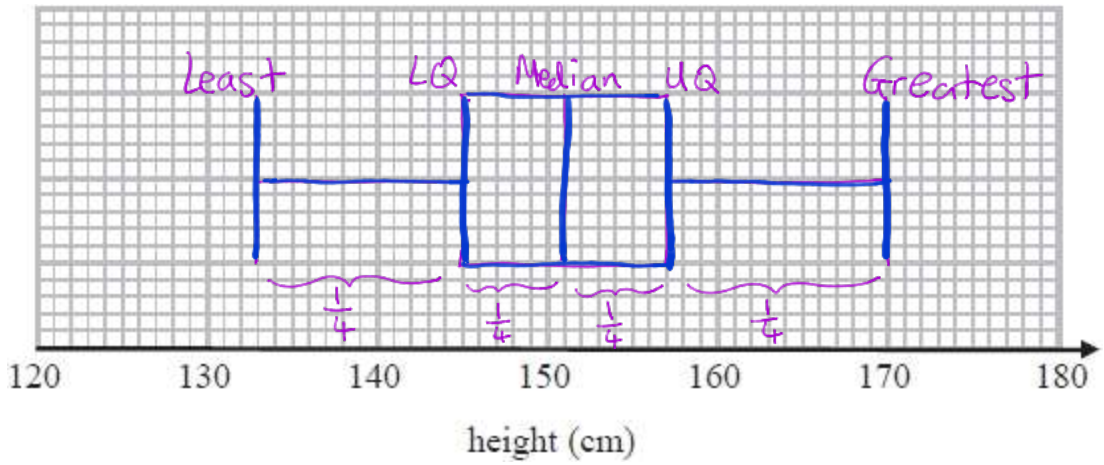
FULL MODEL ANSWERS

Q1. NON-CALCULATOR

The table gives some information about the heights of 80 girls.

Least height	133 cm
Greatest height	170 cm
Lower quartile	145 cm
Upper quartile	157 cm
Median	151 cm

(a) Draw a box plot to represent this information.



(3)

(b) Work out an estimate for the number of these girls with a height between 133 cm and 157 cm.

$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$

$\frac{3}{4} \times 80$ 60

(2)

(Total for question = 5 marks)

Q2. NON-CALCULATOR

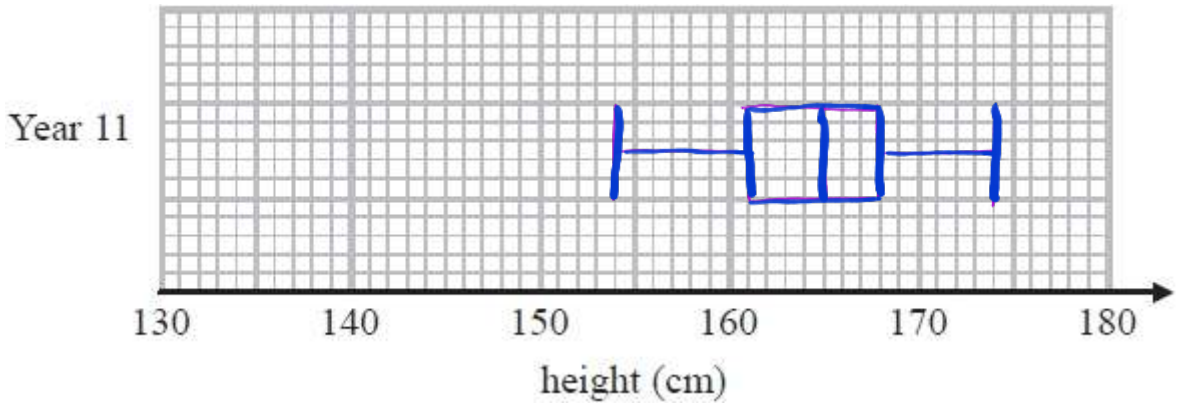
The table shows information about the heights, in cm, of a group of Year 11 girls.

Least + range = Greatest

LQ + IQR = UQ

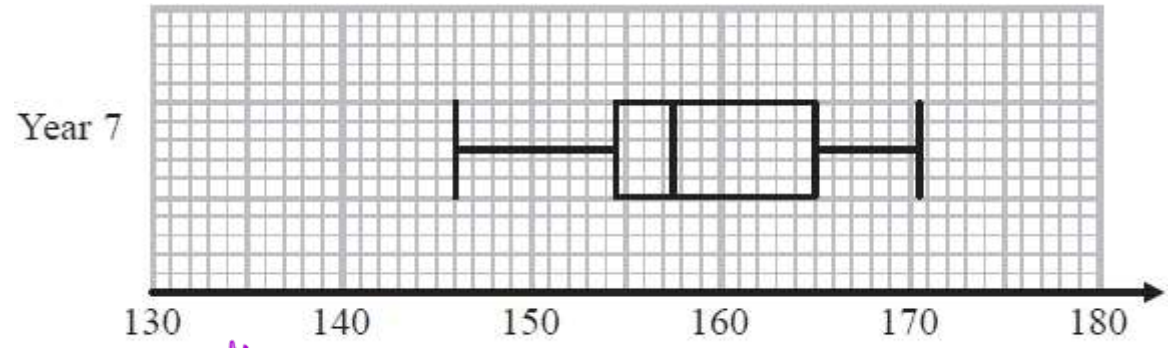
	height (cm)
least height	154
median	165
lower quartile	161
interquartile range	7
range	20

(a) Draw a box plot for this information.



(3)

The box plot below shows information about the heights, in cm, of a group of Year 7 girls.



compare median and IQR.

(b) Compare the distribution of heights of the Year 7 girls with the distribution of heights of the Year 11 girls.

The median height for Y7 was lower than Y11, so Y7 girls are shorter, on average.
The Interquartile Range for Y11 was smaller than for Y7, so the Y11 girls' height is less varied.

(2)

(Total for question = 5 marks)

Q3. NON-CALCULATOR $n=15$

Ben played 15 games of basketball.
Here are the points he scored in each game.

LQ Median UQ

17 18 18 18 19 20 20 22 23 23 23 26 27 28 28

(a) Draw a box plot for this information.

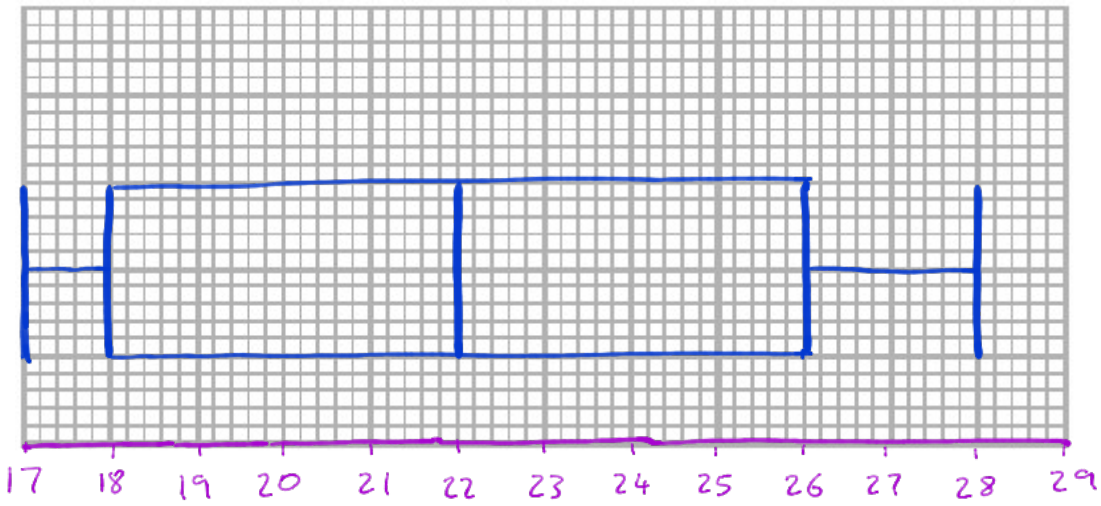
Minimum: 17

LQ: $\frac{n+1}{4}$ = 4th value : 18

Median: $\frac{n+1}{2}$ = 8th value: 22

UQ: $\frac{3(n+1)}{4}$ = 12th value: 26

Maximum: 28



(3)

Sam plays in the same 15 games of basketball.

