LRN International GCSE: Mathematics (7131)

Learning Resource Network

Candidate Name	
Candidate Number	
Centre Name	
Centre Number	

Paper 2:   For Examination June 2023

(2 hour 30 minutes)

It is necessary to respond on this question paper. You must have a soft pencil (preferably of type B or HB),a clean eraser and a dark blue or black pen.

INSTRUCTIONS:

- You must write your name, candidate number, centre name and centre number in the designated spaces.
- Attempt all the questions using a dark blue or black pen.
- You may use a soft pencil for graphs.
- If working is needed for any question it must be shown below that question.
- Do not use correction fluid.
- Avoid writing on any bar codes.
- You are allowed to use a calculator if needed.

INFORMATION:

- This paper has a total of 100 marks.
- The number of marks assigned for every question or its parts is indicated within brackets [ ].
- Rough work must be completed on this question paper.

1. Work out the value of $\left(\frac{323.7}{8.9}\right)^3$, giving your answer correct to 3 significant figures

_____

(3 marks)

2. (a) Solve $5k + 7 \leq 30$

_____

(2 marks)

(b) p is an integer and $5p + 7 \leq 30$

Write down the largest possible value of p.

_____

(1 mark)

3. A farmer found the weight of 100 chickens.

The table gives information about the weights.

Weight (w kg)	Frequency
$0.5 < w \leq 1.5$	6
$1.5 < w \leq 2.5$	19
$2.5 < w \leq 3.5$	39
$3.5 < w \leq 4.5$	16
$4.5 < w \leq 5.5$	13
$5.5 < w \leq 6.5$	7

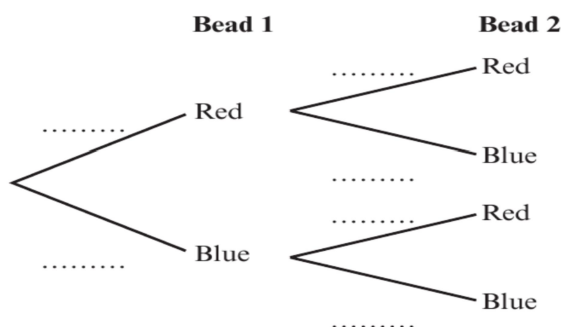(a) Find the class interval that contains the median weight.

_____

(1 mark)

(b) Work out an estimate for the mean weight of the chickens. Give your answer correct to one decimal place.

_____

(3 marks)

4. A bag contains 7 red beads and 3 blue beads. A bead is chosen at random from the bag, the colour is recorded, and the bead is **not** replaced. A second bead is chosen, and the colour recorded.

Bead 1   **Bead 2**

```
                         ......... — Red
              , Red  <
    .........              ` Blue
   <               .........
    .........              ......... — Red
              ` Blue <
     .........              ` Blue
                         .........
```

(a) Complete this tree diagram to show the outcomes of the experiment.

(3 marks)

(b) Find the probability that both beads are blue.

_____

(2 marks)

(c) Find the probability that both beads are of a different colour.

_____

(2 marks)

5. (a) Solve $5x - 17 = 14 - 3x$

_____

(2 marks)

(b) Expand and simplify $4(2x - 5y) - 2(3x + 5y)$

_____

(3 marks)

