Name ANSWERS	Class

MATHS TEACHER HUB

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Cumulative frequency

(9 – 1) Topic booklet

Higher

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**
- If the question is a **1H** question you are not allowed to use a calculator.
- If the question is a **2H** or a **3H** question, you may use a calculator to help you answer.

Information

- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

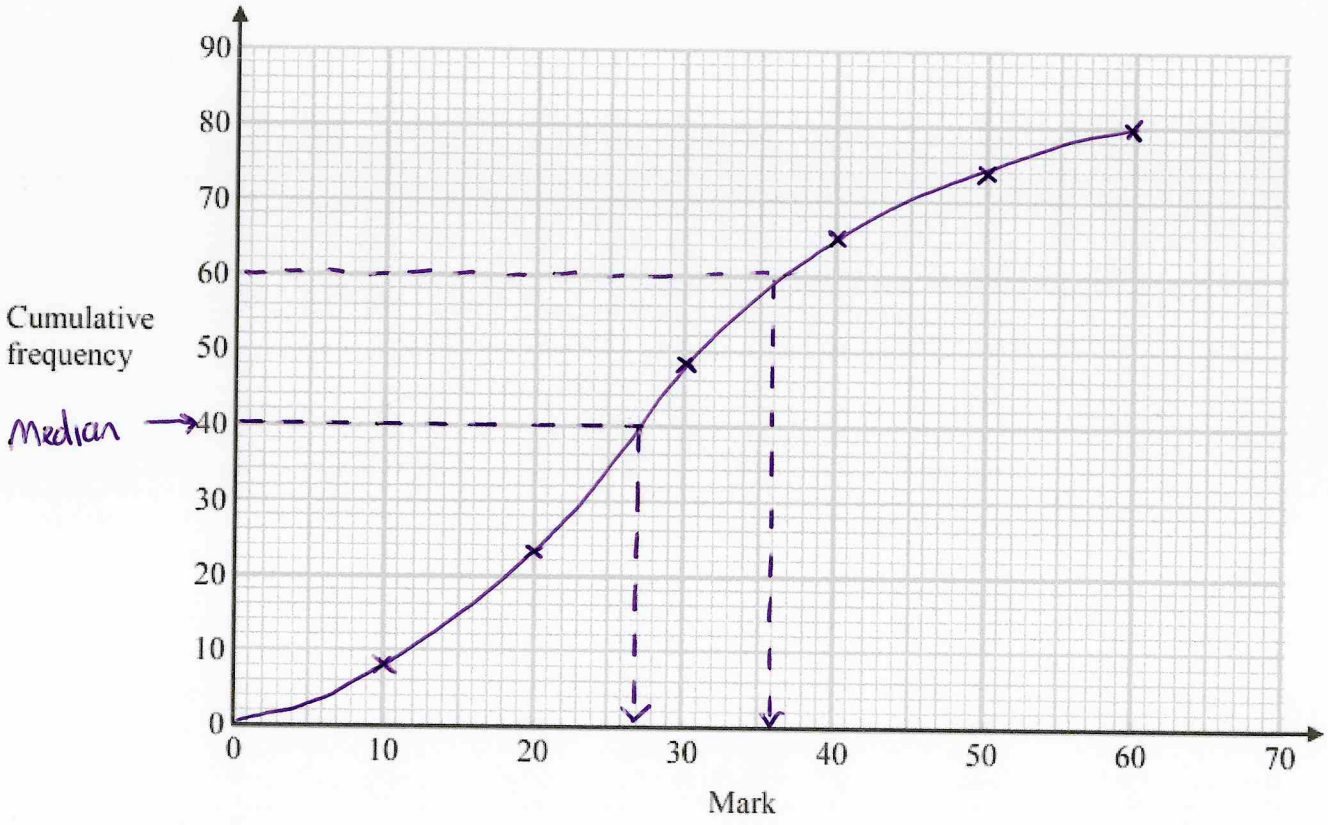
- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions
Write your answers in the space provided.
You must write down all the stages in your working.

7 The cumulative frequency table shows the marks some students got in a test.

Mark (m)	Cumulative frequency
$0 < m \leqslant 10$	8
$0 < m \leqslant 20$	23
$0 < m \leqslant 30$	48
$0 < m \leqslant 40$	65
$0 < m \leqslant 50$	74
$0 < m \leqslant 60$	80

(a) On the grid, plot a cumulative frequency graph for this information.



(2)

(b) Find the median mark.

27

(1)

Students either pass the test or fail the test.
The pass mark is set so that 3 times as many students fail the test as pass the test.

(c) Find an estimate for the lowest possible pass mark.

Pass Fail

x $3x$ $= 80$

↓ ↓

20 60

$4x = 80$

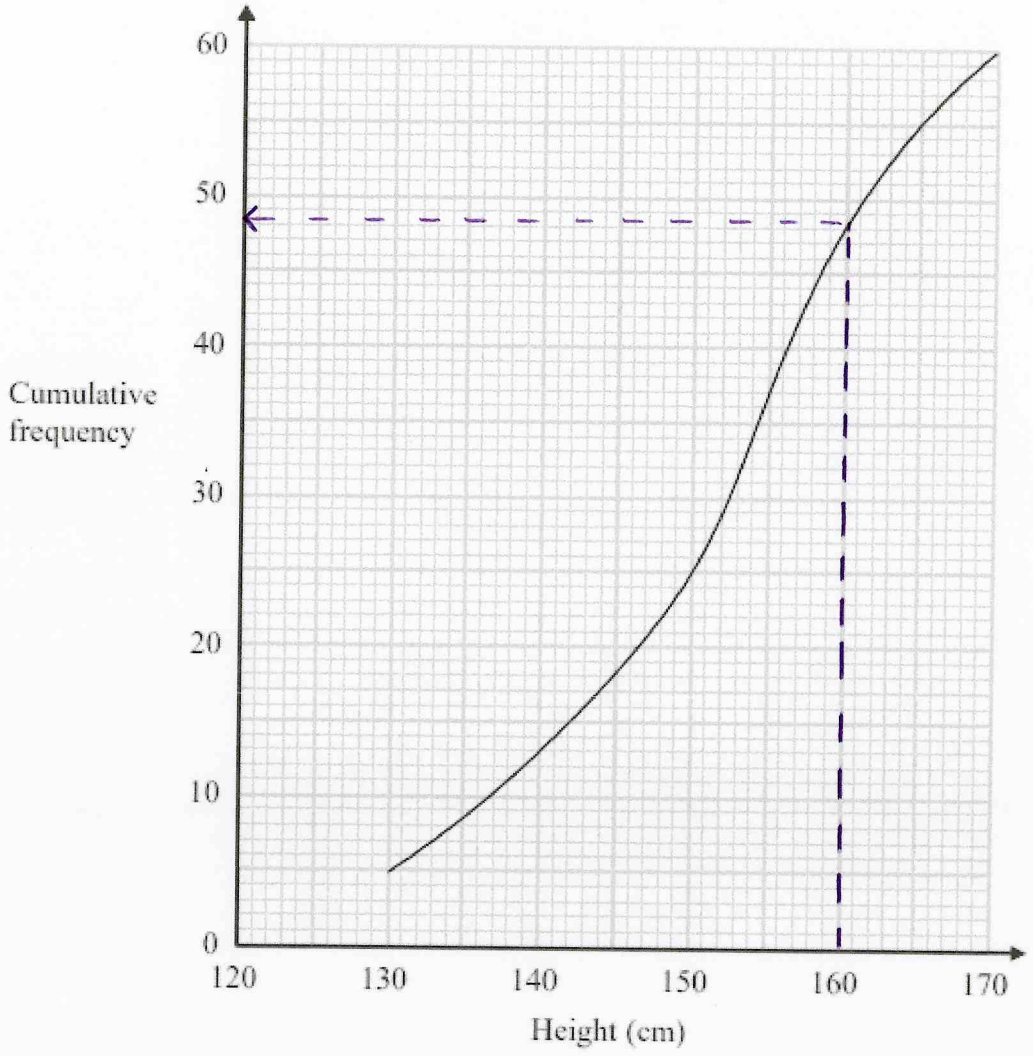
$x = 20$

36

(3)

(Total for Question 7 is 6 marks)

8 The cumulative frequency graph shows some information about the heights, in cm, of 60 students.



Work out an estimate for the number of these students with a height greater than 160 cm.