The median number of points Sam scored is 23
The interquartile range of these points is 12
The range of these points is 20

compare ranges and IQRs

(b) Who is more consistent at scoring points, Sam or Ben?
You must give a reason for your answer.

The range for Ben is 11, so is much lower than Sam's range. The interquartile range for Ben is 8, so this also indicates Ben is more consistent.

(2)

(Total for question = 5 marks)

Q4. NON-CALCULATOR

n=25

The stem and leaf diagram shows the ages, in years, of 25 people.

1	7	7	8	9							
2	1	2	4	4	5	5	6	7	8	9	9
3	0	1	2	2	3	4	5	6			
4	0	1									

Key: 1|7 represents 17 years

LQ: $\frac{n+1}{4}$ = 6.5th value = 23

Median: $\frac{n+1}{2}$ = 13th value = 28

UQ: $\frac{3(n+1)}{4}$ = 19.5th value = 32.5

(a) (i) On the grid, draw a box plot for this information.

(3)

One of these people is chosen at random.

(ii) What is the probability that this person is 30 years of age or older?

P(30 years or less) = Number of people aged 30 or older / Total number of people

= 10/25

2/5

.....

(2)

The grouped frequency table gives information about the ages of a different group of people.

Age (a years)	Frequency
$0 < a \leqslant 20$	7
$20 < a \leqslant 30$	12
$30 < a \leqslant 40$	5
$40 < a \leqslant 50$	1

Anne drew this cumulative frequency table for this information.

Age (a years)	Cumulative frequency
$0 < a \leqslant 20$	7
$20 < a \leqslant 30$	19
$30 < a \leqslant 40$	24
$40 < a \leqslant 50$	25

The cumulative frequency table is **not** correct.

(b) Write down one thing that is wrong with the table.

The lower limits for the groups should be zero.

(1)

(Total for question = 6 marks)

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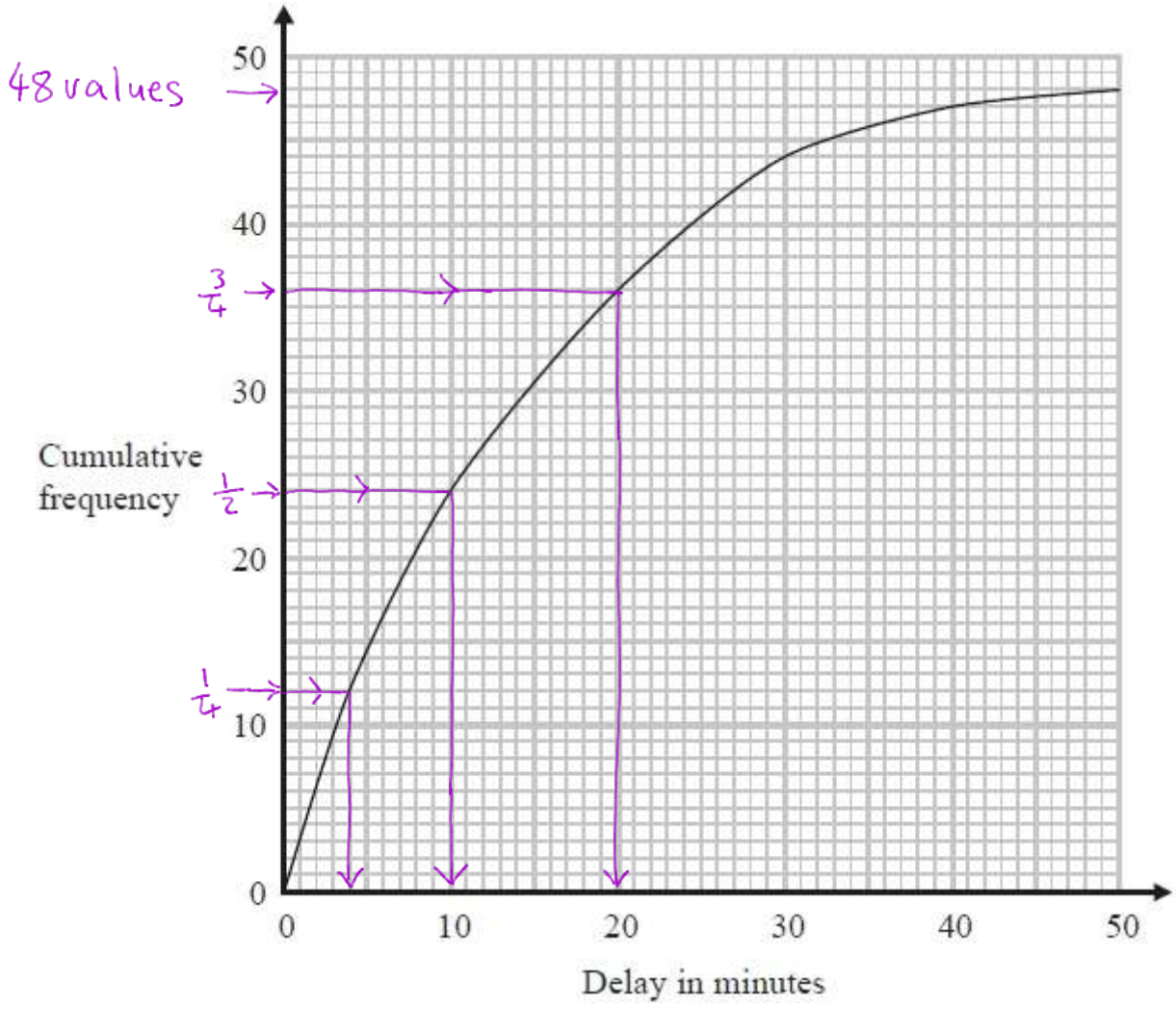
Q5. NON-CALCULATOR

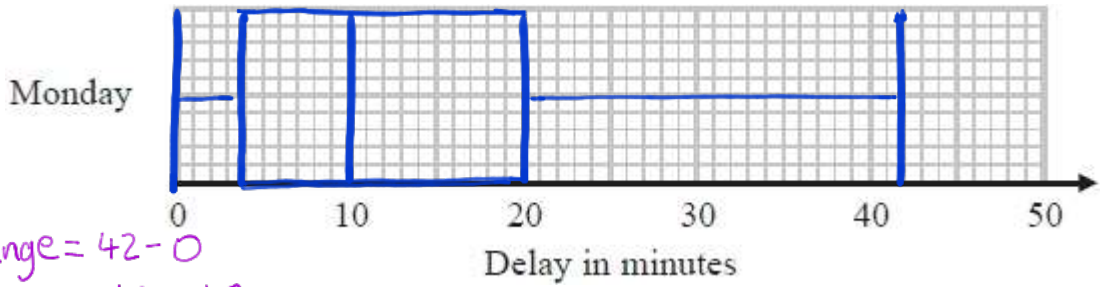
The times that 48 trains left a station on Monday were recorded.

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.

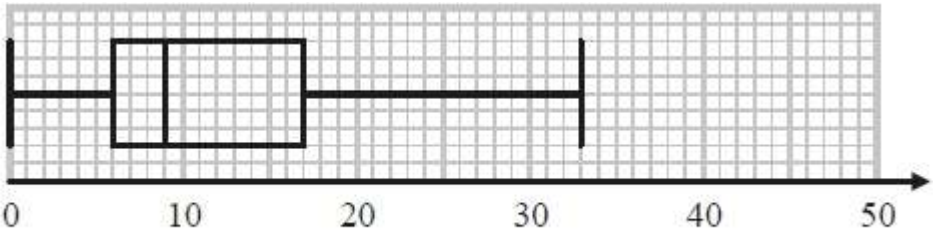
(a) On the grid below, draw a box plot for the information about the delays on Monday.



