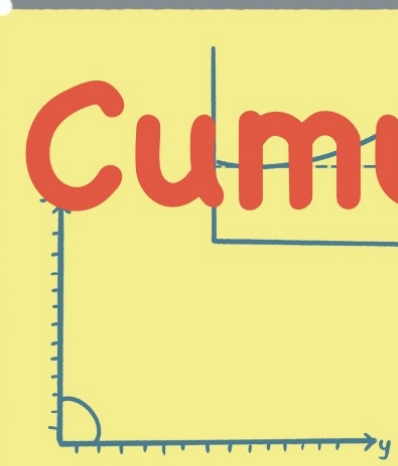
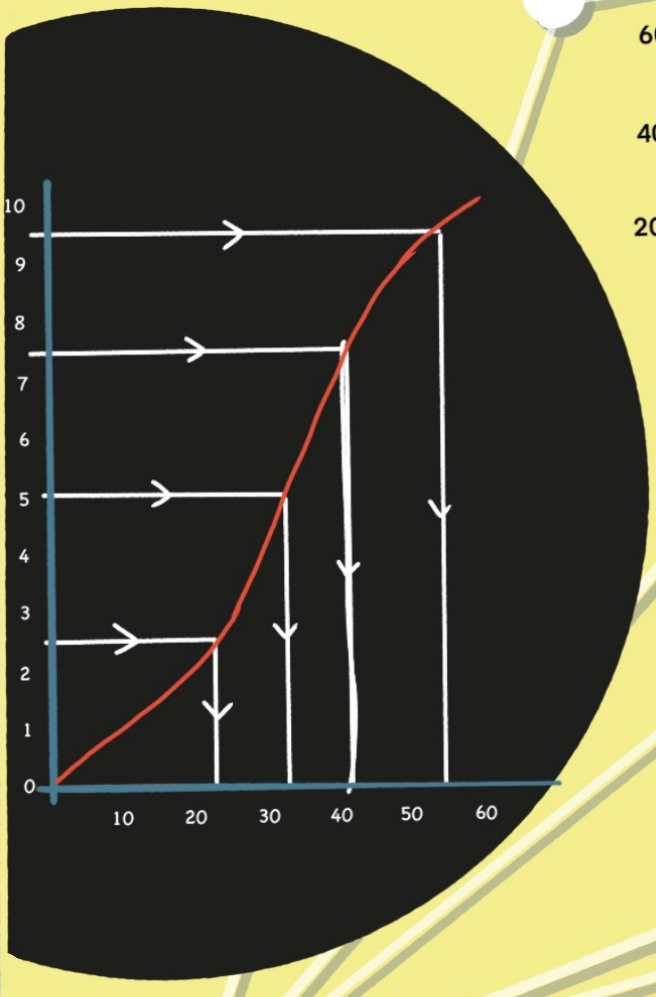
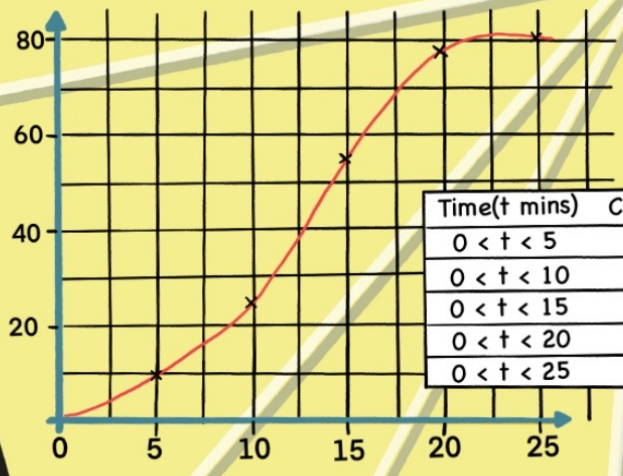
The Maths Society