60 - 48 = 12

12

(Total for Question 8 is 2 marks)

8 The grouped frequency table gives information about the time, in minutes, taken by 50 people to solve a puzzle.

Time (t minutes)	Frequency
$0 < t \leqslant 10$	5
$10 < t \leqslant 20$	8
$20 < t \leqslant 30$	12
$30 < t \leqslant 40$	15
$40 < t \leqslant 50$	7
$50 < t \leqslant 60$	3

Brian was asked to draw a cumulative frequency table for this information.

This is the table that Brian drew.

Time (t minutes)	Cumulative frequency
$0 < t \leqslant 10$	5
$10 < t \leqslant 20$	13
$20 < t \leqslant 30$	25
$30 < t \leqslant 40$	40
$40 < t \leqslant 50$	47
$50 < t \leqslant 60$	50

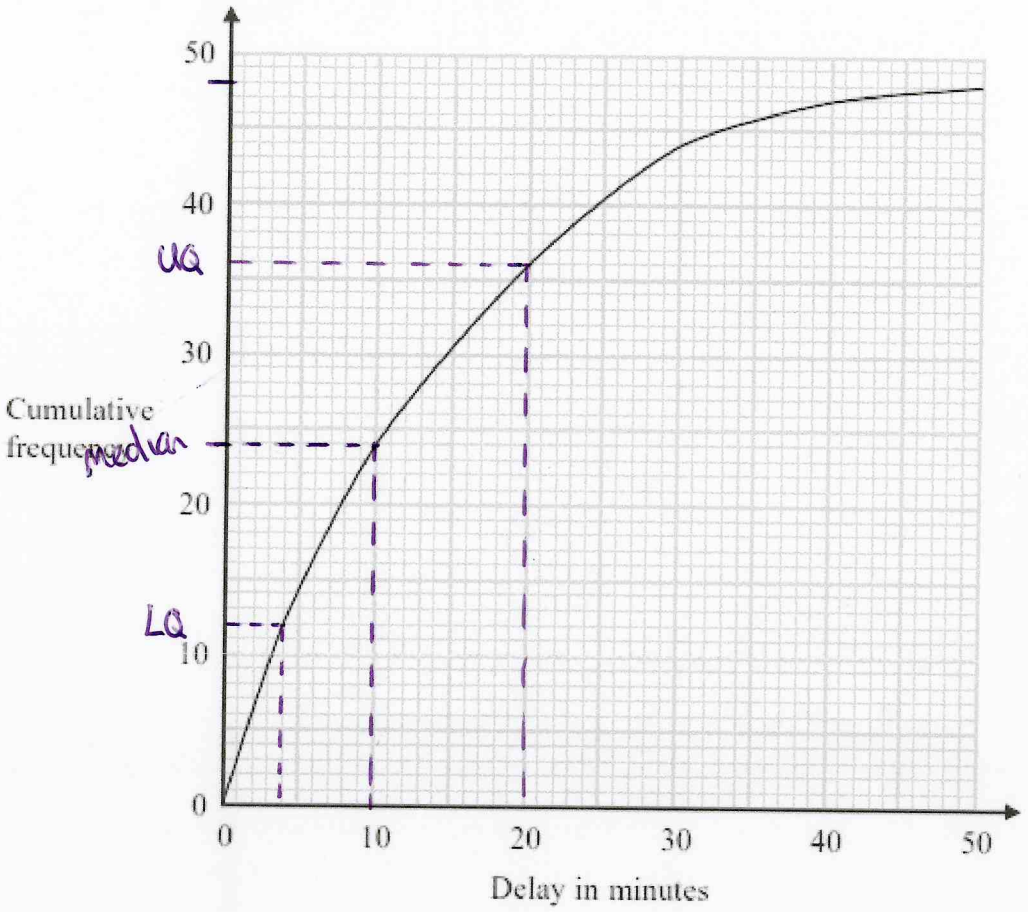
Write down **one** thing that is wrong with this cumulative frequency table.

When working with cumulative frequency, the intervals should all start with 0,
eg $0<t\leq10$, $0<t\leq20$, $0<t\leq30$, $0<t\leq40$....

(Total for Question 8 is 1 mark)

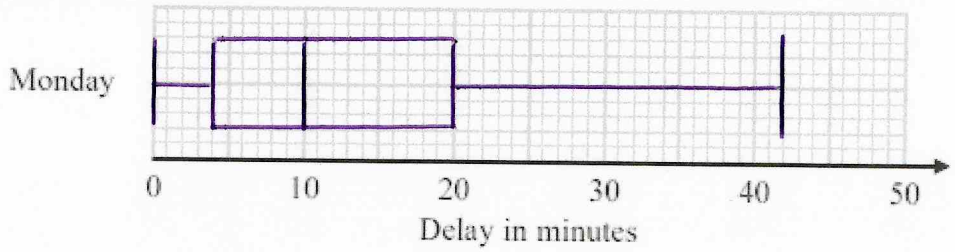
9 The times that 48 trains left a station on Monday were recorded.

The cumulative frequency graph gives information about the numbers of minutes the trains were delayed, correct to the nearest minute.



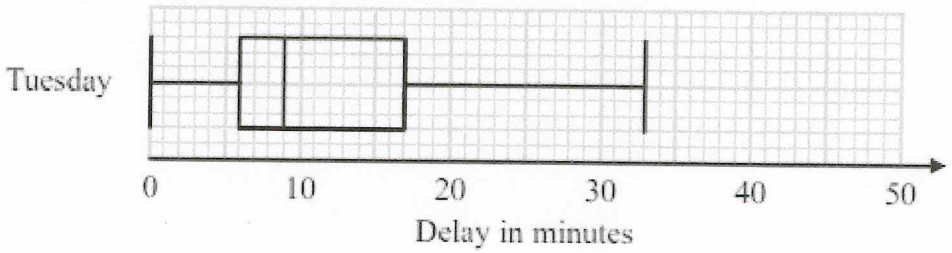
The shortest delay was 0 minutes.
The longest delay was 42 minutes.

(a) On the grid below, draw a box plot for the information about the delays on Monday.



(3)

48 trains left the station on Tuesday.
The box plot below gives information about the delays on Tuesday.



(b) Compare the distribution of the delays on Monday with the distribution of the delays on Tuesday.

Monday had a greater median delay.
Tuesday had a smaller range, which means they were less spread out.

(2)

Mary says,

"The longest delay on Tuesday was 33 minutes.
This means that there must be some delays of between 25 minutes and 30 minutes."

(c) Is Mary right?
You must give a reason for your answer.

Mary might be wrong, the rest of the trains in the upper quarter might have all been between 20-25minutes.

(1)

(Total for Question 9 is 6 marks)

9 The cumulative frequency table gives information about the ages of 80 people working for a company.

Age (a years)	Cumulative frequency
$20 < a \leqslant 30$	20
$20 < a \leqslant 40$	48
$20 < a \leqslant 50$	64
$20 < a \leqslant 60$	75
$20 < a \leqslant 70$	80

(a) On the grid opposite, draw a cumulative frequency graph for this information.