Range = 42 − 0
IQR = UQ − LQ
= 20 − 4

(3)

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



Range = 33 - 0

IQR = UQ - LQ
= 17 - 6

compare medians and IQRs

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

The median was slightly lower on Tuesday (9) than Monday (10). On average, trains were less late on Tuesday. The interquartile range was greatest on Monday, so Monday's trains were overall less reliable.

(2)

Mary says,

Remember we're using grouped data.

"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 is not right. There was definitely a train 33minutes late. Without the original data, we can't say exactly how late other trains were.

(1)

(Total for question = 6 marks)

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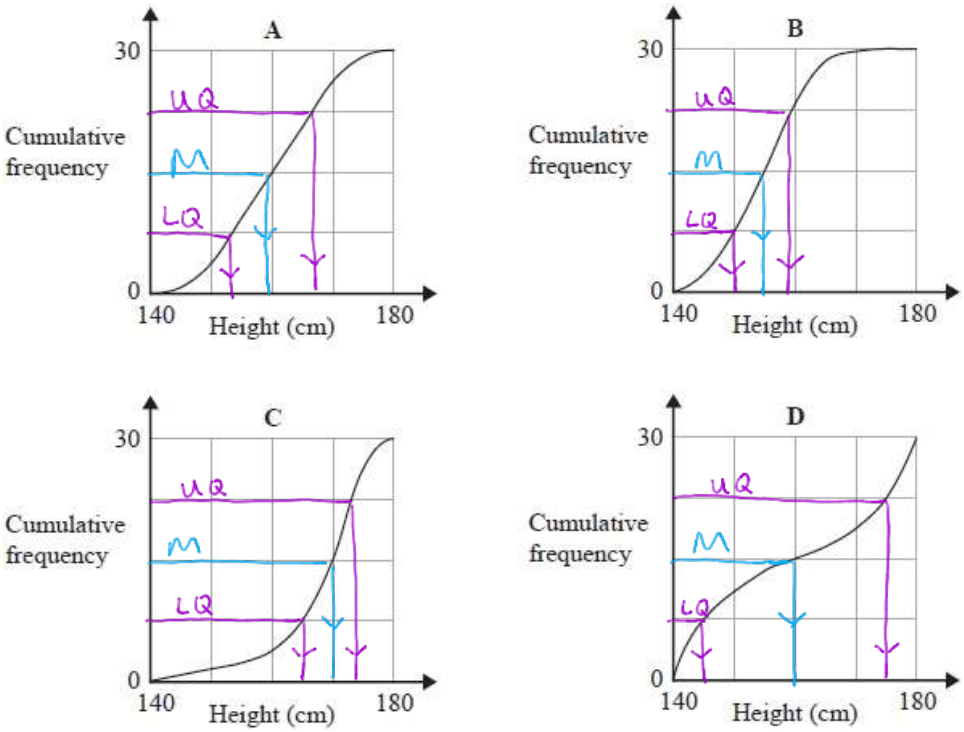
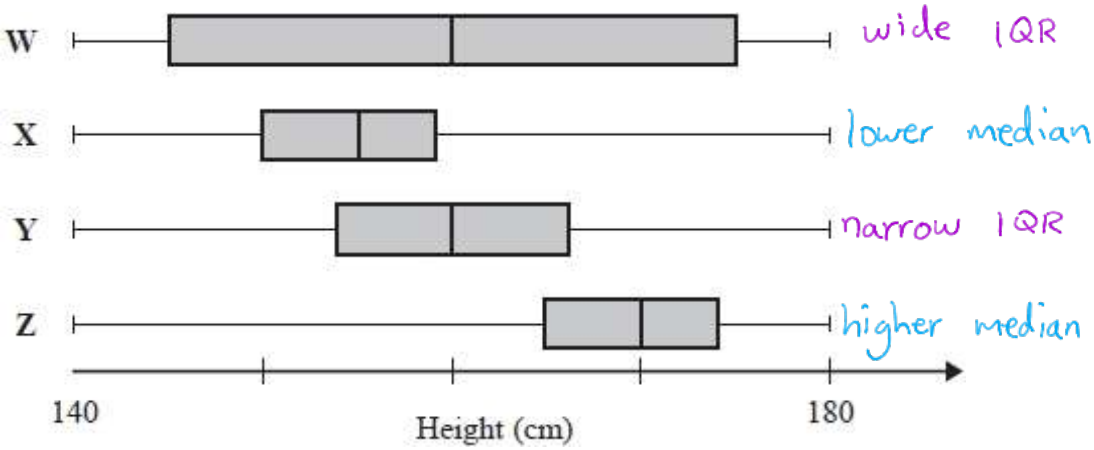
Q6. NON-CALCULATOR

Joan measured the heights of students in four different classes.

She drew a cumulative frequency graph and a box plot for each class.





Match each cumulative frequency graph to its box plot.

Cumulative frequency graph	Box plot
A	Y
B	X
C	Z
D	W

(Total for question = 2 marks)

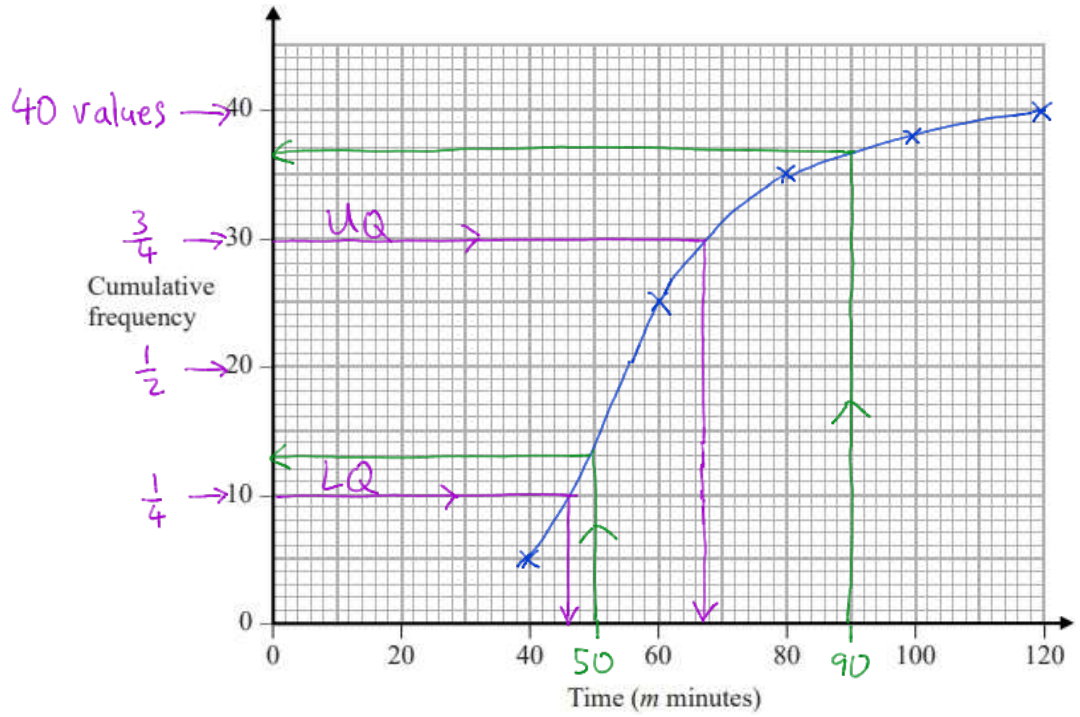
Q7. NON-CALCULATOR

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

x y

(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.

