AQA

GCSE
MATHEMATICS

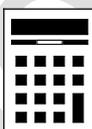**H**

Higher Tier

Paper 3 Calculator

Shadow paper based on June 2022 question paper

Time allowed: 1 hour 30 minutes

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.
- Fill in the boxes at the top of this page.
- 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.
- 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.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
24–25	
26–27	
TOTAL	

8300/3F

Do not write outside the box

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

1 Circle the largest number.

[1 mark]

6.78   6.$\dot{7}$ 6.708   6.77

2 Work out $\begin{pmatrix} 4 \\ -3 \end{pmatrix} - \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

Circle your answer.

[1 mark]

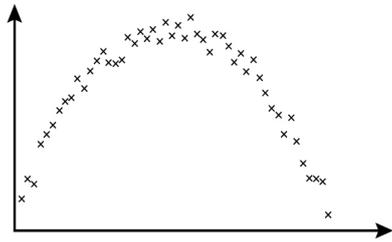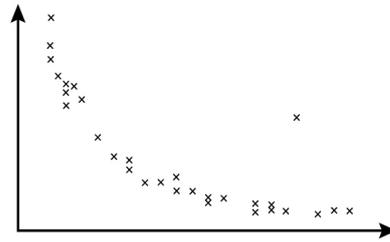$\begin{pmatrix} -2 \\ -5 \end{pmatrix}$ $\begin{pmatrix} 2 \\ -11 \end{pmatrix}$ $\begin{pmatrix} -2 \\ 5 \end{pmatrix}$ $\begin{pmatrix} -2 \\ -11 \end{pmatrix}$
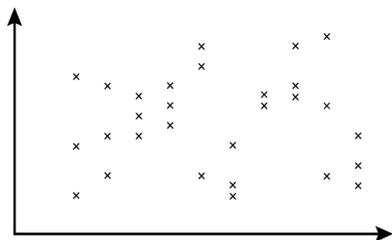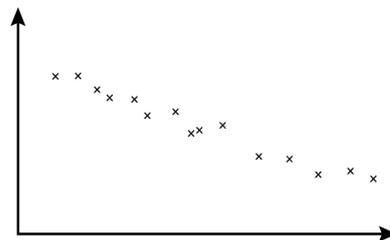
3 Here are four scatter graphs.

Graph A

Graph B

Graph C

Graph D

3 (a) Which graph has **one** outlier?

Circle your answer.

[1 mark]

A B C D

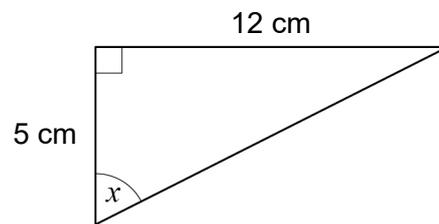**3 (b)** For which graph is a straight line of best fit appropriate?

Circle your answer.

[1 mark]

A B C D

4

Turn over ▶

8300/3H

4   Use trigonometry to work out the size of angle x.

Not drawn accurately

12 cm

5 cm

x

[3 marks]

_____

_____

_____

_____

_____

_____

$x = $ _____ °

Turn over for the next question

5 Lisa works two days part-time in a shop each month.

The table shows the number of hours she works on Monday and Tuesday in May and June.

	Monday	**Tuesday**
May	2	3
June	$4\frac{1}{4}$	$3\frac{3}{4}$

Work out the percentage increase in her **total** hours from May to June.
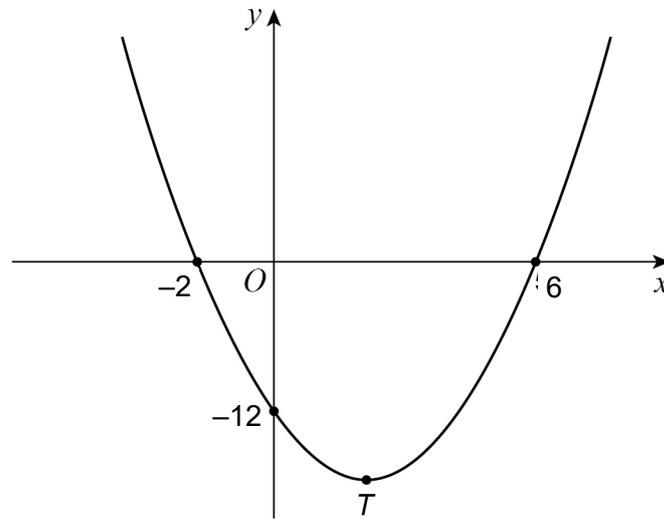
[3 marks]

Answer _____ %

Turn over ▶

8300/3H

6   Here is a sketch of the curve $y = x^2 - 4x - 12$

6 (a)   Write down the **two** roots of $x^2 - 4x - 12 = 0$

[1 mark]

Answer _____ and _____

6 (b)   Work out the coordinates of T, the turning point of the curve.