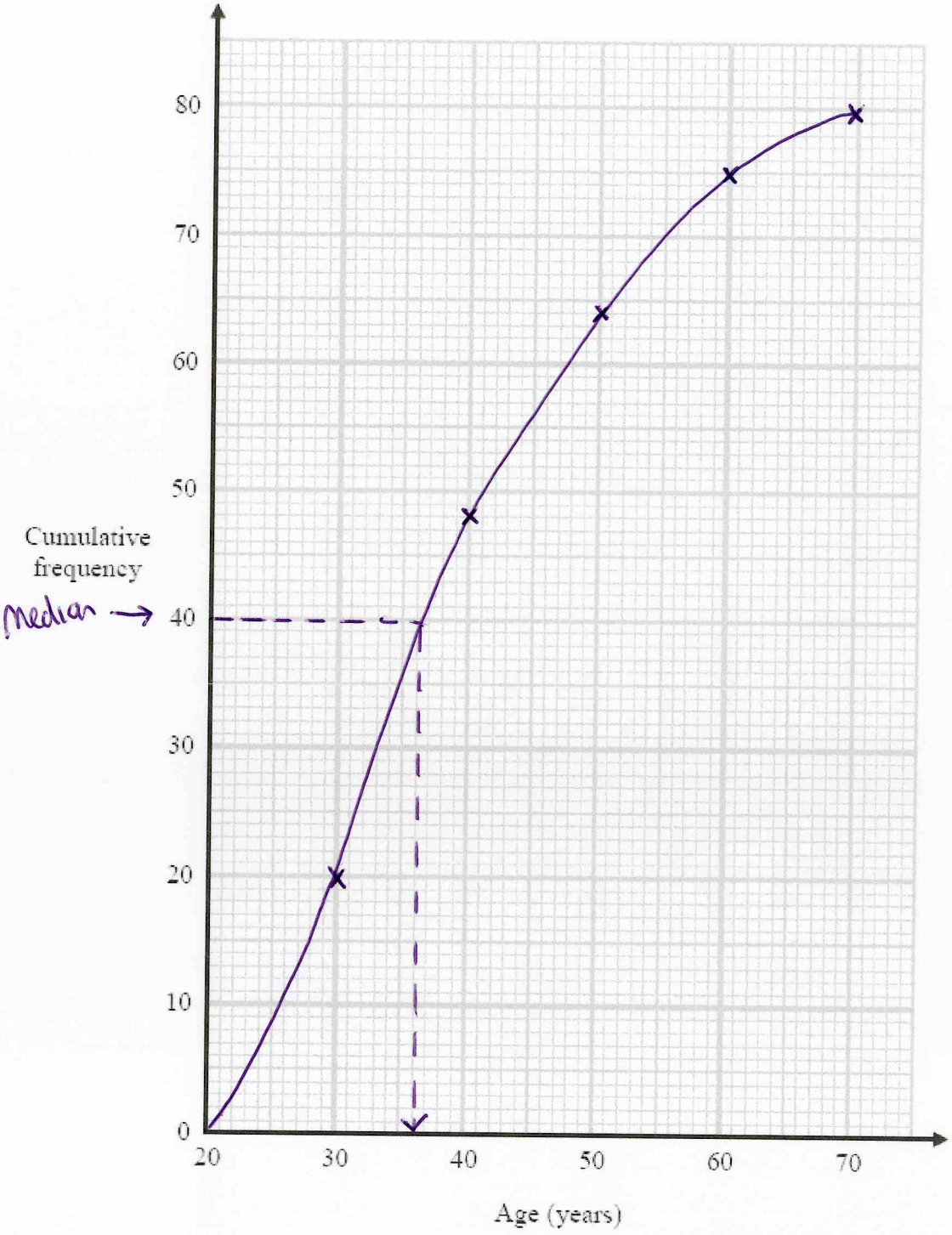
(2)

(b) Use your graph to find an estimate for the median age.

36 years

(1)

35 ⟷ 38



June 2023 – Paper 2H

(Total for Question 9 is 3 marks)

10 The table shows some information about the profit made each day at a cricket club on 100 days.

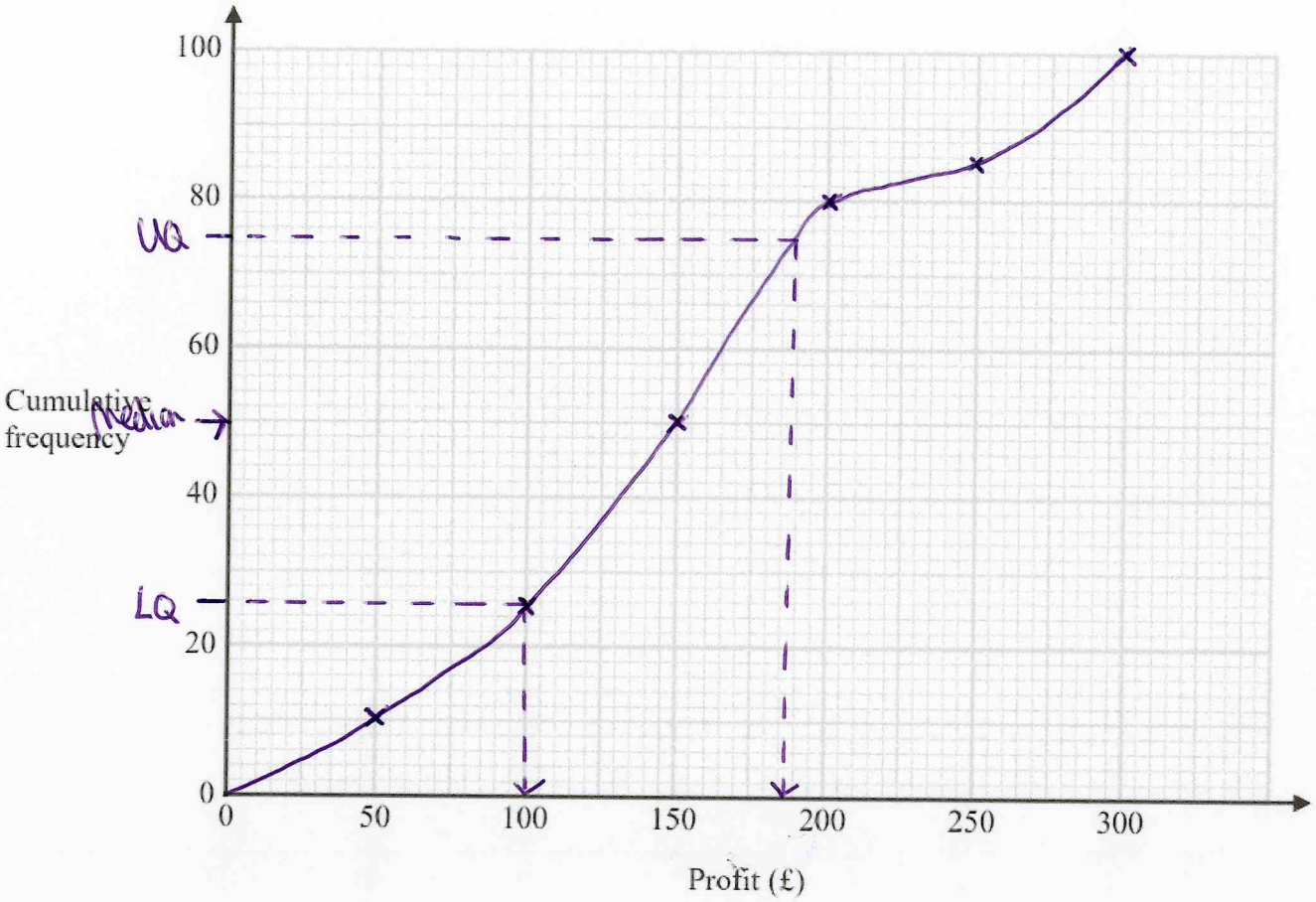
Profit (£x)	Frequency
$0 \leqslant x < 50$	10
$50 \leqslant x < 100$	15
$100 \leqslant x < 150$	25
$150 \leqslant x < 200$	30
$200 \leqslant x < 250$	5
$250 \leqslant x < 300$	15

(a) Complete the cumulative frequency table.

Profit (£x)	Cumulative frequency
$0 \leqslant x < 50$	10
$0 \leqslant x < 100$	25
$0 \leqslant x < 150$	50
$0 \leqslant x < 200$	80
$0 \leqslant x < 250$	85
$0 \leqslant x < 300$	100

(1)

(b) On the grid, draw a cumulative frequency graph for this information.



(2)

(c) Use your graph to find an estimate for the number of days on which the profit was less than £125

..... days

(1)

(d) Use your graph to find an estimate for the interquartile range.