IQR = UQ − LQ
= 67 − 43

24 ..... 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.

37 − 13 = 24 P(between 50 and 90) = Number between 50 and 90 / Total number of people = 24/40 = 3/5

(2)

(Total for question = 6 marks)

Q8. NON-CALCULATOR

Time taken (t minutes)	Cumulative frequency
$0 < t \leqslant 10$	0
$0 < t \leqslant 20$	7
$0 < t \leqslant 30$	20
$0 < t \leqslant 40$	64
$0 < t \leqslant 50$	74
$0 < t \leqslant 60$	80

x y

The cumulative frequency table gives information about the time, in minutes, Jane took to go from her home to school each day last term.

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

(2)

Jane expects that it should take her x minutes to go from her home to school each day.
On 25% of the days last term, Jane took longer than x minutes to go from her home to school.

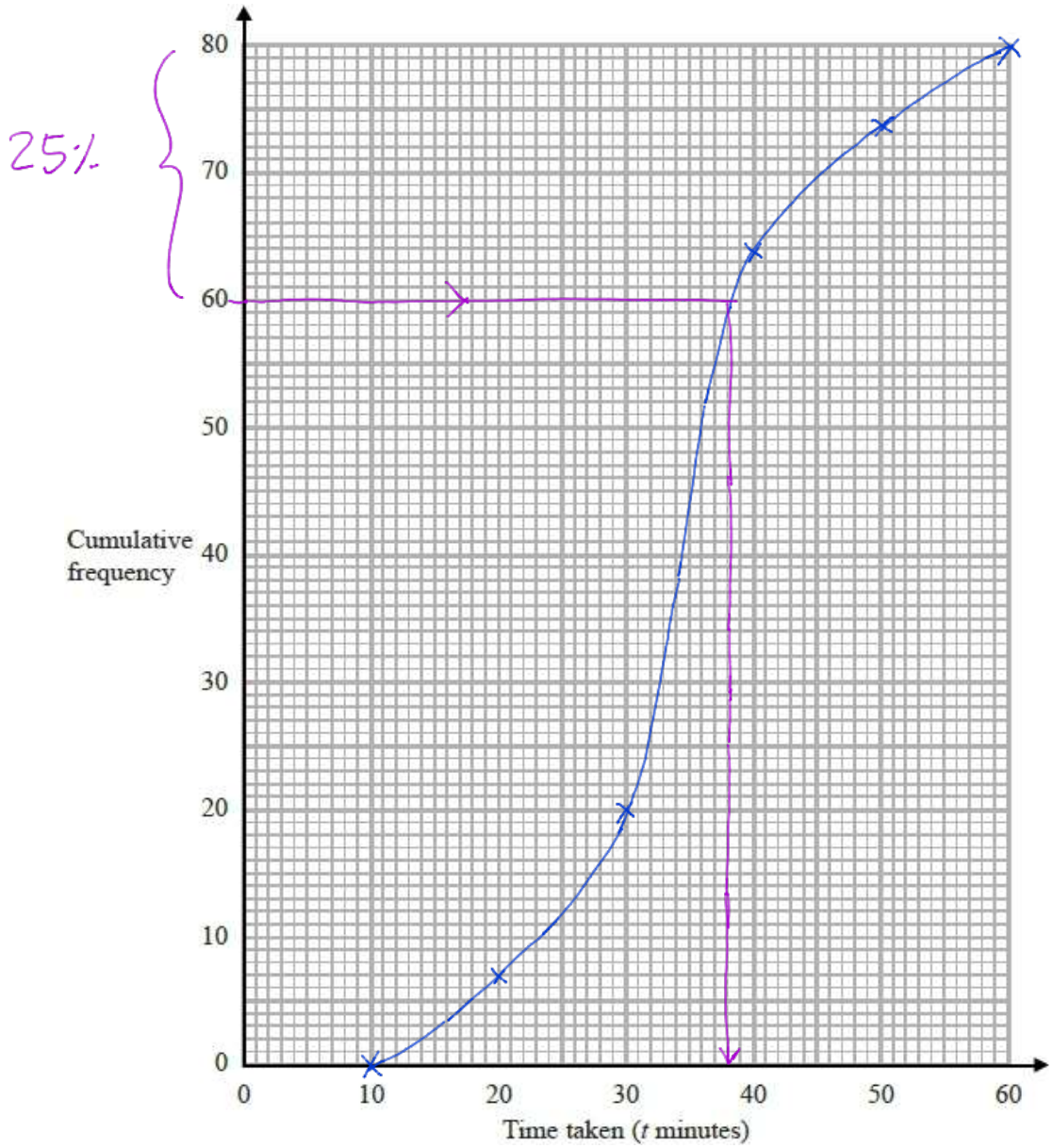
(b) Use your cumulative frequency graph to find an estimate for the value of x.

25% of 80 = 20

80 − 20 = 60

x = 38 minutes

(3)



(Total for question = 5 marks)

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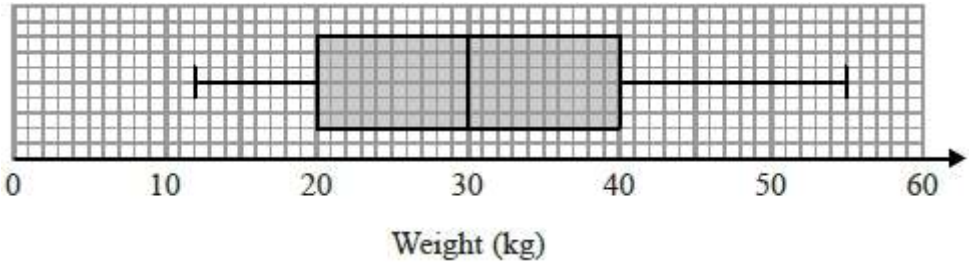
Q9. CALCULATOR ALLOWED

The table shows some information about the weights, in kg, of some boxes.

Minimum	Lower Quartile	Median	Upper Quartile	Range
12	20	32	40	55

Yusuf uses this information to draw the box plot below.



Write down two things wrong with this box plot.

1 The median is plotted as 30 but should be 32.

2 The maximum is plotted as 55 but should be minimum + range = 12 + 55 = 67.

(Total for question = 2 marks)

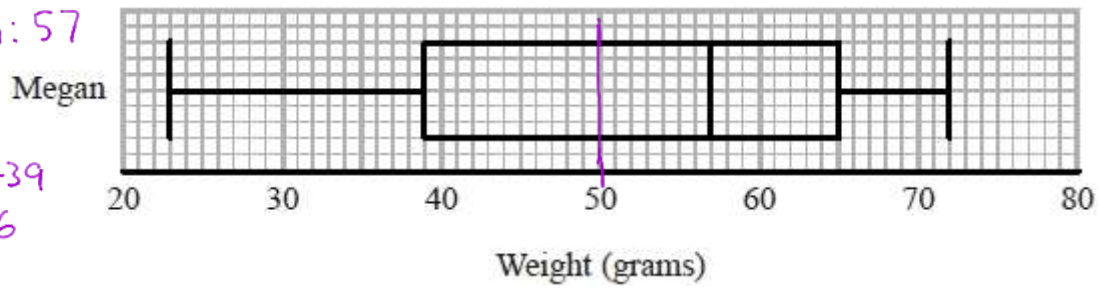
Q10. CALCULATOR ALLOWED

Megan grows potatoes.

The box plot below shows information about the weights of Megan's potatoes.

Median: 57

IQR: 65-39 = 26



Megan says that half of her potatoes weigh less than 50 grams each.

(a) Is Megan correct? Give a reason for your answer.