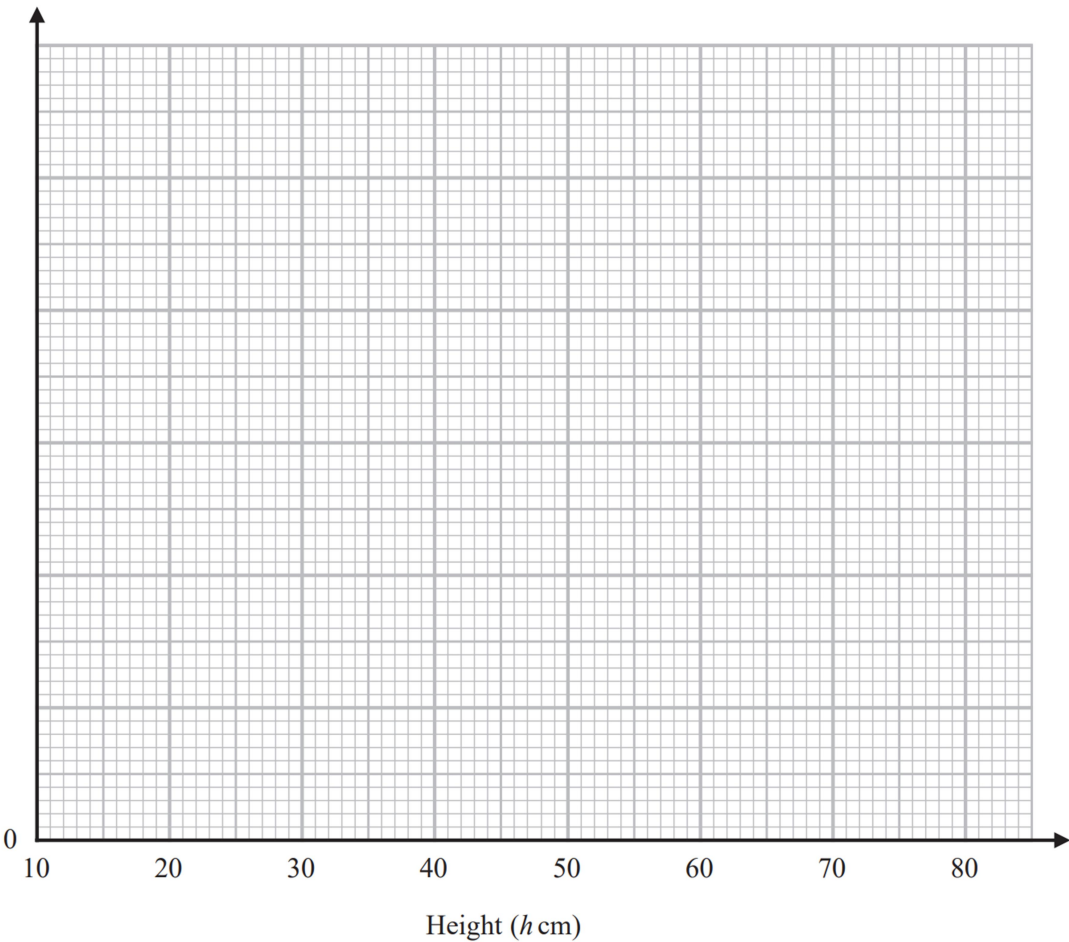**6.** The table gives information about the heights, in centimetres, of 200 dolls.

Height (h cm)	Frequency
$10 < h \leq 20$	30
$20 < h \leq 35$	50
$35 < h \leq 50$	70
$50 < h \leq 70$	45
$70 < h \leq 80$	5

(a) Complete the cumulative frequency table.   (1 mark)

Height (h cm)	Cumulative Frequency
$10 < h \leq 20$	30
$10 < h \leq 35$	80
$10 < h \leq 50$	
$10 < h \leq 70$	
$10 < h \leq 80$	

(b) On the grid, draw a cumulative frequency graph for your table.

Height (h cm)

(2 marks)

(c) Use your graph to find an estimate for the median height of the dolls.

_____ cm

(2 marks)

7. (a) Solve $\dfrac{4x+3}{2x-1} = \dfrac{6x}{3x-1}$

_____

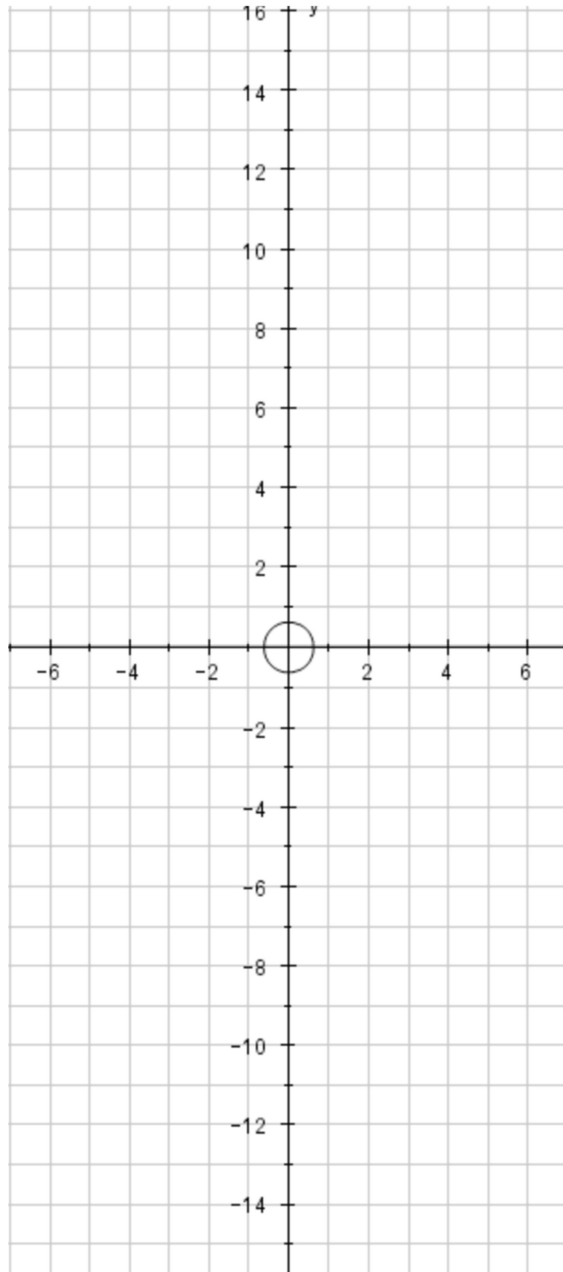(5 marks)