UQ − LQ

185 − 100 = 85

£ 85

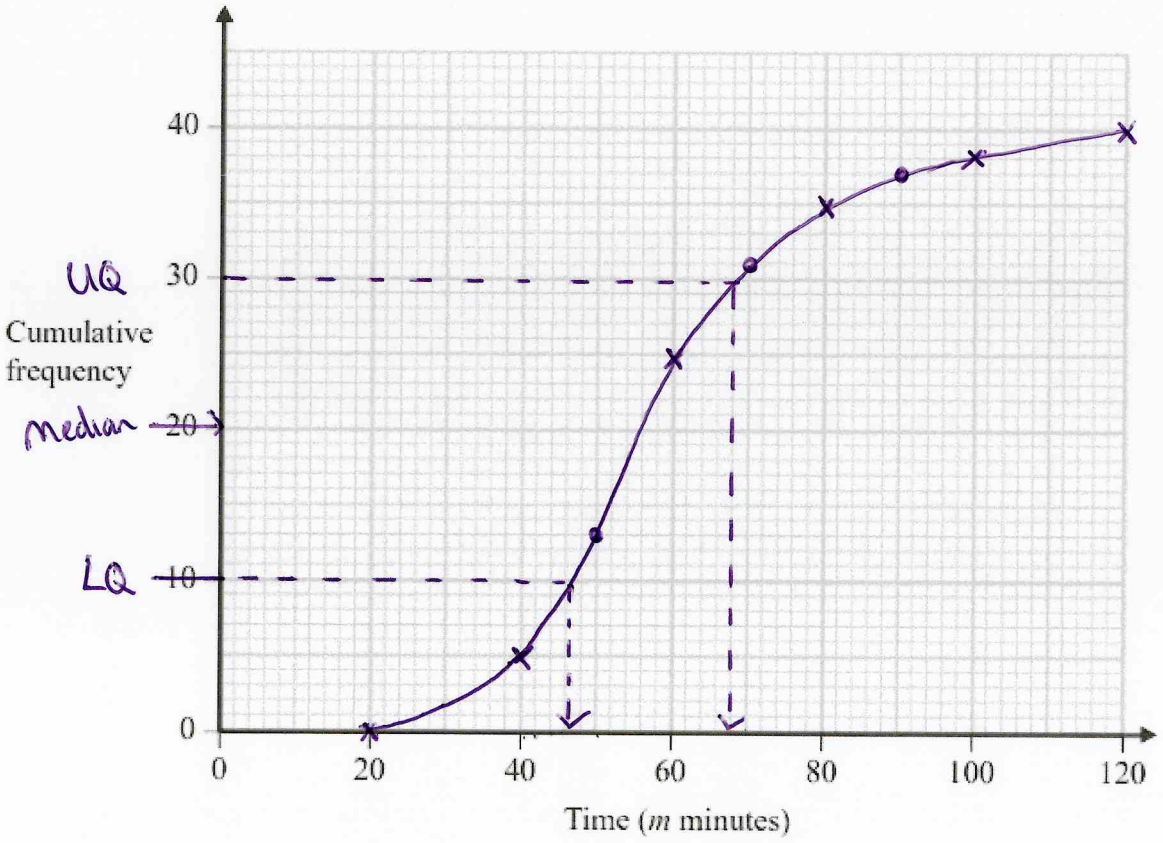
(2)

(Total for Question 10 is 6 marks)

10 The cumulative frequency table shows information about the times, in minutes, taken by 40 people to complete a puzzle.

Time (m minutes)	Cumulative frequency
$20 < m \leqslant 40$	5
$20 < m \leqslant 60$	25
$20 < m \leqslant 80$	35
$20 < m \leqslant 100$	38
$20 < m \leqslant 120$	40

(a) On the grid below, draw a cumulative frequency graph for this information.



(2)

(b) Use your graph to find an estimate for the interquartile range.

UQ - LQ

68 - 46

22 minutes

(2)

One of the 40 people is chosen at random.

(c) Use your graph to find an estimate for the probability that this person took between 50 minutes and 90 minutes to complete the puzzle.

50m = 13

90m = 37

37 - 13 = 24

$\frac{24}{40}$

(2)

(Total for Question 10 is 6 marks)

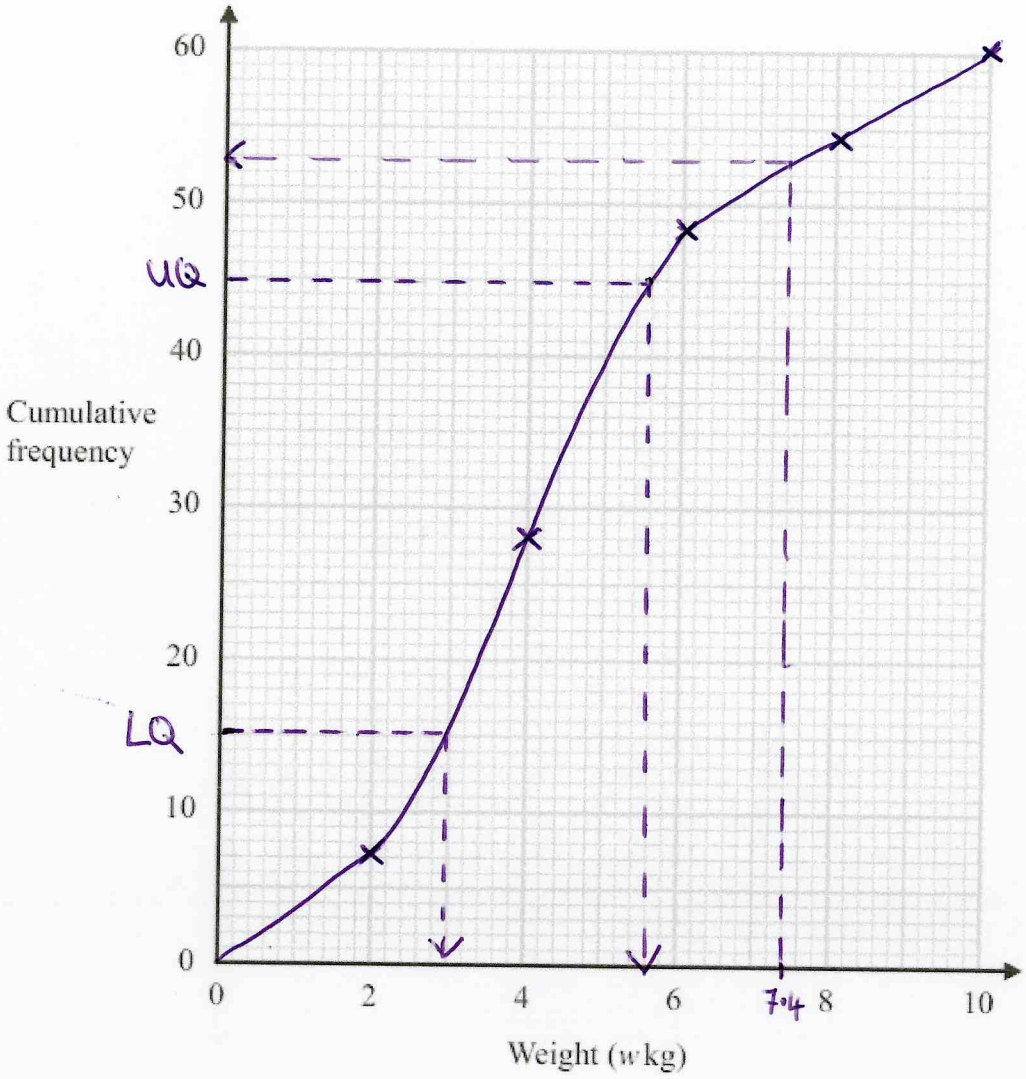
11. The frequency table gives information about the weights of 60 parcels.

Weight (w kg)	Frequency
$0 < w \leq 2$	7
$2 < w \leq 4$	21
$4 < w \leq 6$	15
$6 < w \leq 8$	11
$8 < w \leq 10$	6

(a) Complete the cumulative frequency table.

Weight (w kg)	Cumulative frequency
$0 < w \leq 2$	7
$0 < w \leq 4$	28
$0 < w \leq 6$	43
$0 < w \leq 8$	54
$0 < w \leq 10$	60

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



(c) Use your graph to find an estimate for the interquartile range.

$5.6 - 3 = 2.6$

2.6 kg

(2)

(d) Use your graph to find an estimate for the number of these parcels with a weight greater than 7.4 kg.

$60 - 53 = 7$

7

(2)

(Total for Question 11 is 7 marks)

11 The grouped frequency table gives information about the times, in minutes, that 80 office workers take to get to work.

