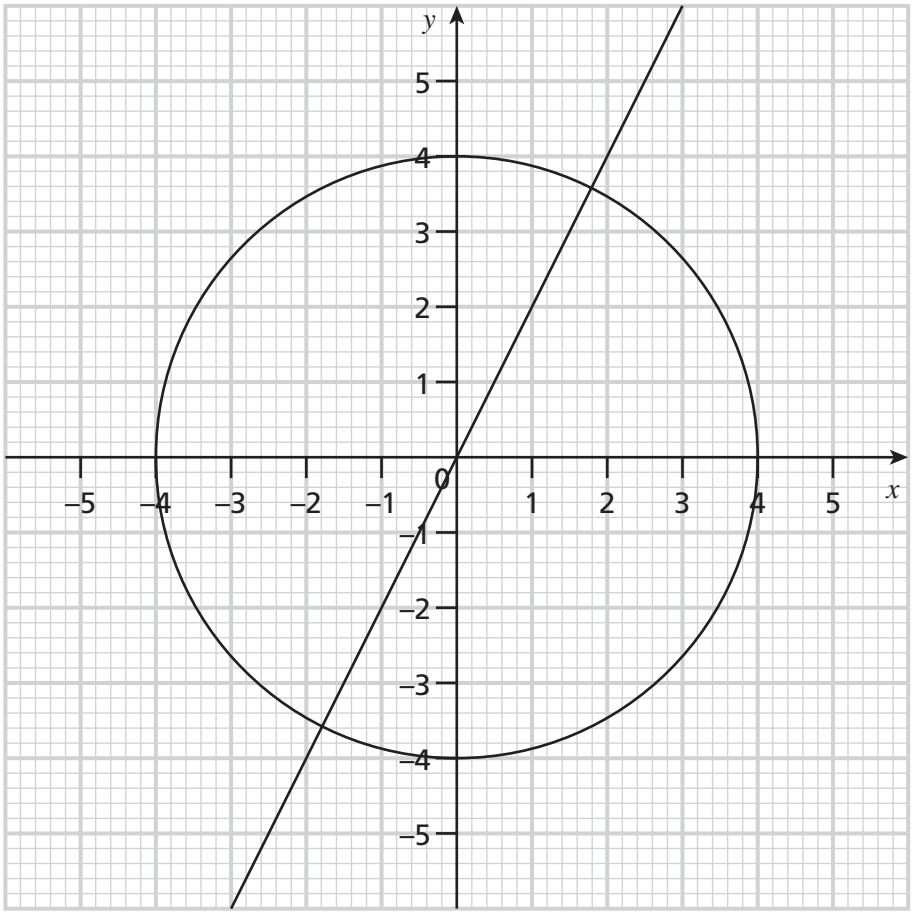
[2 marks]

Answer .....

24 A circle and a line are shown on the centimetre grid.

The line intersects the circle at A.

The circle intersects the x-axis at B.



24 (a) Write down the equation of the circle.

[1 mark]

Answer .....

24 (b) Work out the length of the minor arc *AB*.

[3 marks]

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Answer ..... cm

25 There are x beads in a jar.

The probability of taking a red bead from the jar at random is $\frac{4}{9}$

7 more red beads are added to the jar.

The probability of taking a red bead from the jar at random is now $\frac{1}{2}$

Use algebra to work out the value of x.

[5 marks]

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Answer .....

26 Two functions are $f(x) = 3x - 1$ and $g(x) = x^2 + 2$

26 (a) Work out $f^{-1}(x)$

[2 marks]

Answer .....

26 (b) Work out $fg(x)$

[2 marks]

Answer .....

27 Solve the simultaneous equations

$y = x + 3$

$x^2 + y^2 = x + 12$

[5 marks]

Answer .....

END OF QUESTIONS