Cumulative Frequency



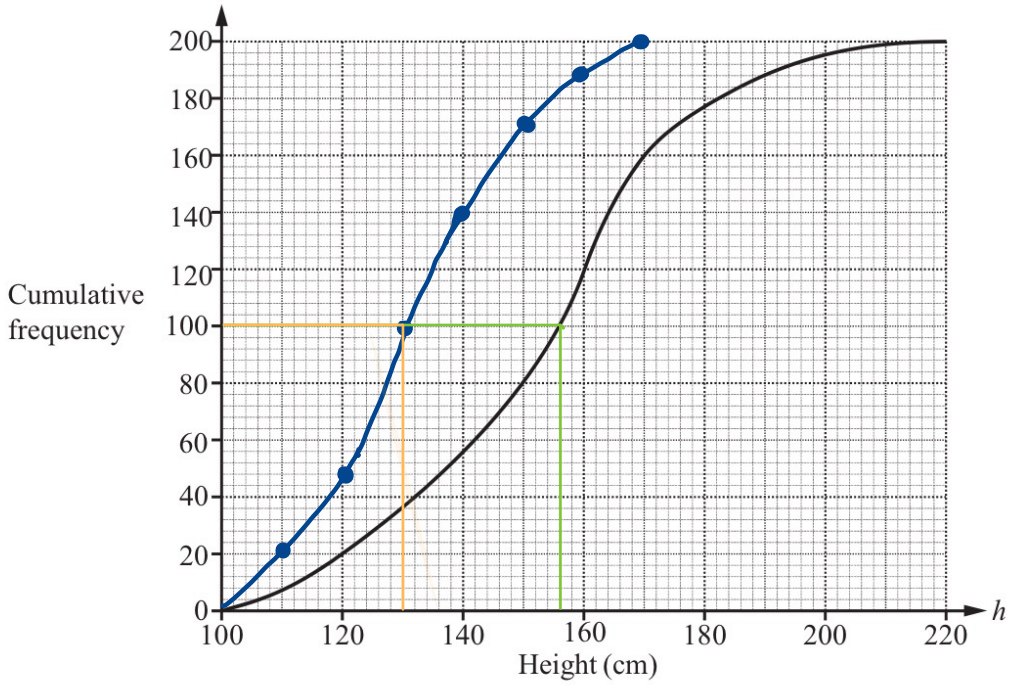




Time(t mins)	Cumu freq
0 < t < 5	10
0 < t < 10	26
0 < t < 15	56
0 < t < 20	78
0 < t < 25	80

Question 1

Simon records the heights, $h$cm, of 200 sunflowers in his garden.
The cumulative frequency diagram shows this information.



(a) Find the number of these sunflowers that have a height of more than 160 cm. [2]

200 − 120 = 80

(b) Sue records the heights, h cm, of 200 sunflowers in her garden.
The cumulative frequency table shows this information. [3]

Height (h cm)	Cumulative frequency
$h \leqslant 100$	0
$h \leqslant 110$	20
$h \leqslant 120$	48
$h \leqslant 130$	100
$h \leqslant 140$	140
$h \leqslant 150$	172
$h \leqslant 160$	188
$h \leqslant 170$	200