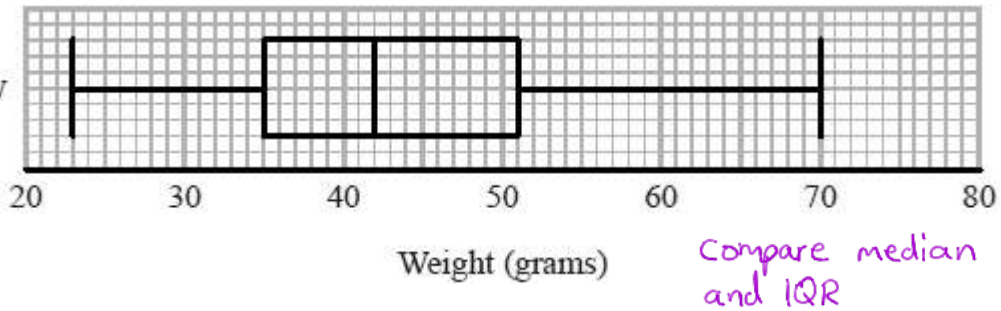
The middle point is represented by the median, which is not at 50g but at 57g. Megan is therefore wrong.

(1)

Amy also grows potatoes. The box plot below shows information about the weights of Amy's potatoes.

Median: 42

IQR: 51-35 = 16



Compare median and IQR

(b) Compare the distribution of the weights of Megan's potatoes with the distribution of the weights of Amy's potatoes.

Megan's potatoes have a greater median than Amy's, so Megan's potatoes were larger, on average. Amy's potatoes have a much shorter interquartile range. So Amy's potatoes were of a more similar weight.

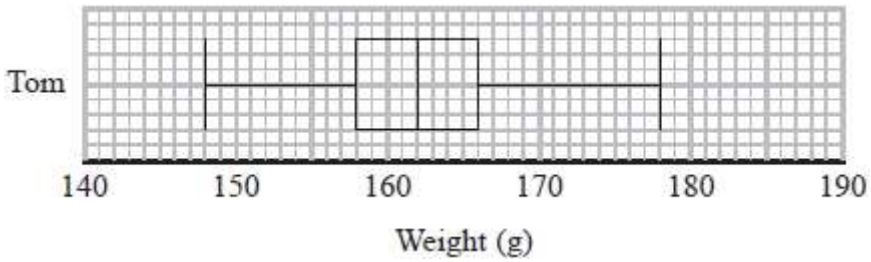
(2)

(Total for question = 3 marks)

Q11. CALCULATOR ALLOWED

Tom grows tomatoes. The box plot below shows the distribution of the weights of 15 of Tom's tomatoes.

Median = 162



(a) Work out the interquartile range.

IQR
= UQ - LQ
= 166 - 158

8 ..... g

(1)

Jack also grows tomatoes.

n = 15

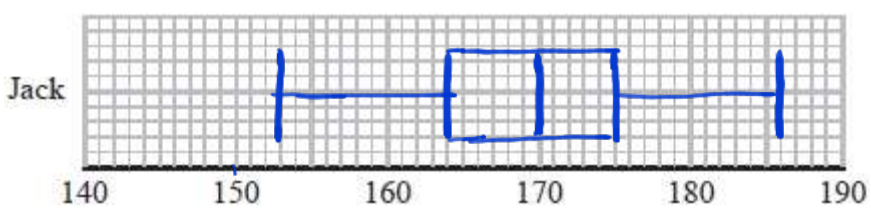
Here are the weights, in grams, of 15 of Jack's tomatoes.

Min: 153 | Median: 170 | Max: 186

153 155 158 164 166 167 170 170 173 174 175 175 177 179 186

(b) On the grid below, draw a box plot for this information.

Median: $\frac{n+1}{2}$



LQ: $\frac{n+1}{4}$

UQ: $\frac{3(n+1)}{4}$

(3)

(c) Compare the distribution of the weights of Tom's tomatoes with the distribution of the weights of Jack's tomatoes.

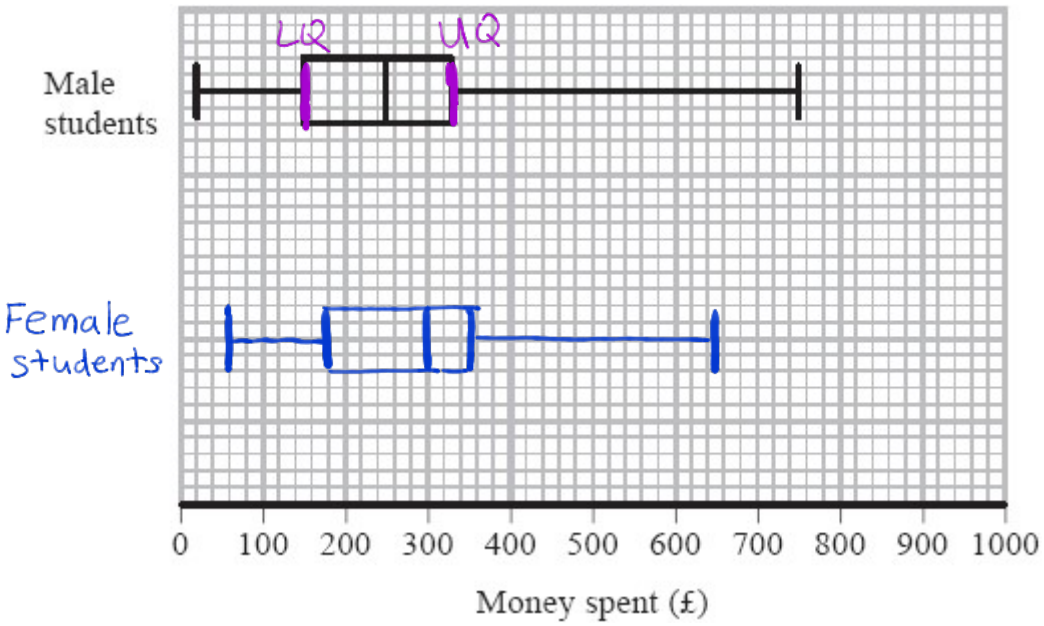
The median for Jack's tomatoes was higher, so he had heavier tomatoes, on average. Tom had a smaller interquartile range, so his tomatoes were of a more similar weight.

(2)

(Total for question = 6 marks)

Q12. CALCULATOR ALLOWED

The box plot shows information about the distribution of the amounts of money spent by some male students on their holidays.



(a) Work out the interquartile range for the amounts of money spent by these male students.

IQR = UQ − LQ

= 330 − 150

£ 180

(2)

The table below shows information about the distribution of the amounts of money spent by some female students on their holidays.

	Smallest	Lower quartile	Median	Upper quartile	Largest
Money spent (£)	60	180	300	350	650

(b) On the grid above, draw a box plot for the information in the table.

(2)

Chris says,

"The box plots show that the female students spent more money than the male students."

(c) Is Chris correct? Give a reason for your answer.

The median for females (£300) is higher than males (£250) so the middle female spends more than the middle male. However, the maximum male spending (£750) was higher than the female equivalent (£650)

(1)

(Total for question = 5 marks)

Q13. CALCULATOR ALLOWED

Francesco carried out a survey about the ages of the people in his office.

The table shows information about his results.

