



Surname _____

Forename(s) _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE

MATHEMATICS

H

Higher Tier Paper 3 Calculator

8300/3H

Monday 10 June 2024 Morning

Time allowed: 1 hour 30 minutes

At the top of the page, write your surname and forename(s), your centre number, your candidate number and add your signature.

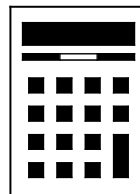
[Turn over]



MATERIALS

For this paper you must have:

- **a calculator**
- **mathematical instruments**
- **the Formulae Sheet (enclosed).**



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 on blank pages.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**
- **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.

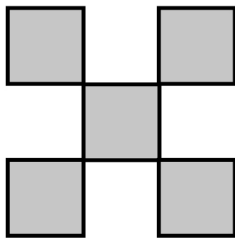
DO NOT TURN OVER UNTIL TOLD TO DO SO



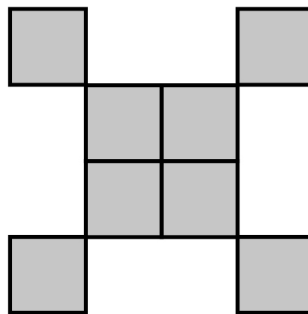
Answer ALL questions in the spaces provided.

- 1** Here are the first three Patterns in a sequence made up of small squares.