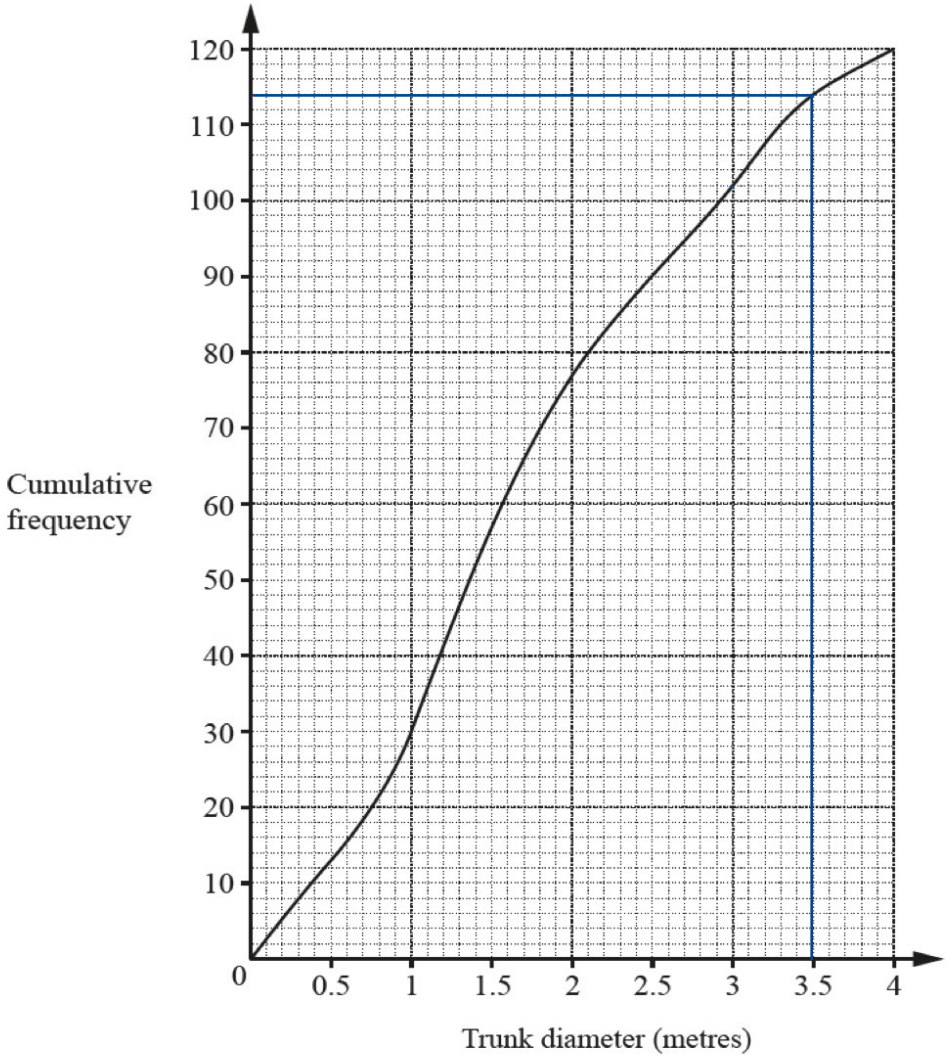
On the grid above, draw another cumulative frequency diagram to show this information.

(c) Work out the difference between the median heights of Simon's sunflowers and Sue's sunflowers. [2]

156 − 130 = 26 cm

Question 2

The cumulative frequency diagram shows information about the trunk diameter, in metres, of 120 trees.



Find

(a) the inter-quartile range, [2]

LQ = 1, UQ = 2.5 , IQ = 2.5 − 1 = 1.5

(b) the 95th percentile, [2]

3.5

(c) the number of trees with a trunk diameter greater than 3 metres. [2]