Age (a years)	Cumulative frequency
$20 < a \leqslant 30$	10
$20 < a \leqslant 40$	26
$20 < a \leqslant 50$	58
$20 < a \leqslant 60$	66
$20 < a \leqslant 70$	70

x y

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

(2)

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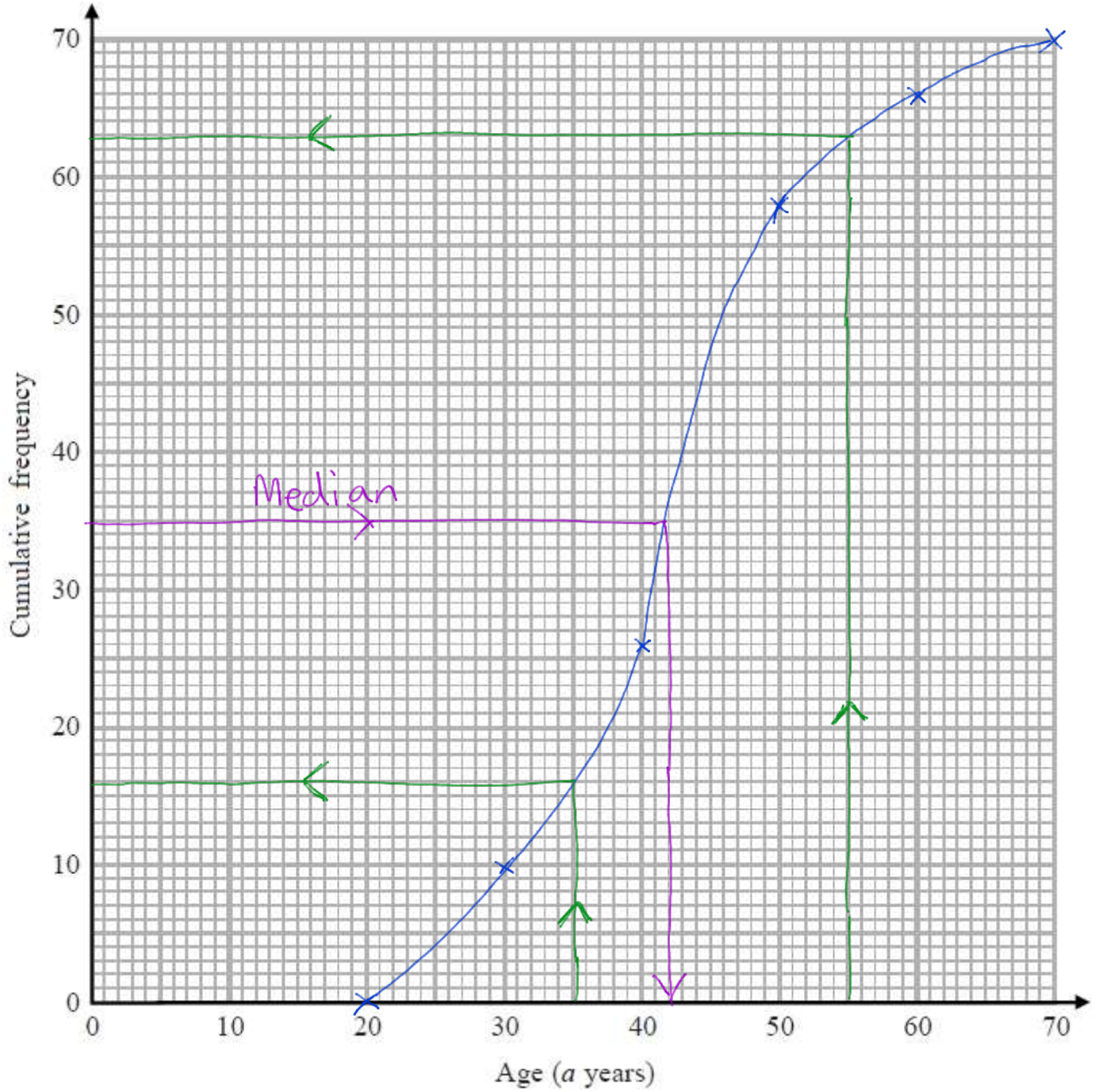

(b) Use your graph to find an estimate for the median age.

42 ..... years

(1)

Francesco says,

"More than 60% of the people in the office are between 35 and 55 years old."

(c) Use your graph to determine if Francesco is correct.

63-16 = 47 $\frac{47}{70} \times 100\%$

Francesco is correct, 67% of people are between 35 and 55 years old.

(3)

(Total for question = 6 marks)

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Q14. CALCULATOR ALLOWED

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

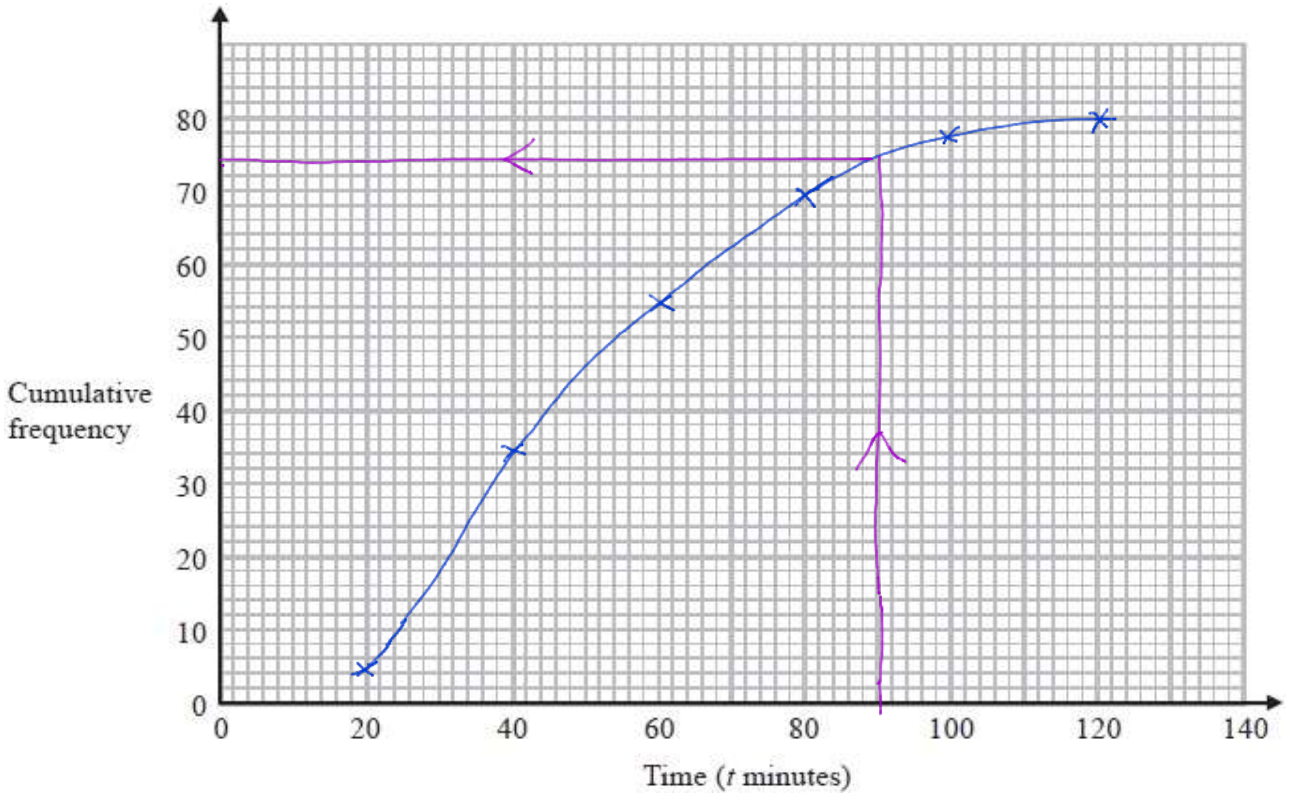
(a) Complete the cumulative frequency table.

running total

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
x	y

(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.