(b) Solve $\dfrac{4x-3}{2} + \dfrac{2x-3}{3} = 5$

_____

(3 marks)

8. A polygon has an interior angle that is eight times the size of the exterior angle. How many sides does this polygon have? (4 marks)

9.

x	-5	-4	-3	-2	-1	0	1	2	3	4	5
y			7		15			12			

(a) Complete the table of values for $y = 16 - x^2$ (2 marks)

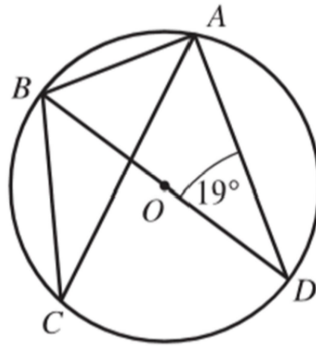(b) On the grid, draw the graph of $y = 16 - x^2$ for all values of x from -5 to 5.

(2 marks)

(c) Use your graph to find solutions to the equation $16 - x^2 = 12$.

_____

(2 marks)

10. O is the centre of a circle. A, B, C and D are points on the circumference of the circle. Angle $ABD = 19°$.

(a) (i) Write down the size of Angle ACB.

_____

(1 mark)

(ii) Give a reason for your answer.

_____

_____

(1 mark)

(b) (i) Write down the size of Angle BAD.

_____

(1 mark)

(ii) Give a reason for your answer.

_____

_____

(1 mark)

(c) Work out the size of Angle ABD.

_____

(1 mark)

11. Vashti recorded the distance, in kilometres, that she ran each day for 13 days. Here are her results:

$$2 , 9, 11, 12, 13, 5, 5, 6, 16, 5, 14, 15, 13$$

Find the interquartile range of her results.

_____

(5 marks)

12. Expand and simplify $(x + 2)(x + 3)(x + 4)$

_____

(4 marks)

13. The table below gives the average price of a semi-detached house in Scotland in 2021 and 2022.

Year	2020	2021	2022
Average price of a semi-detached house (£)		190 009	208 623

(a) Work out the percentage increase in average price of a semi-detached house from 2021 to 2022. Give your answer to 1 decimal place.
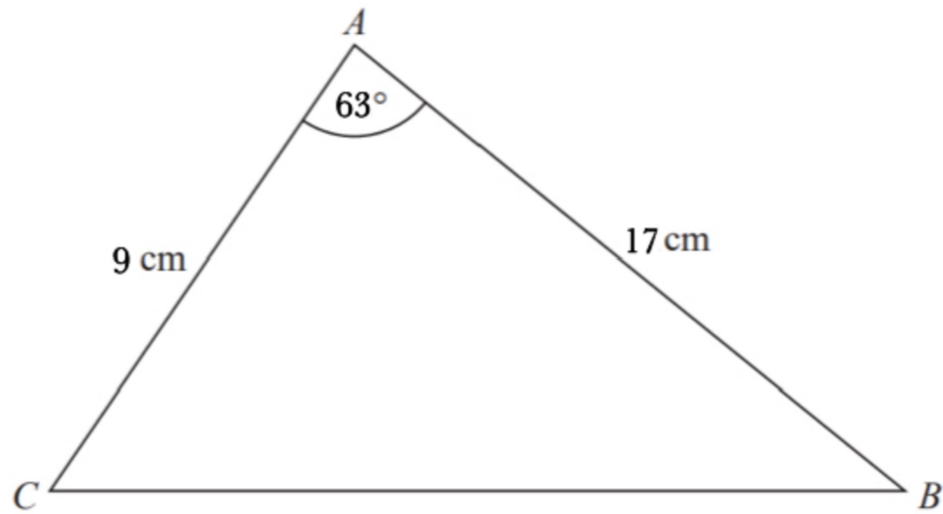
_____

(2 marks)

(b) The average price of a semi-detached house in 2021 was 12.08% greater than the price in 2020. Work out the price of a semi-detached house in 2017. Give your answer to 3 significant figures.