[2 marks]

_____

_____

_____

Answer (_____ , _____)

7 A is an **arithmetic** progression.

Here are the first four terms.

| 11 | 14 | 17 | 20 |

G is a **geometric** progression.

Here are the first four terms.

| 4 | 8 | 16 | 32 |

$$n\text{th term of A} = 8\text{th term of G}$$

Work out the value of n.

[4 marks]

$n = $ _____

Turn over ▶

7

8300/3H
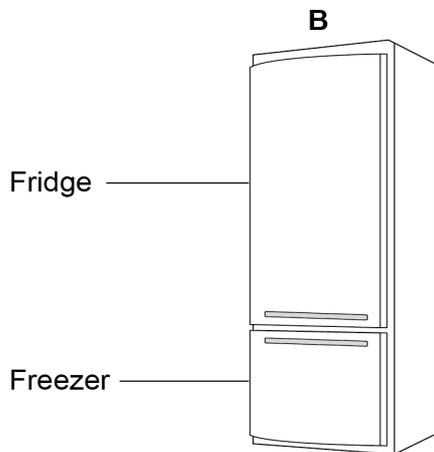
8 Information about two fridge-freezers, A and B, is shown.

A
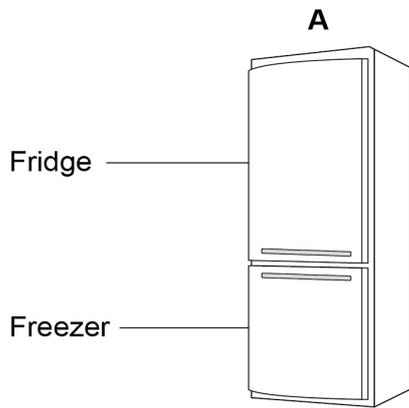
Fridge

Freezer

Total capacity is 380 litres

fridge capacity : freezer capacity = 3 : 2

B

Fridge

Freezer

Freezer capacity is 99 litres

fridge capacity : freezer capacity = 7 : 3

Gillian buys one of these fridge-freezers.

She buys the one with the greater **fridge** capacity.

Which one does she buy?

You **must** show your working.

[4 marks]

Answer _____

Turn over for the next question

4

Turn over ▶

9 Tracey and Anita are the two runners in a 400-metre race.

Tracey completes the race in 52 seconds.

Anita completes the race at an average speed of 28.8 kilometres per hour.

Who wins the race?

You **must** show your working.

[3 marks]

Answer _____

10 The mass of a baby elephant is 120.4 kilograms to 1 decimal place.

What is the error interval for the mass in kilograms?

Tick **one** box.

[1 mark]

☐ $120.3 \leqslant \text{mass} \leqslant 120.5$

☐ $120.35 \leqslant \text{mass} \leqslant 120.45$

☐ $120.3 \leqslant \text{mass} < 120.5$

☐ $120.35 \leqslant \text{mass} < 120.45$

11 A quadrilateral has angles 70°, 90°, 100° and 100°

Circle the possible type of quadrilateral.
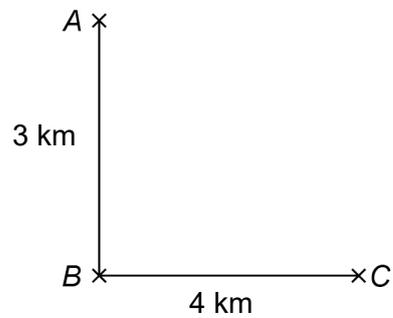
[1 mark]

kite   parallelogram   rhombus   trapezium

Turn over for the next question

5

Turn over ▶

8300/3H

12 (a)　　*B* is

3 km due South of *A*

and

4 km due West of *C*.

A ×

Not drawn
accurately

3 km

B ×————————×C

4 km

Work out the bearing of *A* from *C*.