120 − 102 = 18

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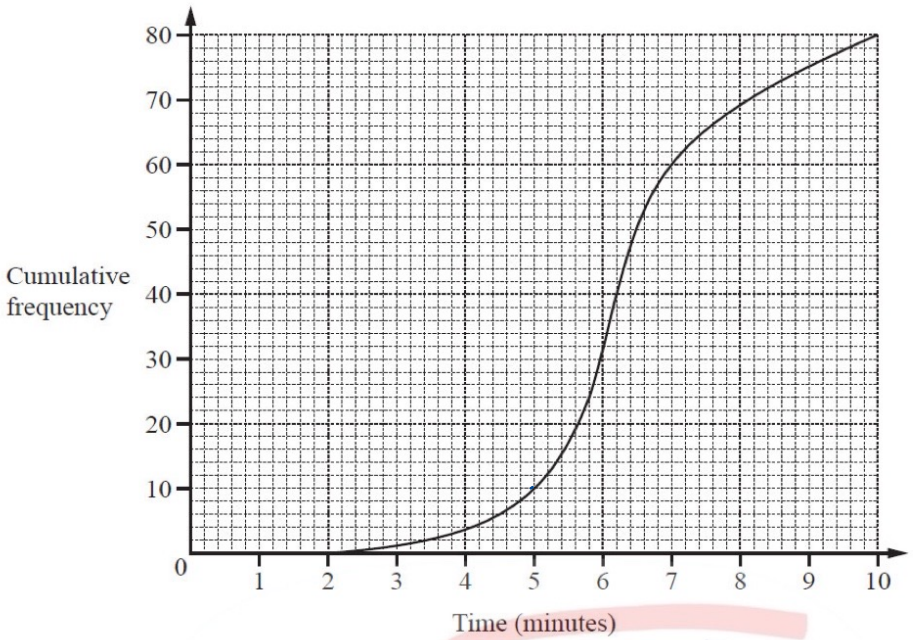
Question 3



The cumulative frequency diagram shows information about the times, in minutes, taken by 80 students to complete a short test.

Find

(a) the median,

6.2

[1]

(b) the 30th percentile,

5.8

[2]

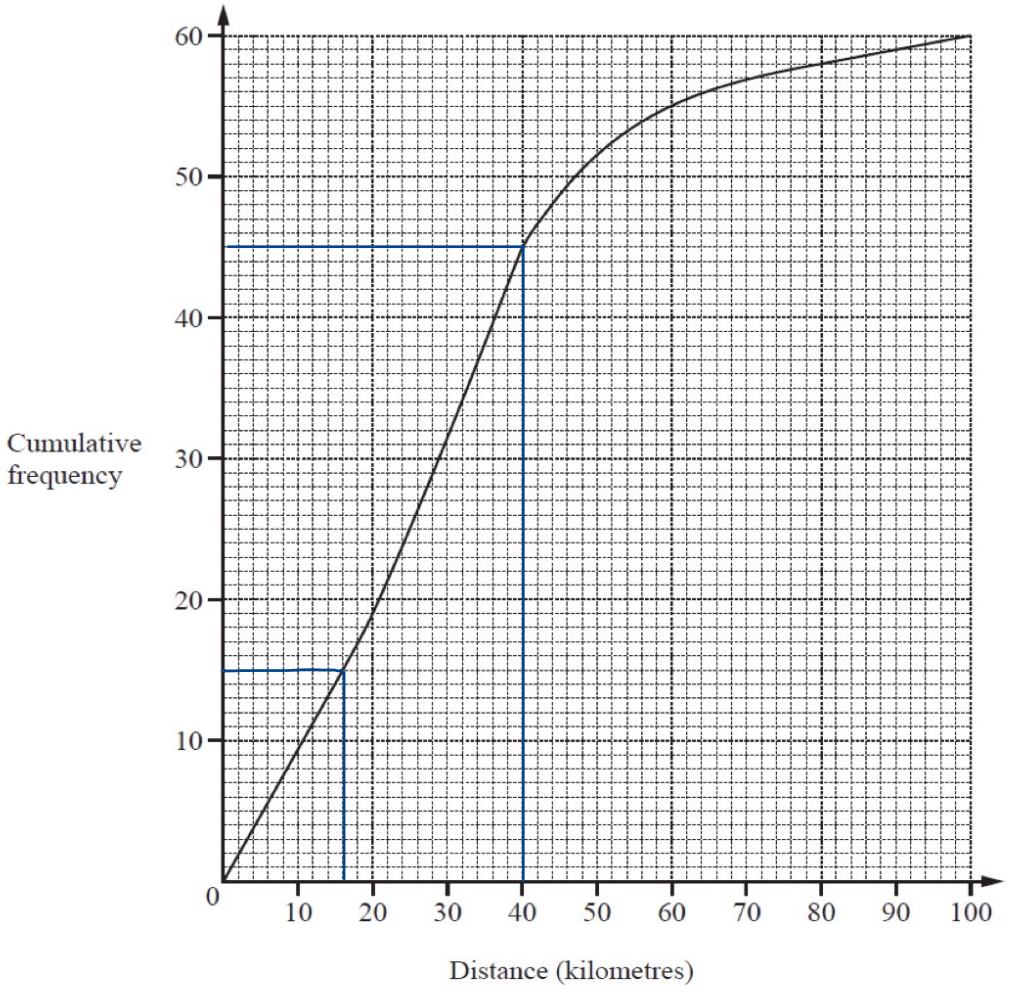
(c) the number of students taking more than 5 minutes.