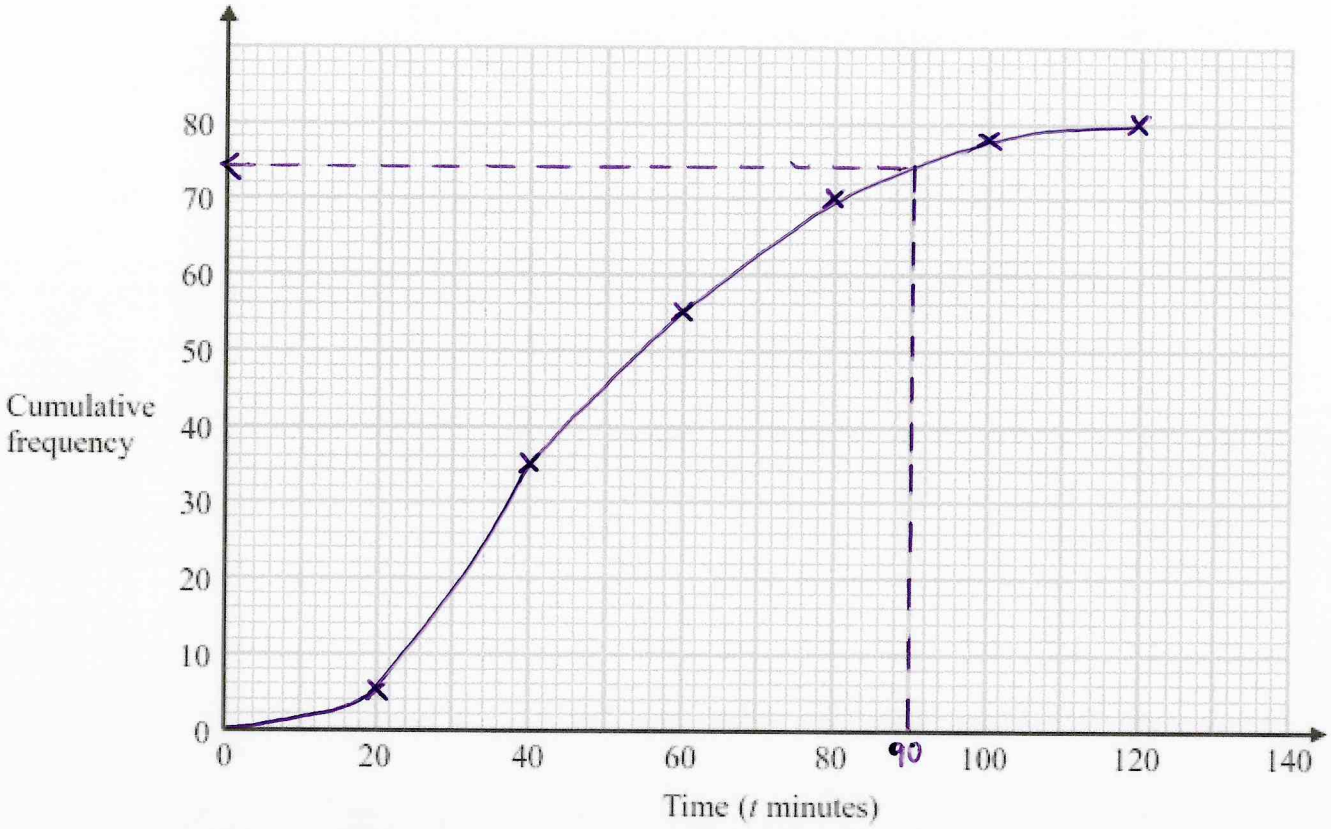
Time (t minutes)	Frequency
$0 < t \leqslant 20$	5
$20 < t \leqslant 40$	30
$40 < t \leqslant 60$	20
$60 < t \leqslant 80$	15
$80 < t \leqslant 100$	8
$100 < t \leqslant 120$	2

(a) Complete the cumulative frequency table.

Time (t minutes)	Cumulative frequency
$0 < t \leqslant 20$	5
$0 < t \leqslant 40$	35
$0 < t \leqslant 60$	55
$0 < t \leqslant 80$	70
$0 < t \leqslant 100$	78
$0 < t \leqslant 120$	80

(1)

(b) On the grid, draw the cumulative frequency graph for this information.



(2)

(c) Use your graph to find an estimate for the percentage of these office workers who take more than 90 minutes to get to work.

$80 - 74 = 6$

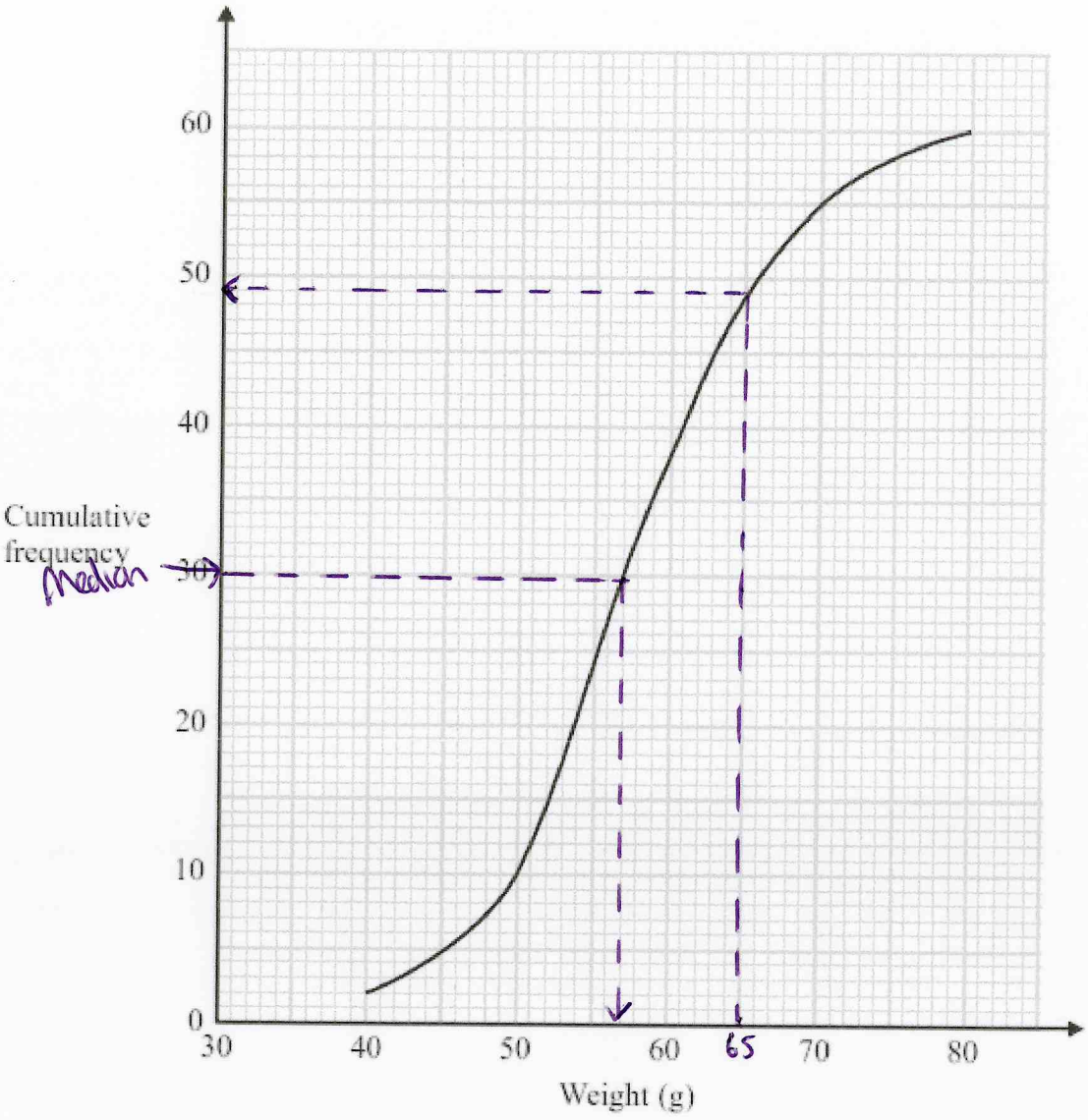
$\frac{6}{80} = 0.075$

7.5 %

(3)

(Total for Question 11 is 6 marks)

11 The cumulative frequency graph shows information about the weights of 60 potatoes.



(a) Use the graph to find an estimate for the median weight.

57 g

(1)

Jamil says,

"80 − 40 = 40 so the range of the weights is 40 g."

(b) Is Jamil correct?
You must give a reason for your answer.

When the data is grouped, we don't know if 80 is the official highest mark, or 40 is the official lowest mark.

(1)

(c) Show that less than 25% of the potatoes have a weight greater than 65 g.