$80 - 74 = 6$

$\frac{6}{80} \times 100\%$

7.5 ..... %

(3)

(Total for question = 6 marks)

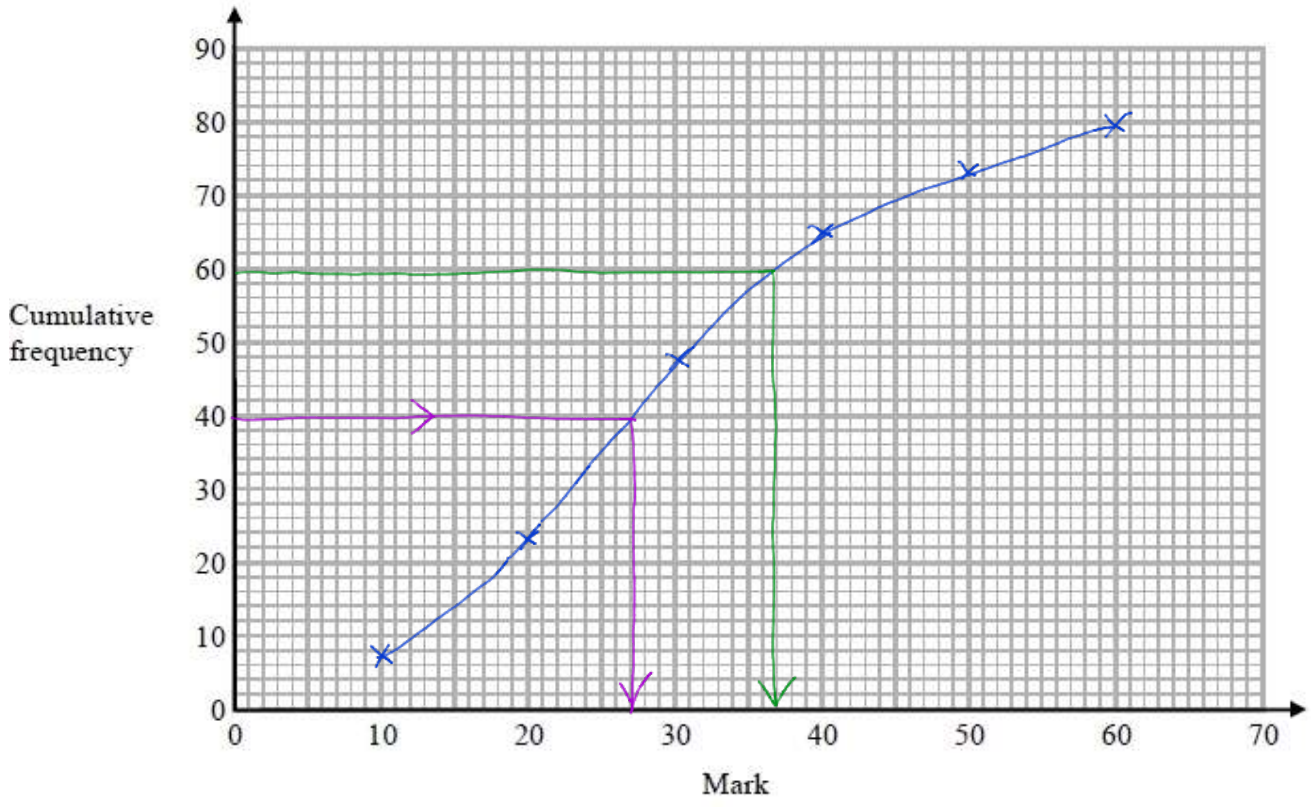
Q15. CALCULATOR ALLOWED

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

x y

(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.

fail : pass

3 : 1

pass = $\frac{1}{3+1}$

= $\frac{1}{4}$

= 25 %

25% of 80 pupils = 20 pupils

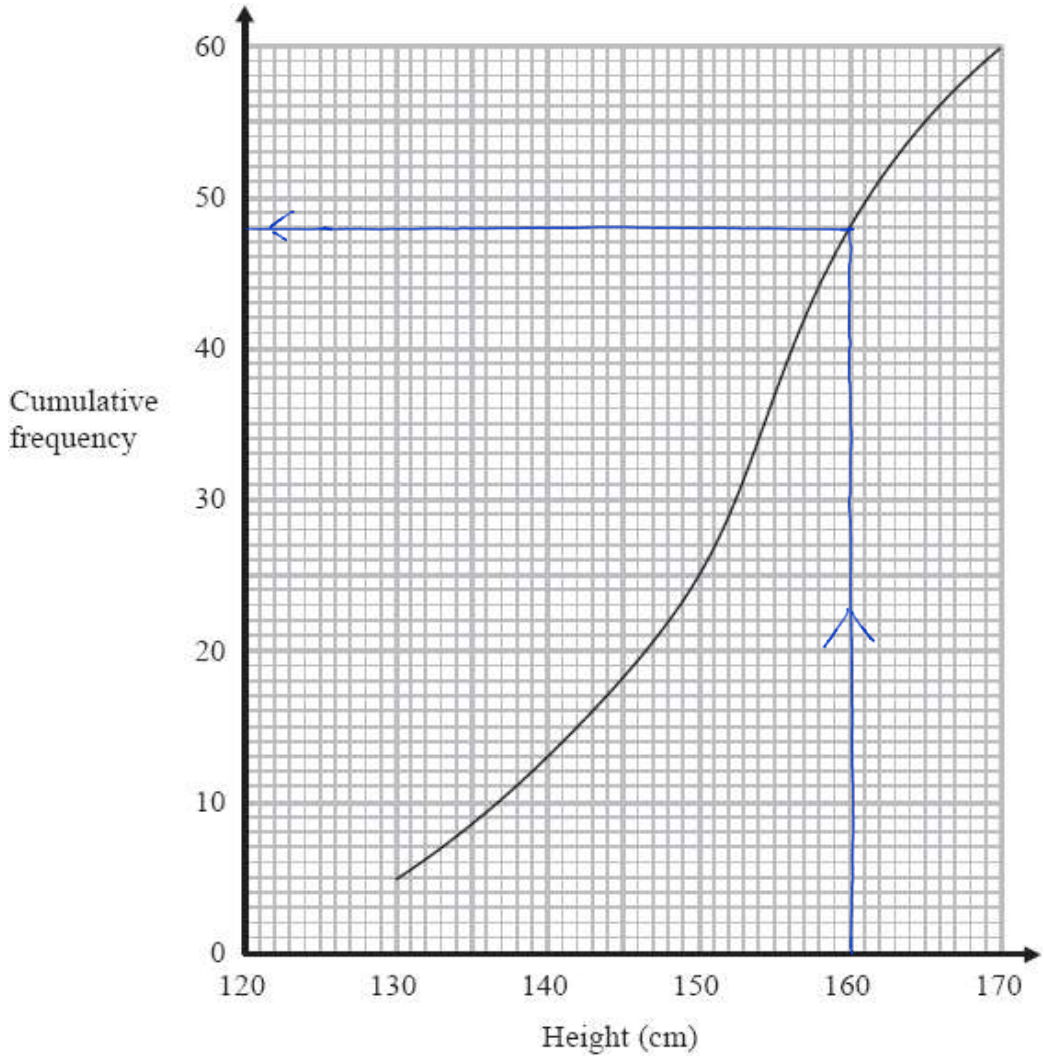
37 marks

(3)

(Total for question = 6 marks)

Q16. CALCULATOR ALLOWED

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

(Total for question = 2 marks)