80 − 10 = 70

[2]

Question 4

The cumulative frequency diagram shows information about the distances travelled, in kilometres, by 60 people.



Find

(a) the 80th percentile,

44

[2]

(b) the inter-quartile range,

LQ = 16 , UQ = 40

IQ = 40 − 16 = 24

[2]

(c) the number of people who travelled more than 60 km.

60 − 55 = 5

[2]

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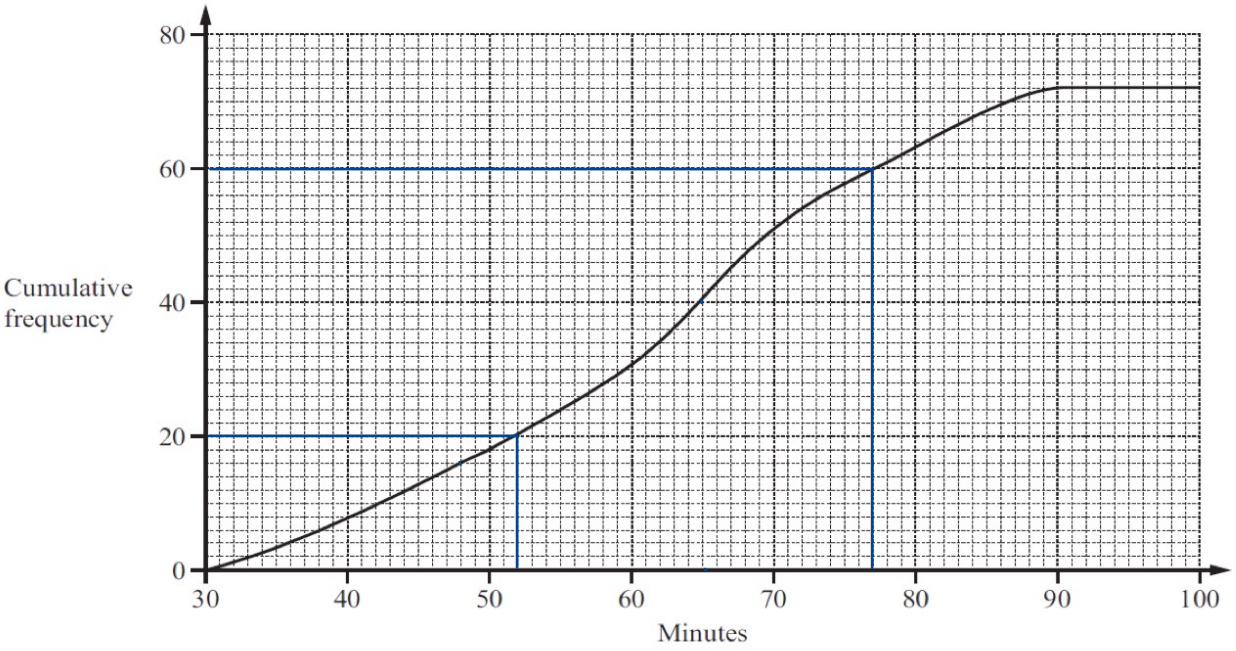
Question 5

72 students are given homework one evening.
They are told to spend no more than 100 minutes completing their homework.
The cumulative frequency diagram shows the number of minutes they spend.