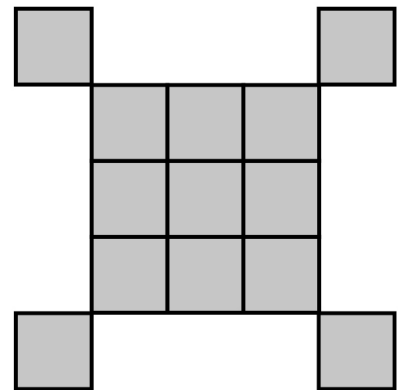
Pattern 1



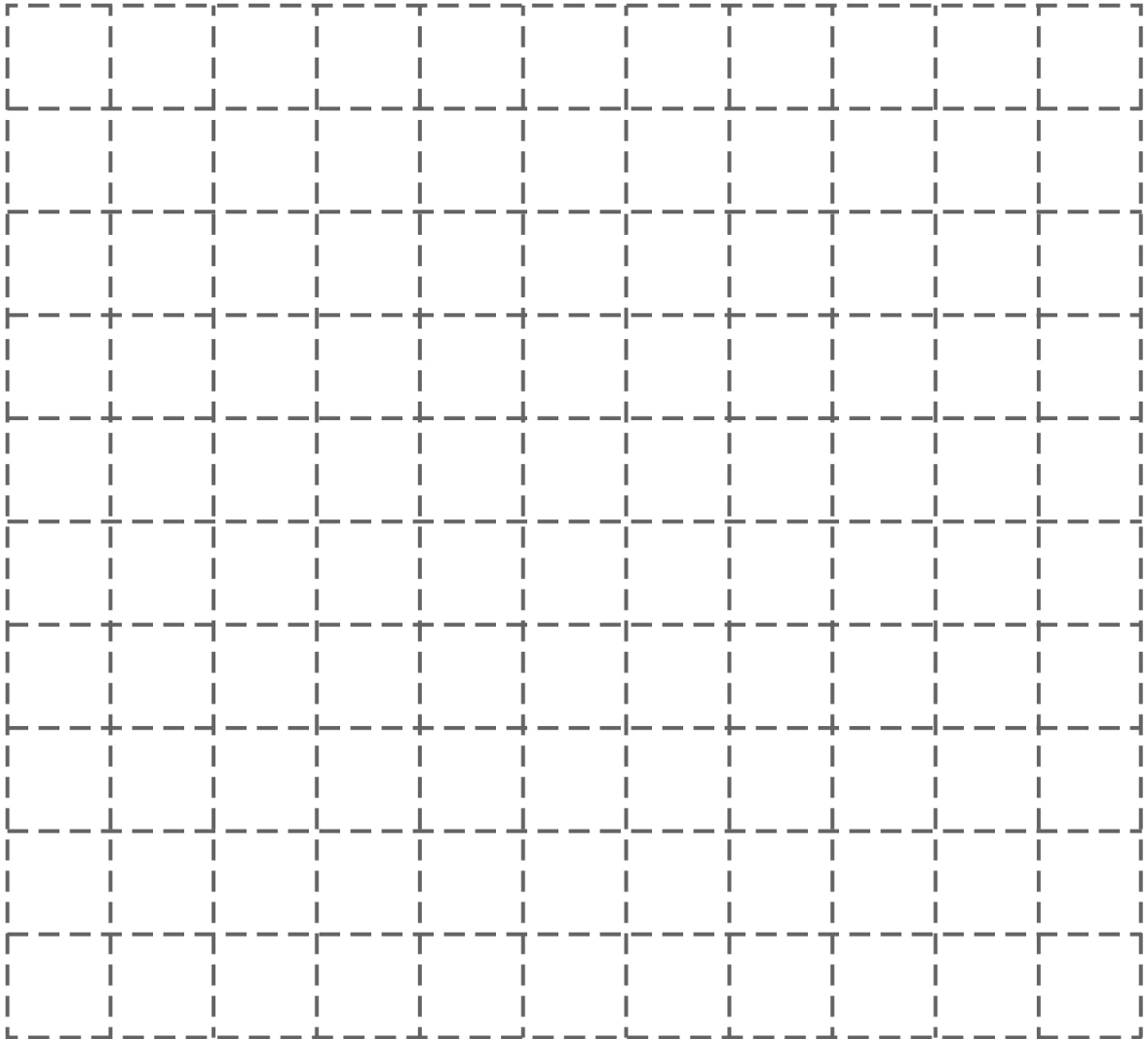
Pattern 2



Pattern 3



1(a) On the grid, draw Pattern 4 [1 mark]



[Turn over]



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- 1 (b) The expression for the number of small squares in Pattern n is $n^2 + 4$

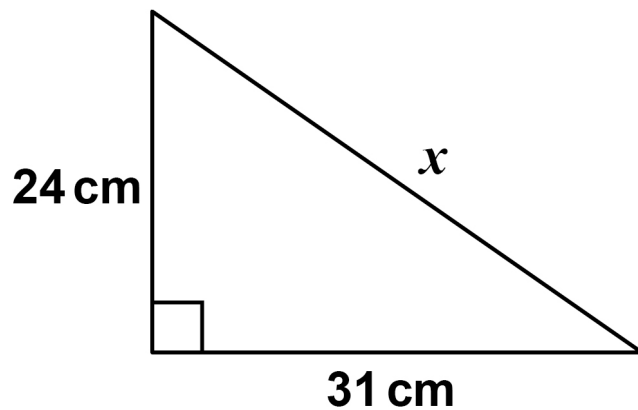
Work out the least value of n for which the number of small squares is greater than 500
[1 mark]

$n =$ _____

[Turn over]



- 2 The diagram is not drawn accurately.



Use Pythagoras' theorem to work out the value of x .

Give your answer as a decimal. [3 marks]

Answer _____ cm

[Turn over]

5



- 3 Rick claims most of the flats in his 8-floor building are energy efficient.**

He samples 45 flats from floors 1 to 5

Give a reason why this sample may NOT be useful in testing Rick's claim. [1 mark]



4 $3(x - 1) \equiv 3x - 3$ is an identity.

Tick ONE box. [1 mark]

☐

It is true for ALL values of x

☐

It is true for SOME values of x

☐

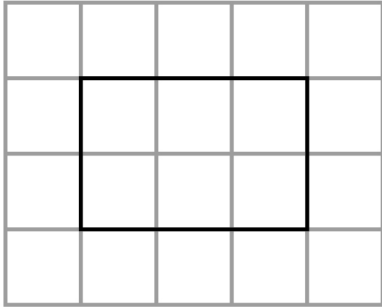
It is true for NO values of x

[Turn over]



- 5 The front elevation of a cuboid is shown on this centimetre grid.

FRONT ELEVATION

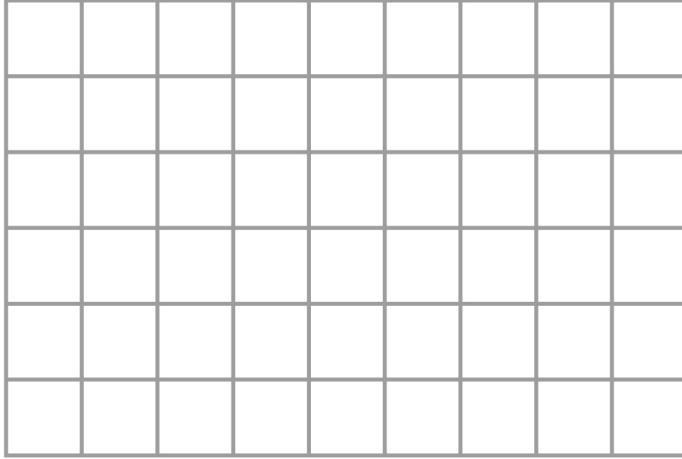


The volume of the cuboid is 42 cm^3

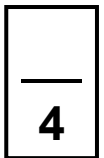


Draw the SIDE ELEVATION on this centimetre grid. [2 marks]

SIDE ELEVATION



[Turn over]



- 6(a) On Monday, Larrs swims 50 metres in 40 SECONDS at a constant speed.**

On Tuesday, Larrs swims 1.5 kilometres.

Assume he swims at the same constant speed as on Monday.