[2 marks]
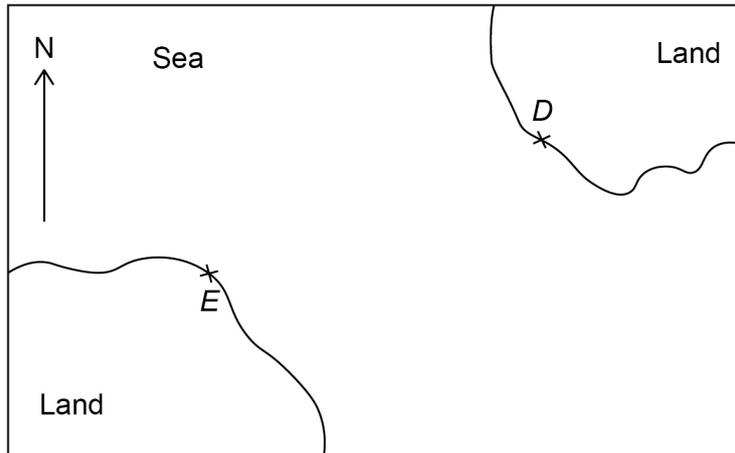
Answer _____ °

12 (b) Here is a scale drawing.

A ship is going to sail from *E* to *D*.

Molly works out that the ship needs to sail on a bearing of 248°

Why must Molly be wrong?

[1 mark]

_____

_____

_____

13 Simplify $\sqrt{7a} + \sqrt{7a}$

Circle your answer.

[1 mark]

$7a$ $\qquad\qquad$ $49a^2$ $\qquad\qquad$ $2\sqrt{7}\,a$ $\qquad\qquad$ $2\sqrt{7a}$
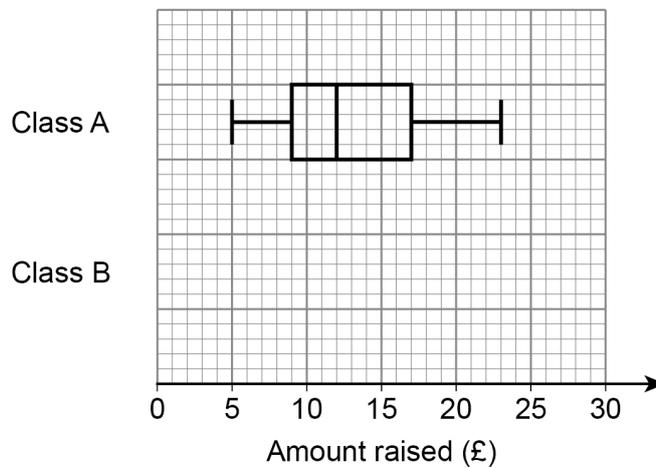
4

Turn over ►

14 People in two villages, A and B, raised money for charity.

The box plot for class A is shown on the grid.

Class A

Class B

0   5   10   15   20   25   30

Amount raised (£)

For class B,

- the lowest amount was £5 and the highest amount was £29
- the lower quartile was £8
- the median was £4 greater than the class A median
- the interquartile range was double the class A interquartile range.

Draw the box plot for village B on the grid.

[4 marks]

15   A town has

a population density of 294 people per km^2

and

a population of 141 120

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

The population increases to 151 680

Work out the population density after the increase.

[3 marks]