(a) How many students spent more than 48 minutes completing their homework? [2]

80 − 16 = 64

(b) Find

(i) the median, [1]

65

(ii) the inter-quartile range. [2]

LQ = 52, UQ = 76

IQ = 76 − 52 = 24

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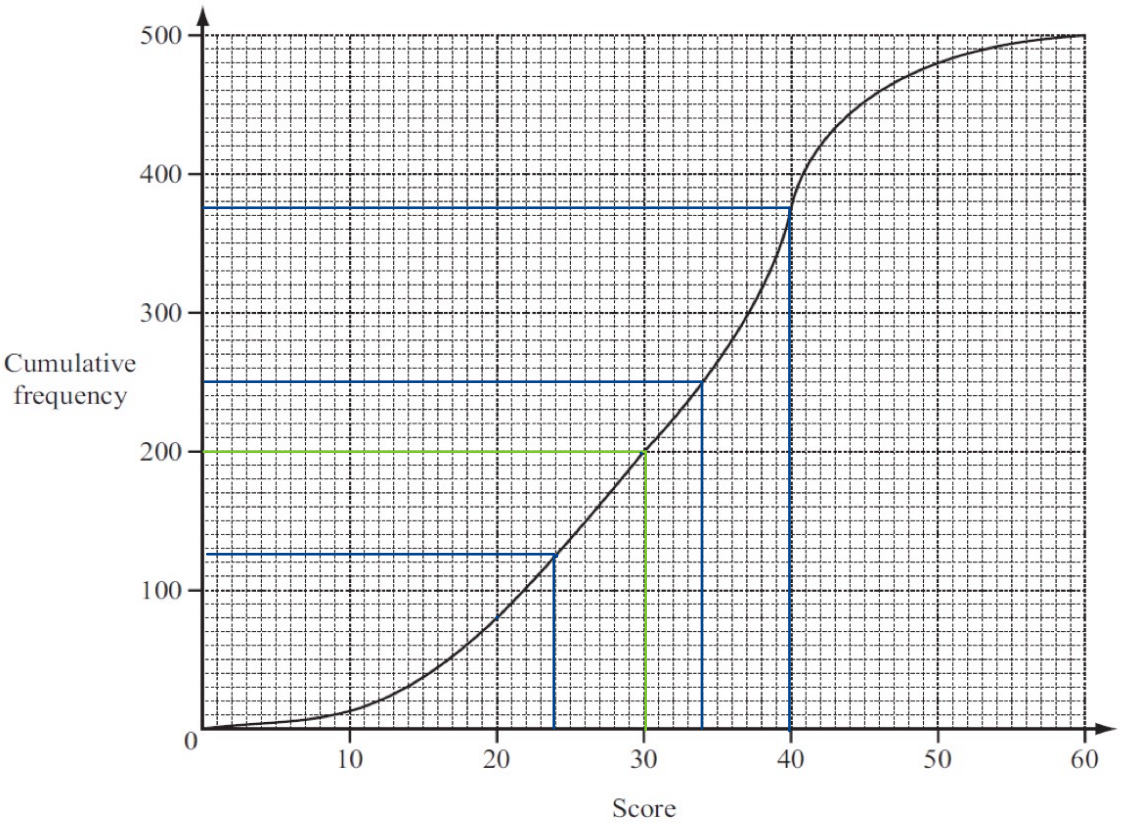
Question 1

Jenna draws a cumulative frequency diagram to show information about the scores of 500 people in a quiz.