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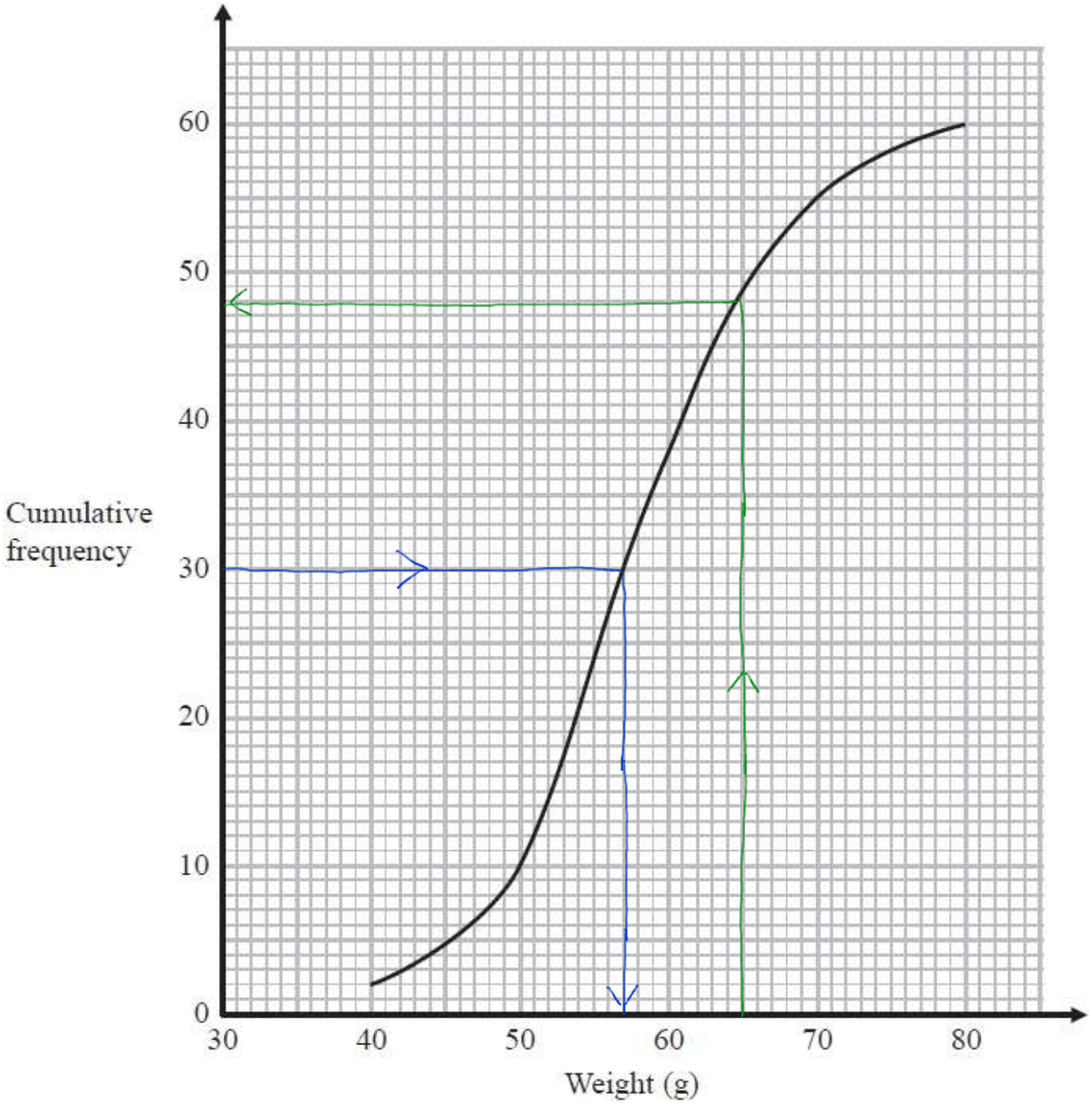
Q17. CALCULATOR ALLOWED

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,

Can we be sure this is the lowest weight?

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

(b) Is Jamil correct?

You must give a reason for your answer.

We don't have any data about the smallest weight, and it isn't plotted either Jamil is wrong.

(1)

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

60 − 48 = 12 potatoes have a weight greater than 65g.

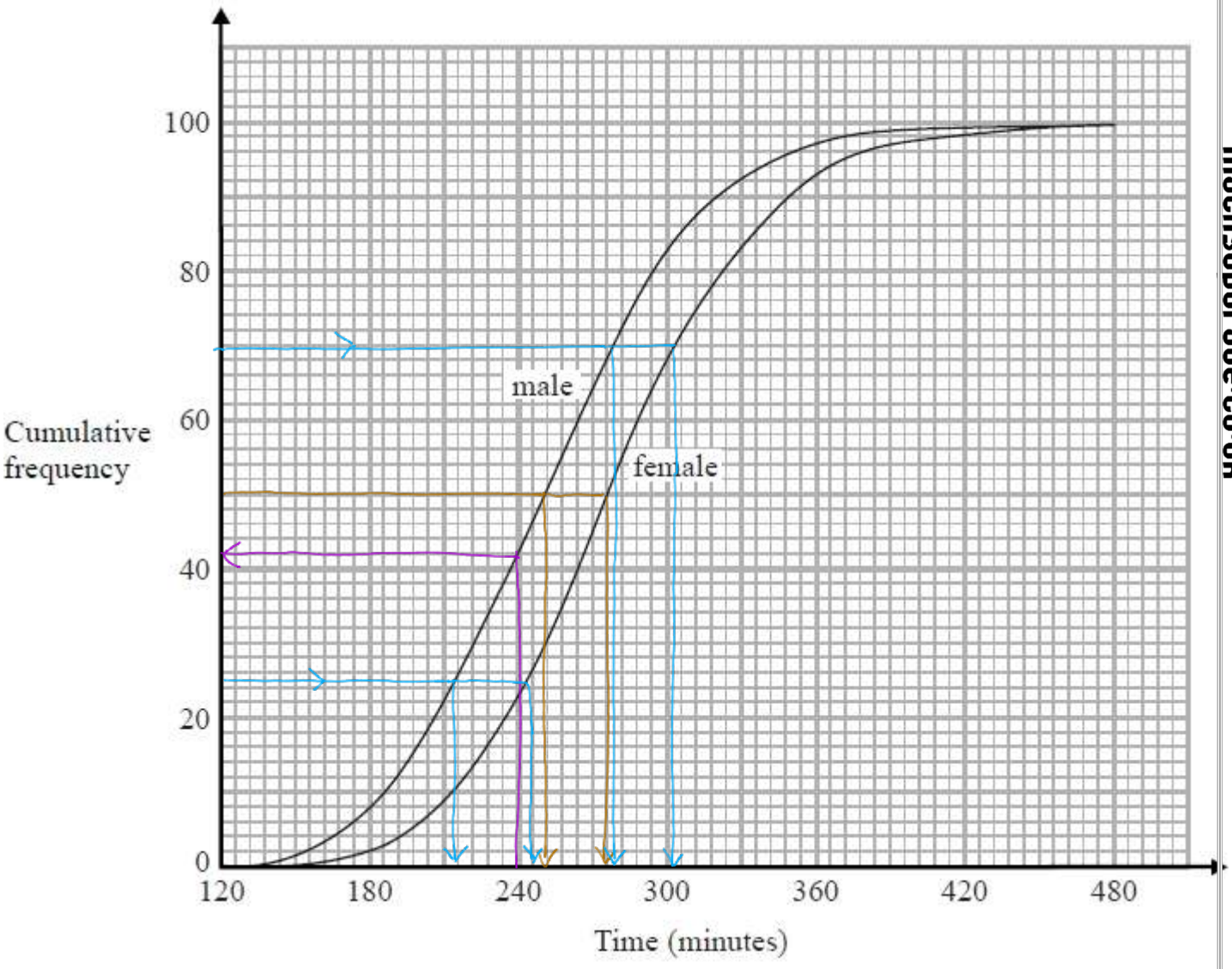
$\frac{12}{60} \times 100\% = 20\%$

(2)

(Total for question = 4 marks)

Q18. CALCULATOR ALLOWED

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.

4 × 60 = 240 minutes

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

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$P(\text{less than 240 minutes}) = \frac{\text{Number that took less than 240 mins}}{\text{Number of male runners}}$

$= \frac{42}{100}$

$\frac{21}{50}$

(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.

	Median	IQR
Male	252	279-216 = 63
Female	276	303-246 = 47

Male runners took less time to complete the marathon than female runners, on average, as shown by their lower median. The lower interquartile range for female runners shows that their times were more similar – male runners' times varied more.

(4)

(Total for question = 6 marks)

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