_____

_____

_____

_____

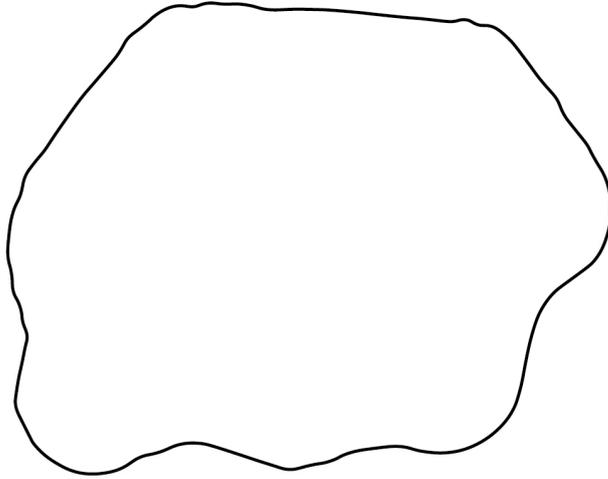_____

_____

_____

_____

Answer _____ people per km^2
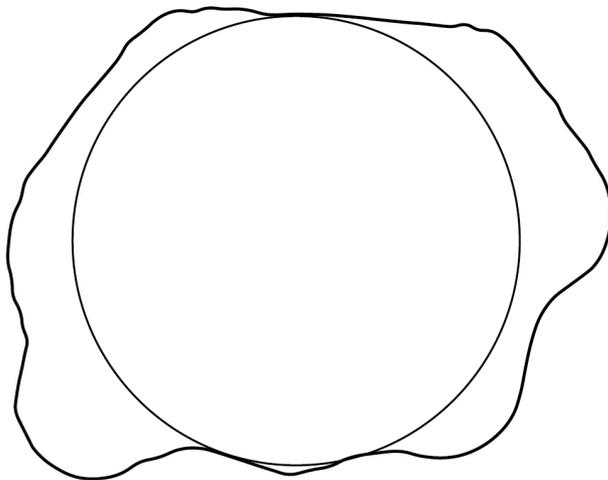
Turn over ▶

8300/3H

16   Here is a scale drawing of a reservoir.

     Scale: 1 cm represents 600 m

     Vanessa wants to estimate the volume of water in the reservoir.

     She draws on the scale drawing a circle with radius 3 cm

16 (a) Vanessa estimates the volume of the reservoir by assuming that

- the reservoir is a cylinder whose cross section is the circle
- the depth of the reservoir is 19 metres.

Work out Vanessa's estimate in cubic metres.

[3 marks]

Answer _____ m³

16 (b) In fact,

- the depth of the reservoir is 15 metres
- the reservoir is **not** a cylinder (see diagram).

Which statement about the actual volume of the reservoir is correct?

Tick **one** box.

☐ It is less than Vanessa's estimate

☐ It is greater than Vanessa's estimate

☐ It could be less than or greater than Vanessa's estimate

Give a reason for your answer.

[2 marks]

Turn over ▶

17 In a restaurant, diners can choose their meal combinations.

They choose one of each from

5 starters

10 main dishes

8 desserts

17 (a) How many different meal combinations can be made?

[2 marks]

Answer _____

17 (b) Two meal combinations are chosen at random.
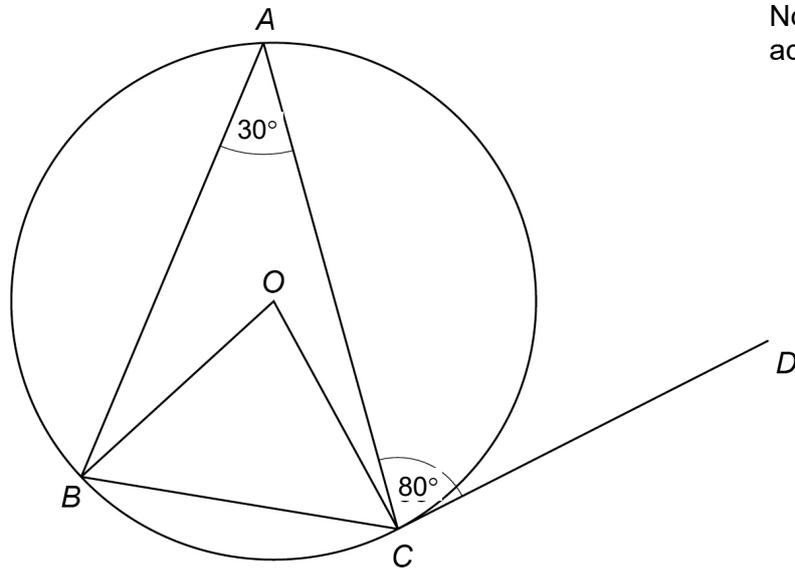
What is the probability that they are exactly the same?

[1 mark]

Answer _____

18   *A*, *B* and *C* are points on a circle, centre *O*.

DC is a tangent to the circle.

Not drawn accurately

Show that   angle *ACO* : angle *ABO* = 1 : 2

[5 marks]

8

Turn over ▶

8300/3H

19 Here is the plan of the floor of an L-shaped room.

All lengths are in metres.