$60 - 49 = 11$

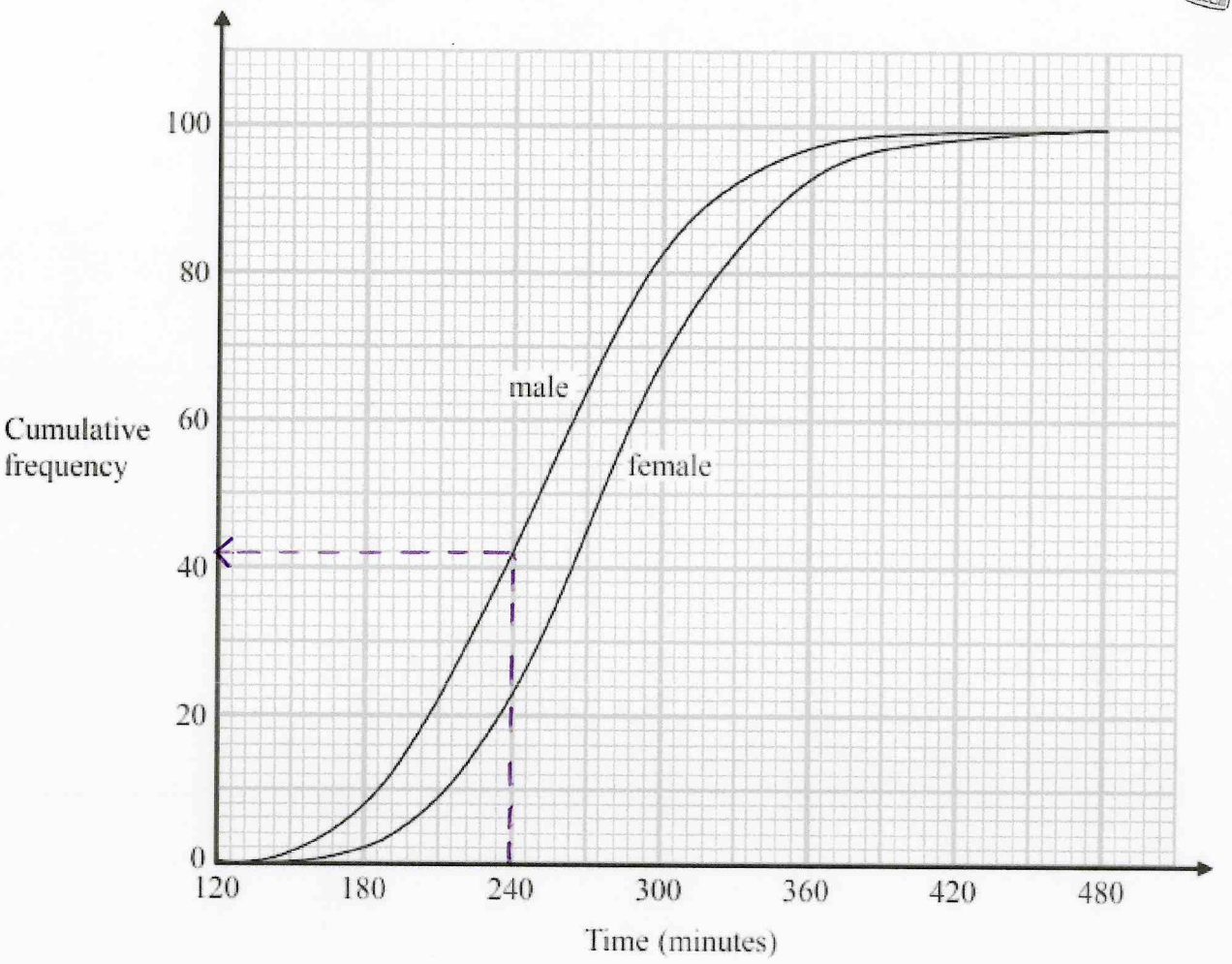
$\frac{11}{60} = 18.\dot{3}\%$

$18.3\% < 25\%$

(2)

(Total for Question 11 is 4 marks)

11 The cumulative frequency graphs show information about the times taken by 100 male runners and by 100 female runners to finish the London marathon.



A male runner is chosen at random.

(a) Find an estimate for the probability that this runner took less than 4 hours to finish the London marathon.

4 hours = 240 minutes

$\frac{42}{100}$

(2)

(b) Use medians and interquartile ranges to compare the distribution of the times taken by the male runners with the distribution of the times taken by the female runners.

Males

Median = 252

IQR = 286 - 216
= 70

Females

Median = 276

IQR = 314 - 244
= 70

On average the females took longer as their median was higher.
The IQR was the same for both groups, so the spread of times was the same.

(4)

(Total for Question 11 is 6 marks)

12 The table gives information about the weekly wages of 80 people.

Wage (£w)	Frequency
$200 < w \leqslant 250$	5
$250 < w \leqslant 300$	10
$300 < w \leqslant 350$	20
$350 < w \leqslant 400$	20
$400 < w \leqslant 450$	15
$450 < w \leqslant 500$	10

(a) Complete the cumulative frequency table.

Wage (£w)	Cumulative frequency
$200 < w \leqslant 250$	5
$200 < w \leqslant 300$	15
$200 < w \leqslant 350$	35
$200 < w \leqslant 400$	55
$200 < w \leqslant 450$	70
$200 < w \leqslant 500$	80

(1)

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

(2)

Juan says

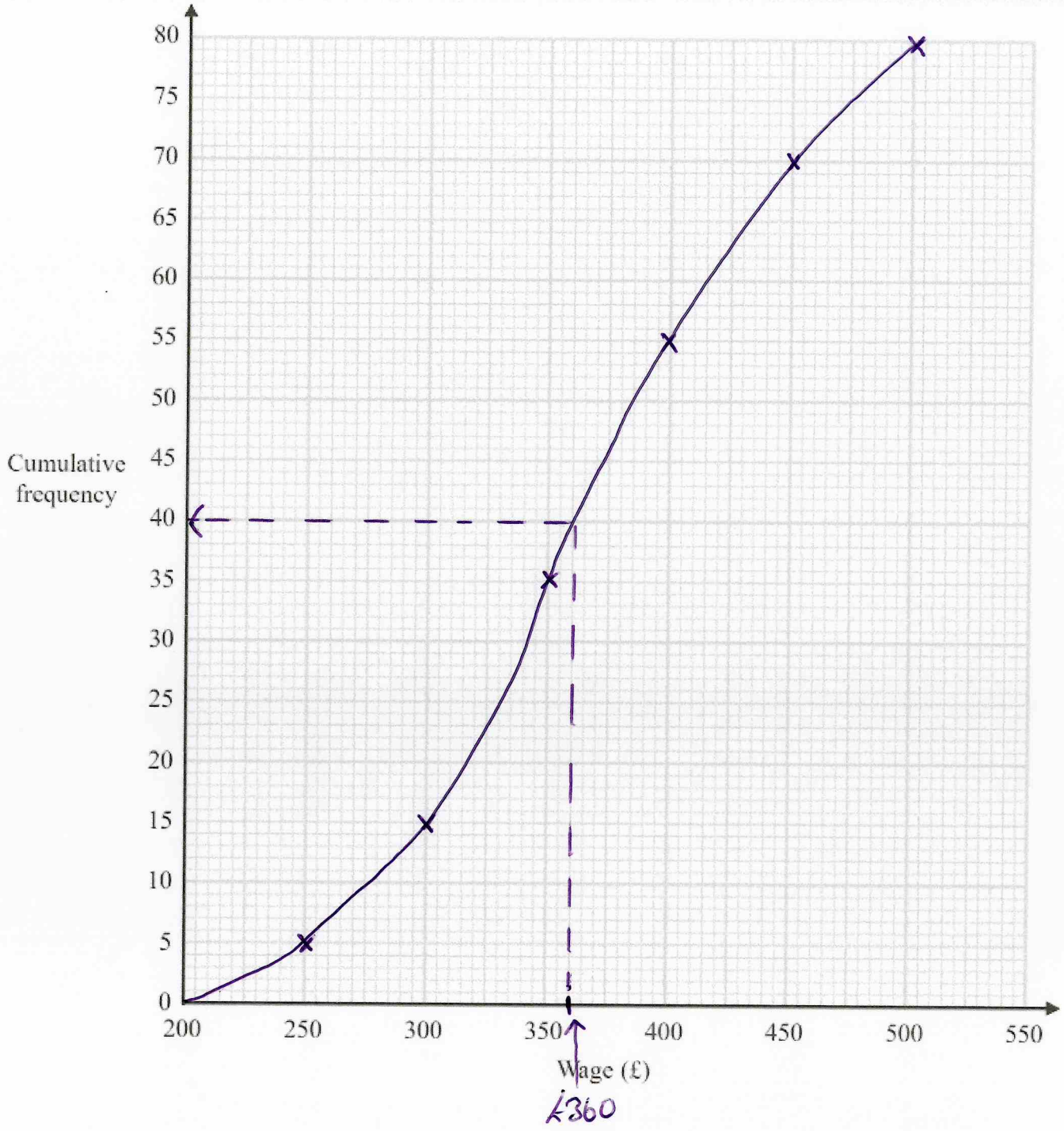
"60% of this group of people have a weekly wage of £360 or less."