How many MINUTES does he swim for on Tuesday? [5 marks]



Answer _____ **minutes**

- 6(b) In fact, on Tuesday Larrs swims at a slower constant speed than on Monday.**

What does this mean about the number of minutes he swims for on Tuesday?

Tick the correct box. [1 mark]

☐

It is less than the answer to part (a)

☐

It is the same as the answer to part (a)

☐

It is greater than the answer to part (a)

☐

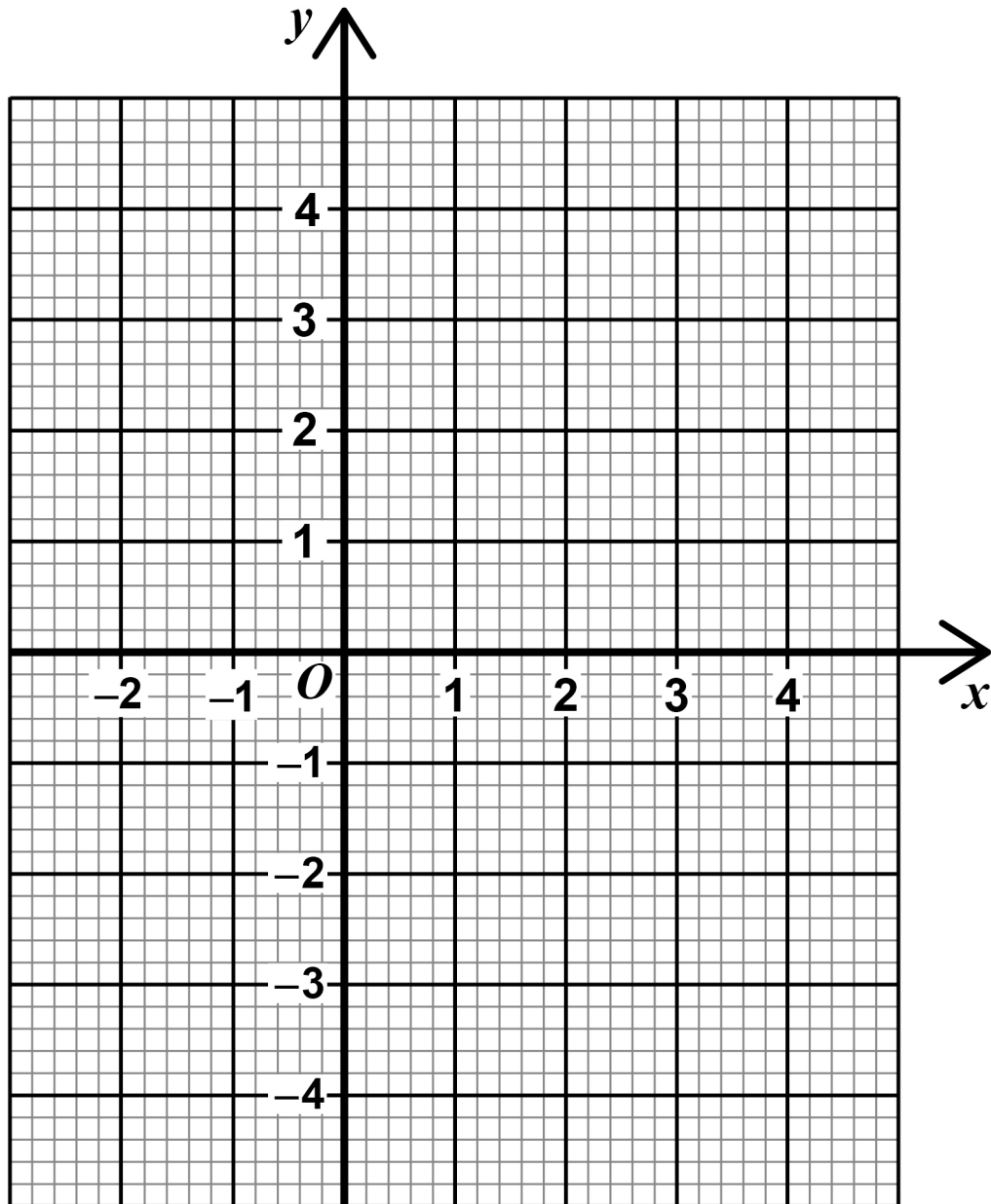
It is not possible to say

[Turn over]



- 7 On the opposite page, draw the graph of $y = 1 - \frac{1}{2}x$ for values of x from -2 to 4
[3 marks]





[Turn over]