_____

(2 marks)

14. Here is triangle ABC.

(a) Find the length of BC.

Give your answer correct to 3 significant figures.

_____

(3 marks)

(b) Find the area of triangle ABC. Give your answer correct to 3 significant figures.

_____

(3 marks)

15. Solve the simultaneous equations, giving your answers to two decimal places:

$$x^2 + y^2 = 25$$
$$x - 2y = 4$$

(6 marks)

16. A piece of string is cut into two parts. The first part is bent into the shape of a square. The second part is bent into the shape of a rectangle with one side 5 cm long and the other side twice the length of the square's side. Let x represent the side of the square.

(a) Write down an expression for the area of the square.

_____

(1 mark)

(b) Write down an expression for the area of the rectangle.

_____

(1 mark)

(c) Given that the sum of the areas of the square and the rectangle is $25\ cm^2$, find the value of x to 2 decimal places.

_____

(4 marks)

(d) Hence find the original length of the string.

_____

(3 marks)

17.

$$f(x) = \frac{2x + 3}{8} \quad ; \quad x \in R.$$

$$g(x) = x - 7 \quad ; \quad x \in R.$$

(a) Find $fg(x)$

_____

(3 marks)

(b) Find $f^{-1}(x)$

_____

(3 marks)

(c) Solve the equation $fg(x) = f^{-1}(x)$

_____

(3 marks)

18. Show that

$$\frac{\sqrt{96} - \sqrt{2}\sqrt{3}}{\sqrt{6}}$$

simplifies to an integer.   (3 marks)

19. The 7th term in an arithmetic series is 33.

The 12th term of the same arithmetic series is 58.

Find the sum of the first 20 terms of the sequence.

_____

(5 marks)

20.

The straight line L passes through the points $(7, 17)$ and $(9, 21)$.

Find the equation of the line that is parallel to L and passes through the point $(-2, 5)$. Give you answer in the form $ax + by + c = 0$, where a, b and c are integers.
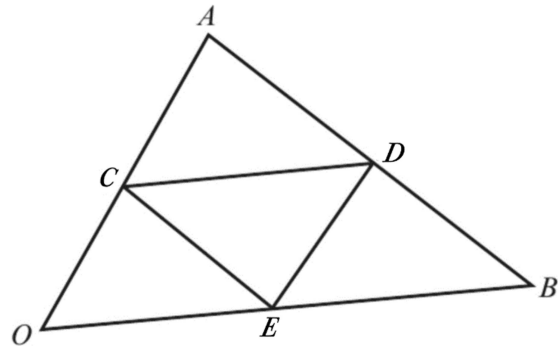
(6 marks)

21.

OAB is a triangle.

C, D and E are the midpoints of OA, AB and OB respectively.

OC and OE are equal to $\boldsymbol{a}$ and $\boldsymbol{b}$ respectively.

(a) Find $\overrightarrow{CE}$

_____

(1 mark)

(b) Show that $\overrightarrow{AB}$ and $\overrightarrow{CE}$ are parallel.

_____

(3 marks)
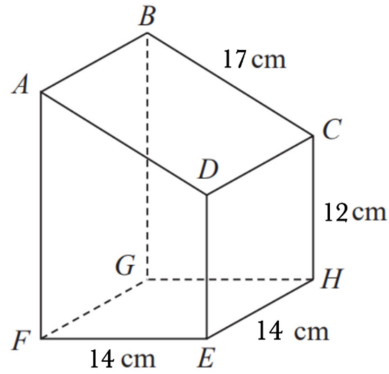
22.

Simplify fully $\frac{2x^2-5x-12}{3x^2-12x}$ (5 marks)

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23. The diagram shows a prism ABCDEFGH with a horizontal square base, EFGH, of side $14\,cm$.

Trapezium $ADEF$ is a cross section of the prism where DE and AF are vertical edges

$DE = CH = 12\,cm$

$AD = BC = 17\,cm$

Work out the length of FH, giving your answer in the form $k\sqrt{2}\,cm$.

_____

(2 marks)

Find the size of the angle between CF and the base EFGH. Give your answer correct to 1 decimal place.

_____

(3 marks)

Trapezium $ADEF$ has an area of $235.5\ cm^2$.

Work out the length of AF. Give your answer correct to one decimal place.

_____

(3 marks)