(c) Is Juan correct?
You must show how you get your answer.

$\frac{40}{80} = 50\%$ are less than £360

Juan is not correct.

(3)

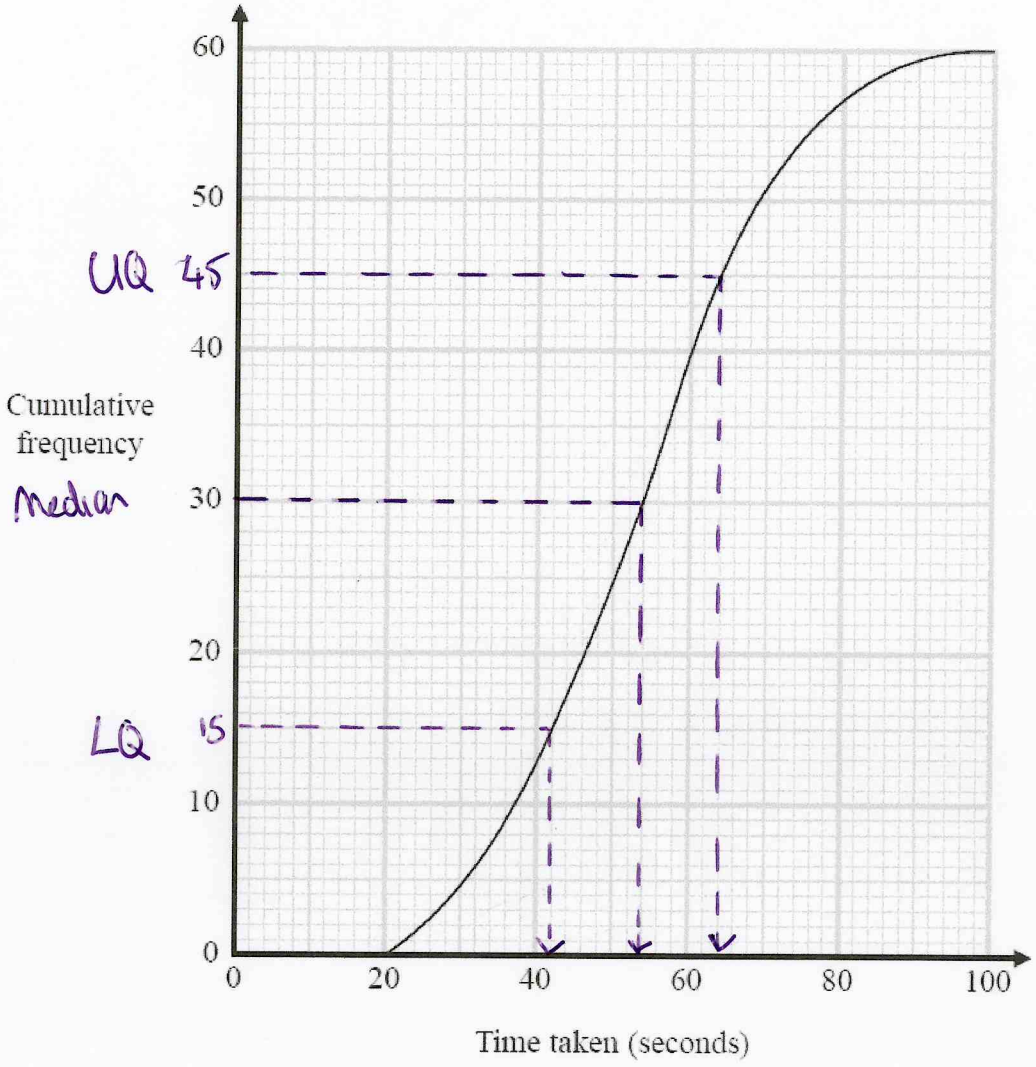


November 2020 – Paper 1H

(Total for Question 12 is 6 marks)

11 In an experiment, 60 students each completed a puzzle.

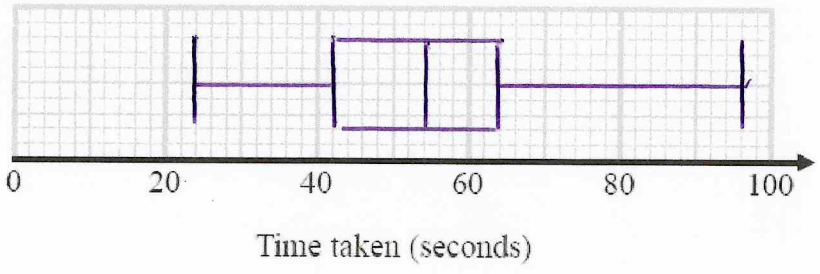
The cumulative frequency graph shows information about the times taken for the 60 students to complete the puzzle.



For these 60 students,

the least time taken was 24 seconds
the greatest time taken was 96 seconds.

On the grid below, draw a box plot for the distribution of the times taken by the students.

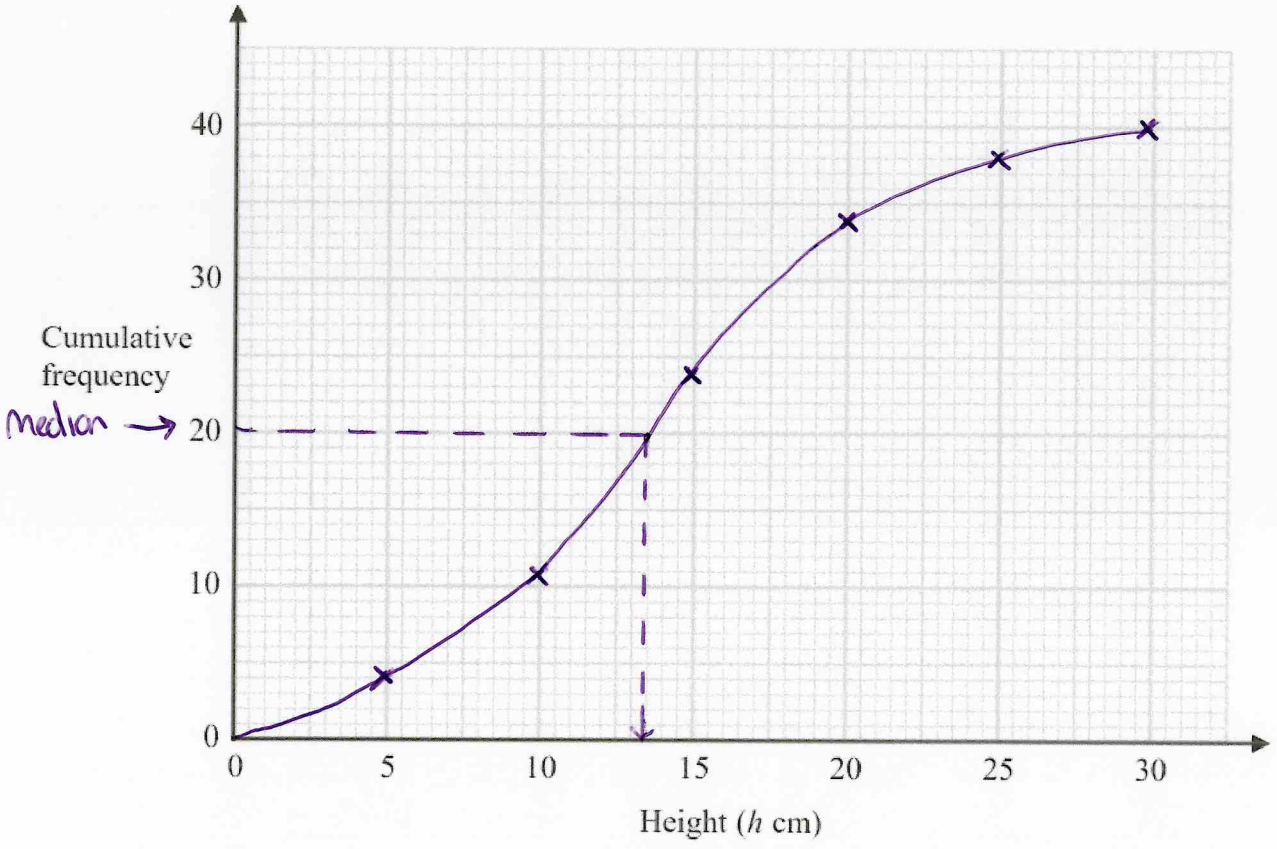


(Total for Question 11 is 3 marks)

12 The cumulative frequency table gives information about the heights, in cm, of 40 plants.

Height (h cm)	Cumulative Frequency
$0 < h \leqslant 5$	4
$0 < h \leqslant 10$	11
$0 < h \leqslant 15$	24
$0 < h \leqslant 20$	34
$0 < h \leqslant 25$	38
$0 < h \leqslant 30$	40

(a) On the grid, draw a cumulative frequency graph for this information.