 9

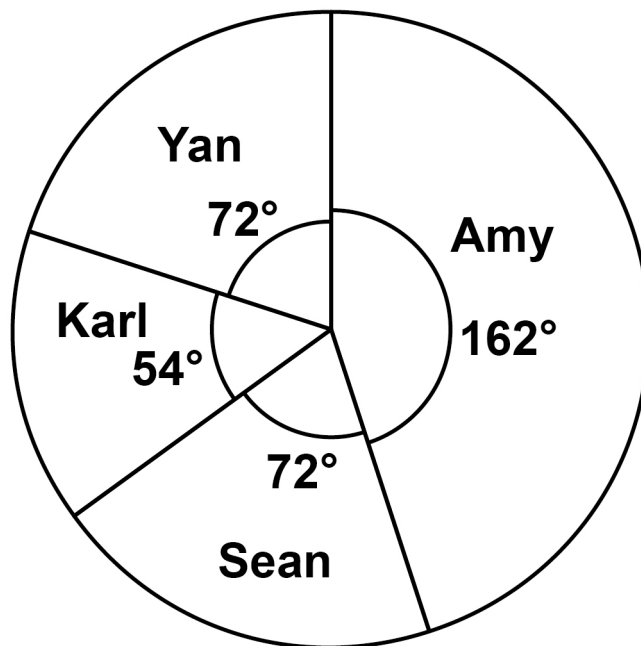


- 8 Four people are taking part in a television talent show.

Here are Amy's marks from the 6 judges.

8 9 9 6 9 10

The pie chart represents the phone vote.



Amy's total score is found by

4 × the MEAN of her marks

+

her PERCENTAGE of the phone vote



Work out Amy's total score. [4 marks]

[illegible]

[Turn over]



Answer _____

—
4



BLANK PAGE

[Turn over]



- 9 Town A has
a population of 84 000
an area of 7 SQUARE MILES.

Town B has a population density of 4695 people
per SQUARE KILOMETRE.

$$\text{Population density} = \frac{\text{population}}{\text{area}}$$

Which town has the greater population density?

Use 1 square mile = 2.6 square kilometres

Tick a box.

☐

Town A

☐

Town B

Show working to support your answer. [3 marks]



[Turn over]



- 10 On a biased dice,
 $P(\text{lands on } 6) = 0.38$
This dice is rolled 150 times.

How many times would you expect the dice NOT
to land on 6 ? [3 marks]

Answer _____

6



- 11 Write a number in each box to make the calculations correct. [2 marks]

$$\boxed{10} \div \boxed{-2} \times \boxed{} = \boxed{5}$$

$$\boxed{\frac{1}{3}} \times \boxed{} \times \boxed{6} = \boxed{8\pi}$$

[Turn over]



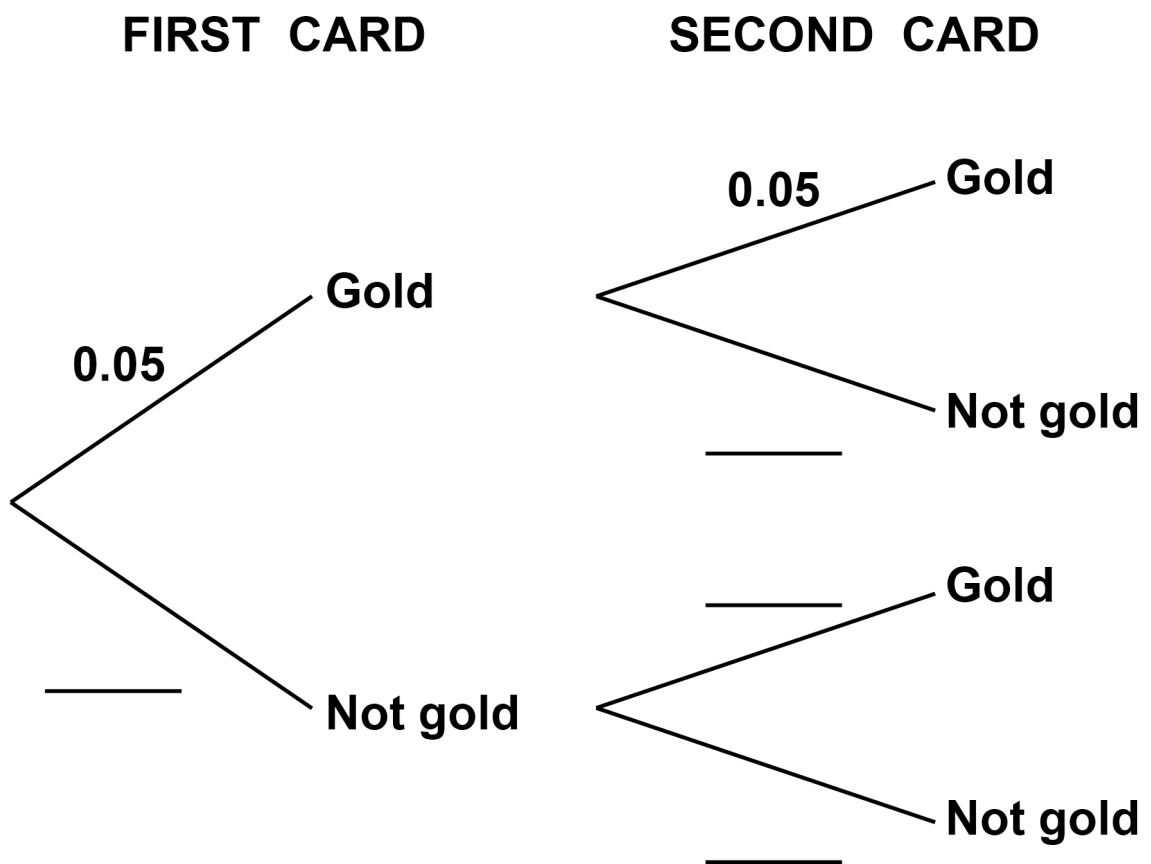
12 Cards are either gold or not gold.