$x - 6$

4

6

Not drawn accurately

$x + 2$

$x - 2$

x
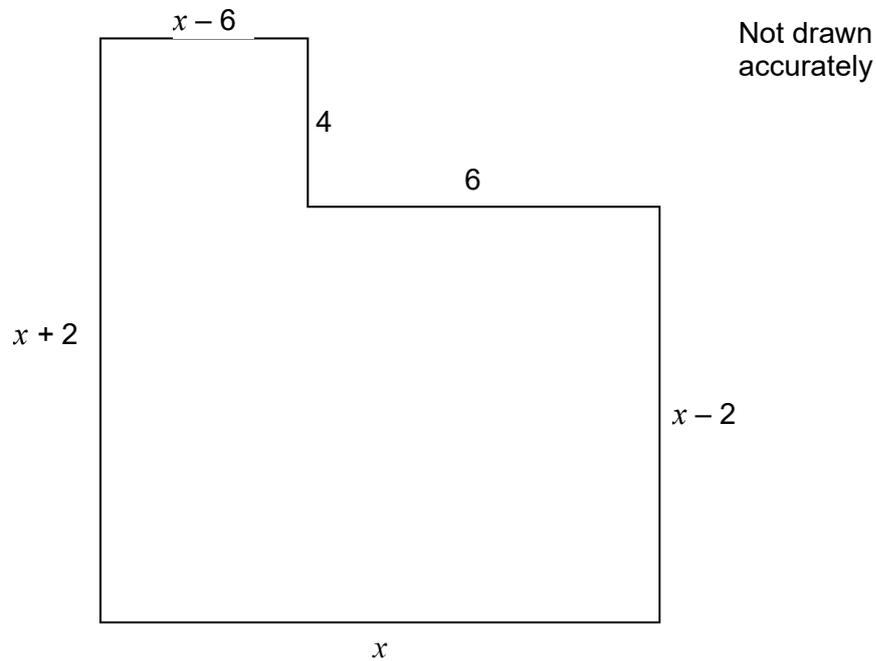
19 (a) The area of the floor is $119\,\text{m}^2$

Show that $x^2 + 2x - 143 = 0$

[3 marks]

19 (b) By factorising $x^2 + 2x - 143$ work out the value of x.

You **must** show your working

[2 marks]

_____

_____

_____

$x =$ _____

20 £2448 is invested in an account at a rate of compound interest.

One year after the investment there is £2509.20 in the account.

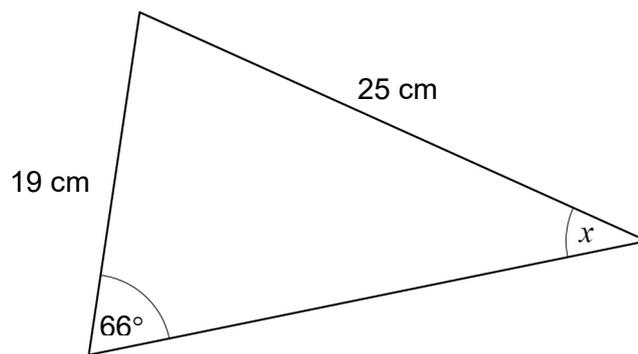How much is in the account five years after the investment?

[3 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

Answer £ _____

8

Turn over ▶

21

25 cm

19 cm

66°

x

Not drawn accurately

Use the sine rule to work out the size of angle x.

[3 marks]

$x =$ _____ °

22 $f(x) = 3x$ and $g(x) = x^2$

Circle the expression for $gf(x)$

[1 mark]

$3x^2$ $9x^2$ $3x^3$ $9x^4$

23 Here are two simultaneous equations.

$$y = x^2 + 5x + a$$

and

$$y = 4x - b$$

There is a solution when $x = 6$

Work out the value of $a + b$
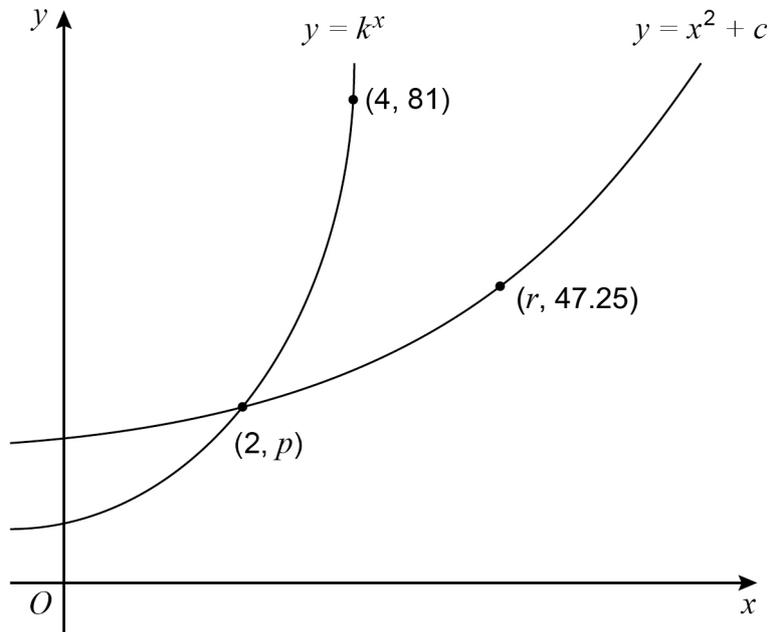
[3 marks]