(2)

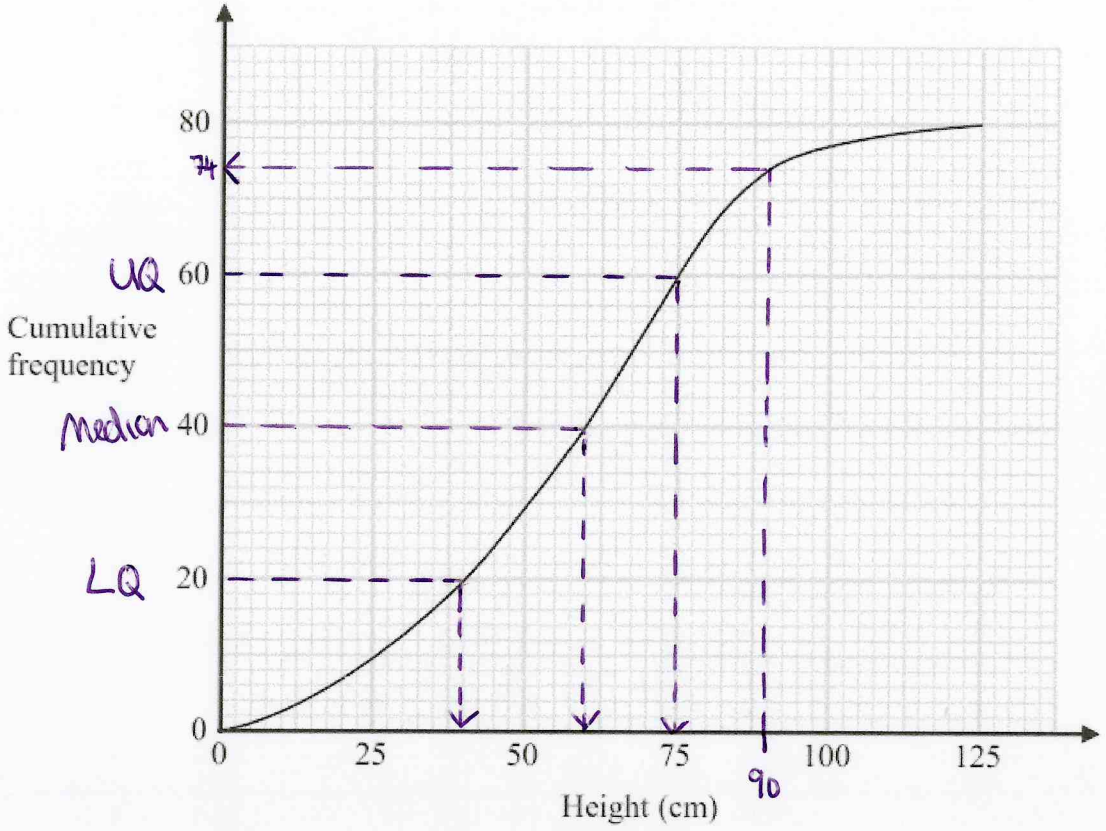
(b) Use the graph to find an estimate for the median height of the plants.

13·5 cm

(1)

(Total for Question 12 is 3 marks)

13 Alan grew 80 plants of the same type outside.
The cumulative frequency graph shows information about the heights, in cm, of these plants.



One of the plants is chosen at random.

(a) Find an estimate for the probability that this plant will have a height greater than 90 cm.

80 - 74 = 6

$\frac{6}{80}$

(2)

(b) Use the graph to find an estimate for the median height.

60 cm

(1)

(c) Use the graph to find an estimate for the interquartile range of the heights.

UQ - LQ

75 - 40 = 35

35 ..... cm

(2)

Alan also grew plants of the same type inside.

The interquartile range of the heights of these plants is 30 cm.

(d) Give one comparison between the distribution of the heights of the plants grown inside with the distribution of the heights of the plants grown outside.

The IQR of heights of the plants inside is lower.

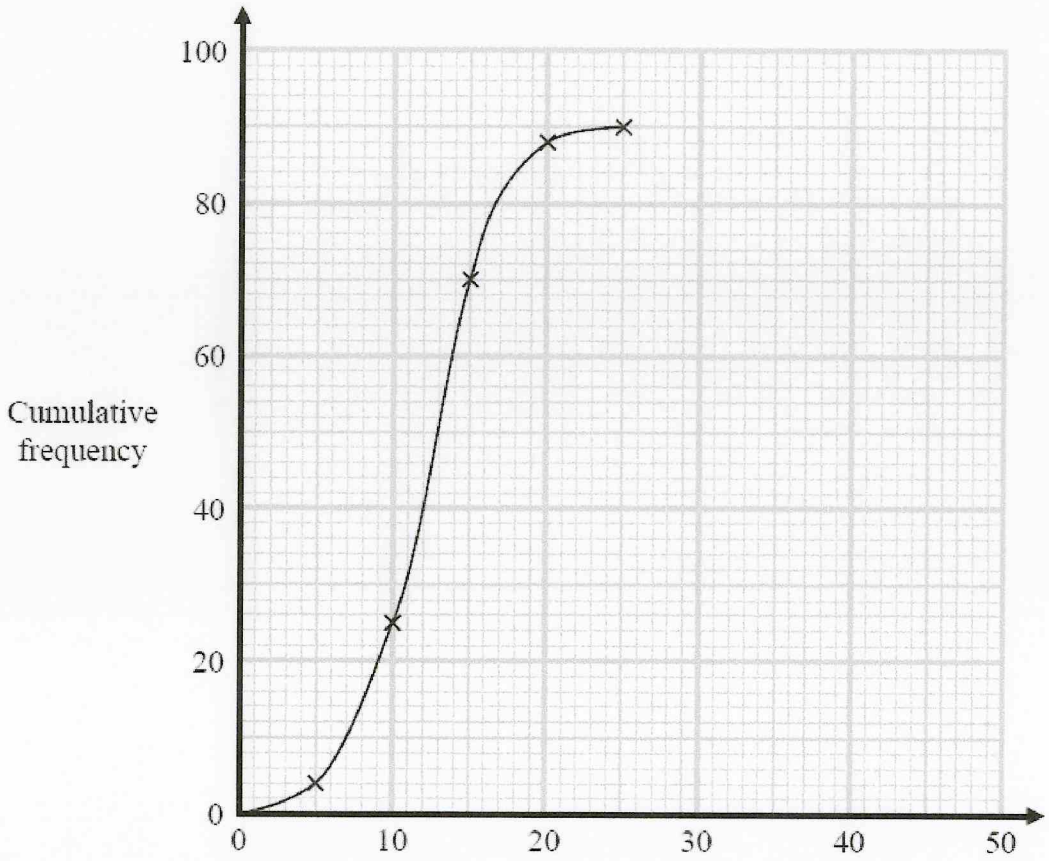
(1)

(Total for Question 13 is 6 marks)

13 Chen has this information about the time that it took an operator at a call centre to answer each of 90 calls.

Time (t seconds)	Cumulative frequency
$0 < t \leqslant 10$	4
$0 < t \leqslant 20$	25
$0 < t \leqslant 30$	70
$0 < t \leqslant 40$	88
$0 < t \leqslant 50$	90

Chen draws this cumulative frequency graph for the information in the table.



Write down two different things that are wrong with this graph.

1 The frequencies should have been plotted with the upper bound of each time group.

2 There is no label for the horizontal axis

(Total for Question 13 is 2 marks)