$$P(\text{gold}) = 0.05$$

Harim chooses a card at random and replaces it.

He then chooses a second card.

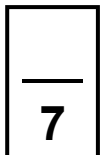
12 (a) Complete the tree diagram. [2 marks]



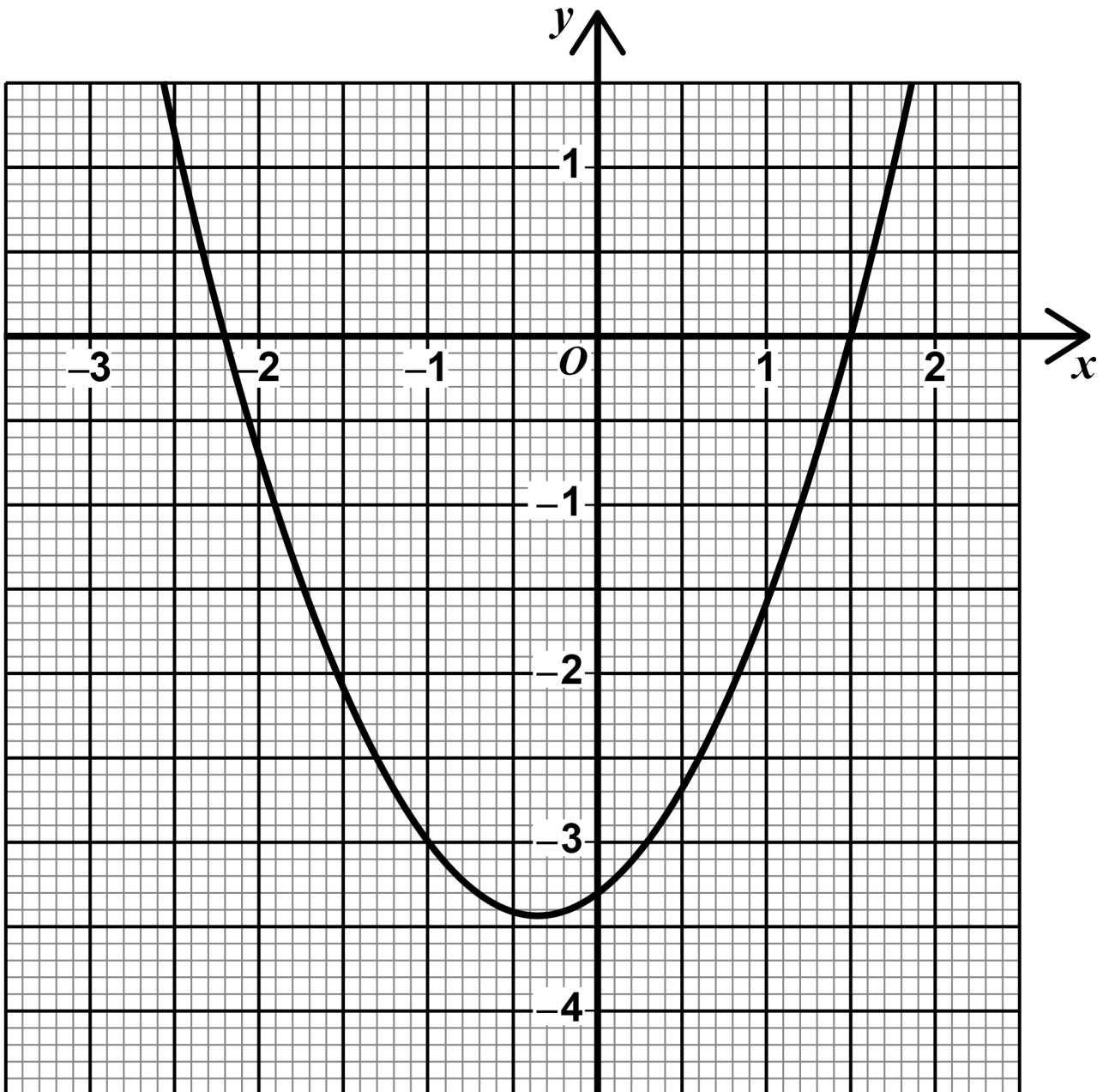
- 12(b) What is the probability that AT LEAST ONE of Harim's cards is gold? [3 marks]