Answer _____

Turn over for the next question

7

Turn over ▶

8300/3H

24 Here is a sketch of the graphs of $y = k^x$ and $y = x^2 + c$

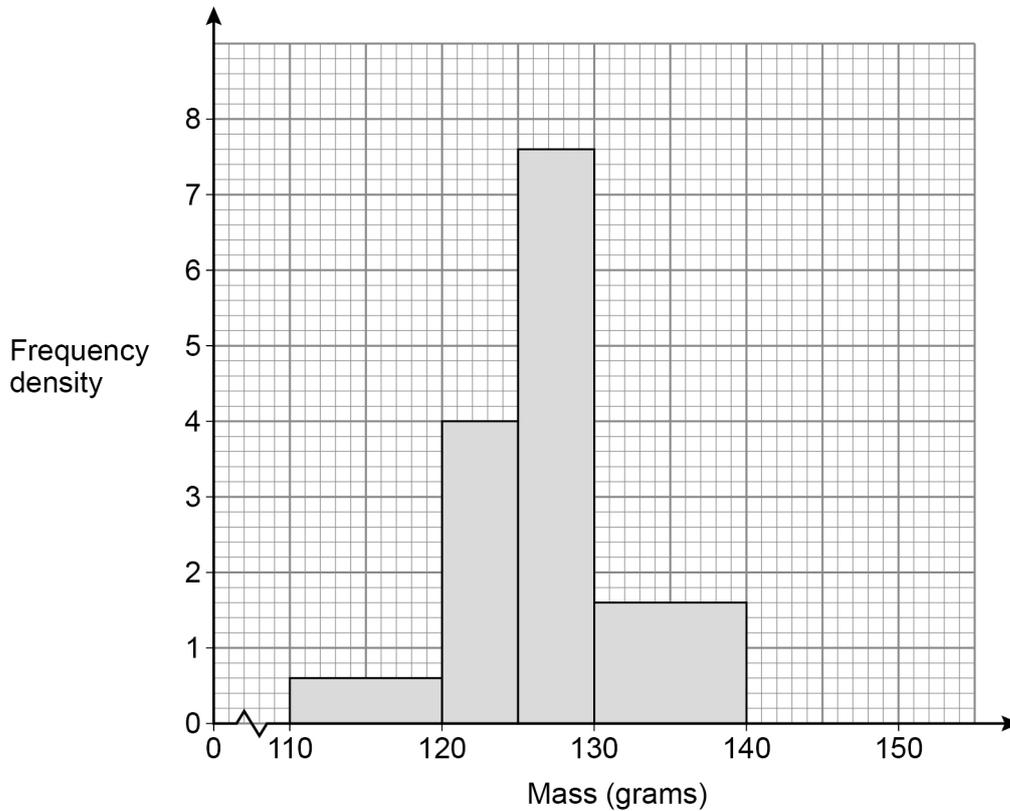k and c are positive constants.

Work out the value of r.

[4 marks]

r = _____

25 A company makes light bulbs.

The masses of 80 light bulbs are checked.

A histogram is drawn to represent the data.

The company makes 42 000 light bulbs each day.

Estimate how many light bulbs made each day have a mass **greater than** 124 grams.

[4 marks]

Answer _____

8

Turn over ▶

26 Q and R are two numbers.

As a product of prime factors,

$$Q = 3^3 \times 5 \times a^3$$
$$R = 3^4 \times 5^2 \times a^2$$

26 (a) The highest common factor (HCF) of Q and R is 6615

Work out the value of a.

[2 marks]

$a =$ _____

26 (b) Work out the lowest common multiple (LCM) of Q and R.

[2 marks]

Answer _____

27 Expand and simplify fully $(x - 5)(x + 4)(x - 7)$

[3 marks]

Answer _____

END OF QUESTIONS

Shadow paper based on June 2022 question paper

8300/3H

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ANSWER IN THE SPACES PROVIDED

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8300/3H