Answer _____

[Turn over]



13 Here is a quadratic graph with equation $y = f(x)$



Write down the roots of the equation $f(x) = 0$
[2 marks]

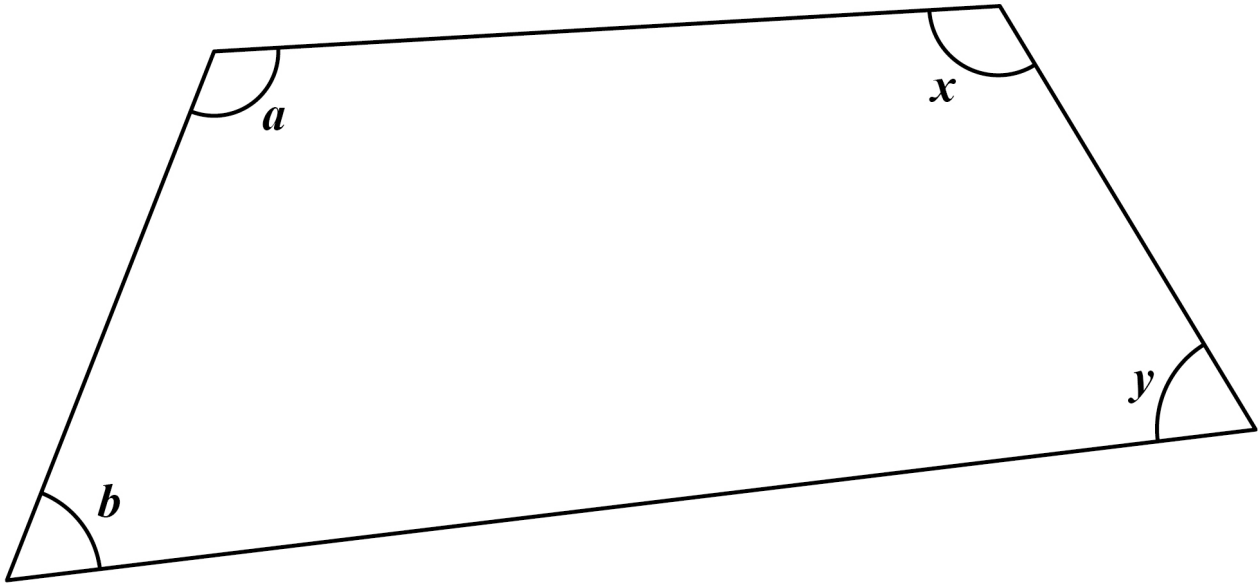
Answer _____

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[Turn over]



- 14 The diagram is not drawn accurately.



$b = 45^\circ$ and $a : b = 7 : 3$ and $x : y = 4 : 1$

Show that $a : y = 5 : 2$ [3 marks]

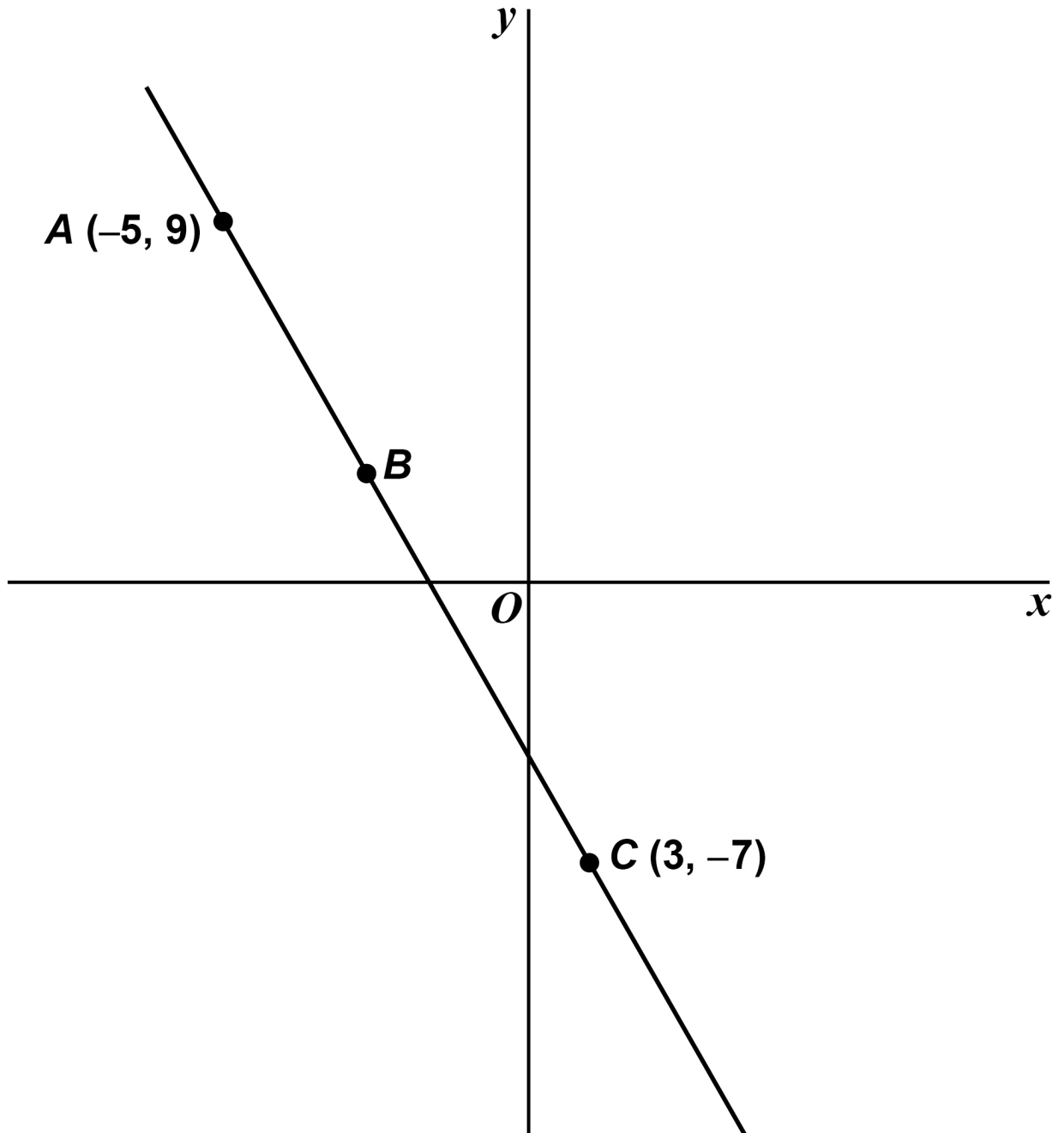
[Turn over]

—
5



- 15 A straight line passes through points $A (-5, 9)$, B and $C (3, -7)$.

The diagram is not drawn accurately.



15 (a) $AB : BC = 1 : 3$

Work out the coordinates of point B . [3 marks]

Answer (_____ , _____)

[Turn over]



15 (b) Work out the equation of the line perpendicular to AC that passes through C . [4 marks]

[illegible]

Answer _____

[Turn over]

7



- 16 Jing rolls a fair six-sided dice 72 times.

	1	2	3	4	5	6
FREQUENCY	16	11	10	8	14	13

Is the relative frequency of rolling a 5 greater than the theoretical probability?

Tick a box.

☐

Yes

☐

No

Give a reason for your answer. [3 marks]



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[Turn over]



17(a) a and b are different prime numbers.

$$a^3 \times b^2 = 200$$

Work out the value of $a^4 \times b$ [3 marks]

[illegible]

Answer _____



17 (b) c and d are different prime numbers.

Circle the equation for which $c^4 \times d^2 \times e$ is a cube number. [1 mark]

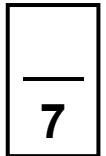
$$e = cd$$

$$e = c^2d$$

$$e = c^2d^2$$

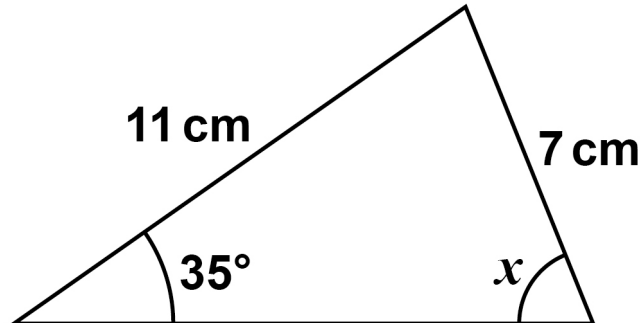
$$e = c^3d^3$$

[Turn over]



18 Here is triangle A.

The diagram is not drawn accurately.



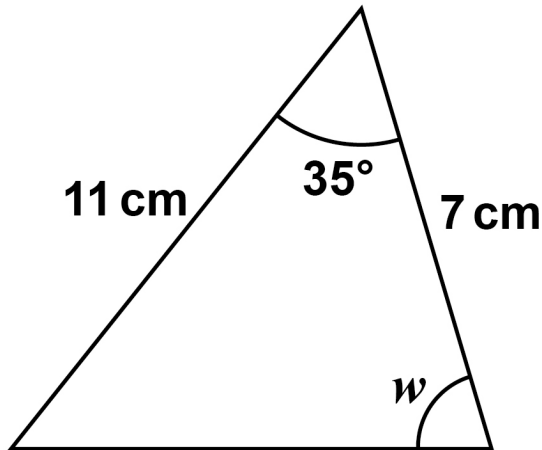
18 (a) Use the sine rule to show that $x = 64^\circ$ to the nearest degree. [3 marks]

[Turn over]



18 (b) Here is triangle B.

The diagram is not drawn accurately.



Anna thinks that w must be 64° to the nearest degree.

She says,

“This is because triangle B has two sides and one angle the same as triangle A.”

WITHOUT FURTHER CALCULATION, is she correct?

Tick a box.

☐

Yes

☐

No

Give a reason for your answer. [1 mark]

[Turn over]

—
4



19 $f(x) = x - 3$ $g(x) = 4x - 7$

19 (a) Work out the value of $fg(6)$ [2 marks]

Answer

19 (b) Solve $(f(x))^2 = g(x)$ [4 marks]



Answer _____

[Turn over]



20 P , Q , and R have positive values.

P is directly proportional to Q

When $P = 8$, $Q = 2$

R is inversely proportional to Q^2

When $R = 10$, $Q = 3$

Work out the value of R when $P = 0.5$ [5 marks]

$$R =$$

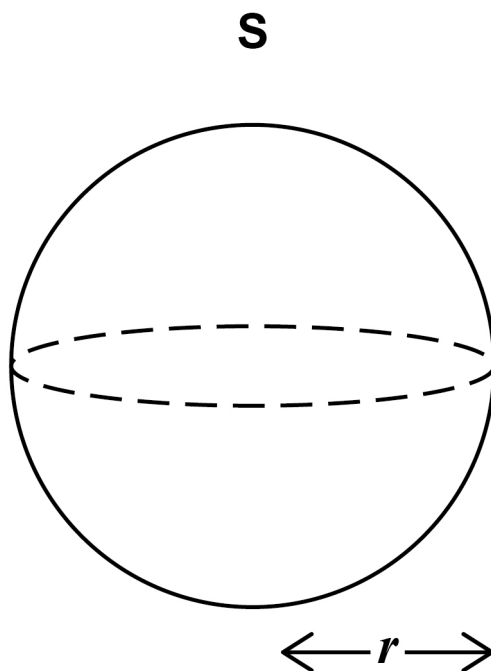
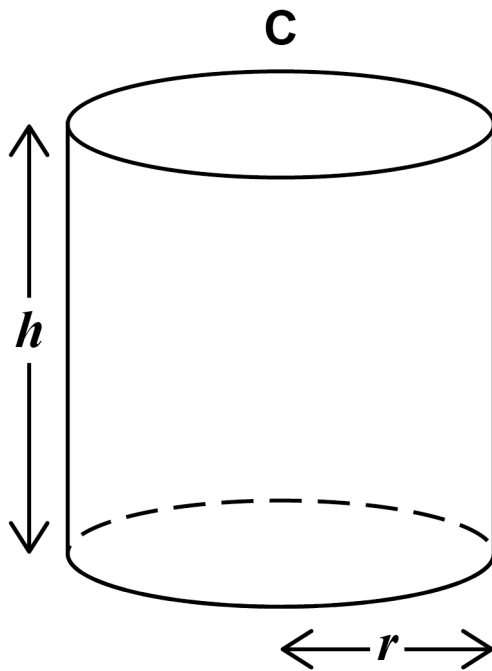
[Turn over]

11



- 21 A cylinder, C, and a sphere, S, each have radius r

C has height h



Volume of a sphere = $\frac{4}{3}\pi r^3$

where r is the radius

21 (a) volume of C = volume of S

Work out the ratio $r : h$

You MUST show your working. [3 marks]

Answer _____ :

[Turn over]



- 21 (b) A DIFFERENT CYLINDER has radius $3r$ and height $2h$.

How many times bigger is the volume of this cylinder than the volume of C? [2 marks]

Answer



22 Fatima is choosing a 4-digit code.

Each digit is a whole number from 0 to 9

She decides

all her digits will be odd numbers

no digits will be repeated.

**How many different codes can she make?
[2 marks]**

Answer _____

[Turn over]

7



23 Quadrilateral $ABCD$ is reflected in edge BC .

How many of the vertices are invariant?

Circle your answer. [1 mark]

1

2

0

4



24 Write $2x^2 - 12x + 7$ in the form $d(x + e)^2 + f$ where d , e and f are integers. [3 marks]

[illegible]

Answer

END OF QUESTIONS

4



Additional page, if required.

Write the question numbers in the left-hand margin.

[illegible]

Additional page, if required.

Write the question numbers in the left-hand margin.

[illegible]

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For Examiner's Use	
Pages	Mark
4–9	
10–13	
14–17	
18–20	
22–24	
25–27	
28–31	
32–35	
36–39	
40–43	
44–47	
48–51	
52–53	
TOTAL	

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