Use the diagram to find

(a) the median score, [1]

34

(b) the inter-quartile range, [2]

LQ = 24, UQ = 40

IQ = 40 − 24 = 16

(c) the 40th percentile, [1]

30

(d) the number of people who scored 30 or less but more than 20. [1]

200 − 80 = 160

Question 2

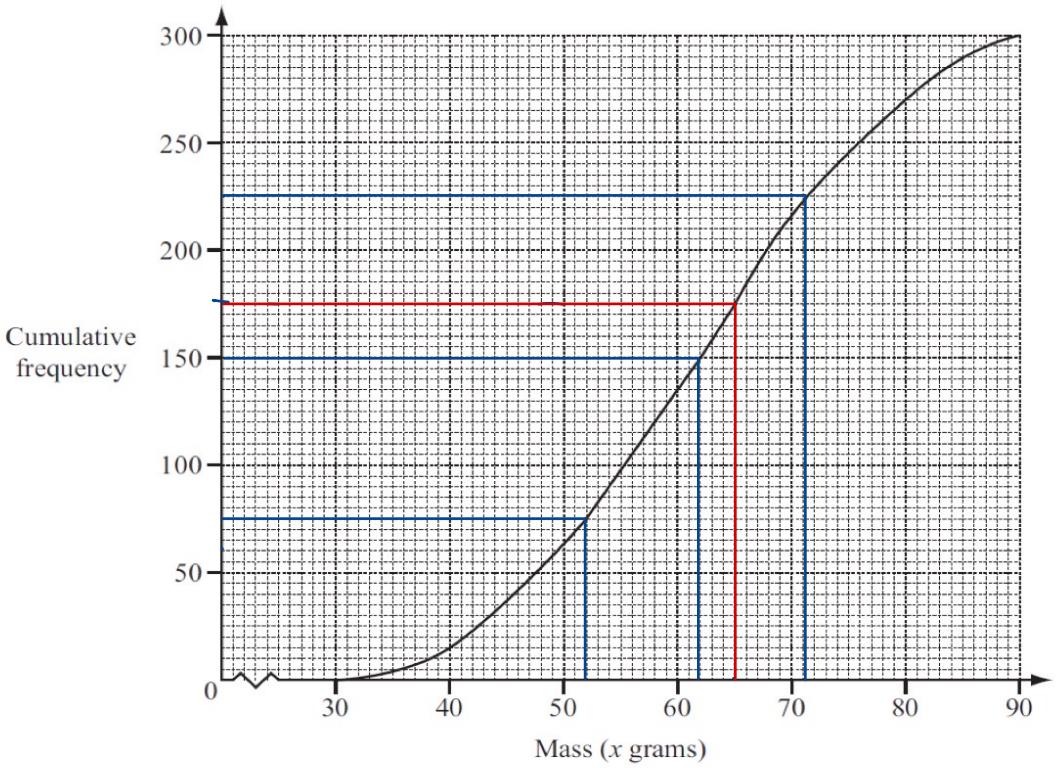
Lauris records the mass and grade of 300 eggs. The table shows the results.

Mass (x grams)	$30 < x \leqslant 40$	$40 < x \leqslant 50$	$50 < x \leqslant 60$	$60 < x \leqslant 70$	$70 < x \leqslant 80$	$80 < x \leqslant 90$
Frequency	15	48	72	81	54	30
Grade	small		medium	large	very large	

(a) Find the probability that an egg chosen at random is graded very large.

$\frac{94}{300} = \frac{47}{150}$ [1]

(b) The cumulative frequency diagram shows the results from the table.



Use the cumulative frequency diagram to find

(i) the median, 62 [1]

(ii) the lower quartile, 52 [1]

(iii) the inter-quartile range, $71 - 52 = 21$ [1]

(iv) the number of eggs with a mass greater than 65 grams.

$300 - 175 = 125$ [2]

Question 3

Mass of parcel (m kilograms)	$0 < m \leqslant 0.5$	$0.5 < m \leqslant 1.5$	$1.5 < m \leqslant 3$
Frequency	20	18	9

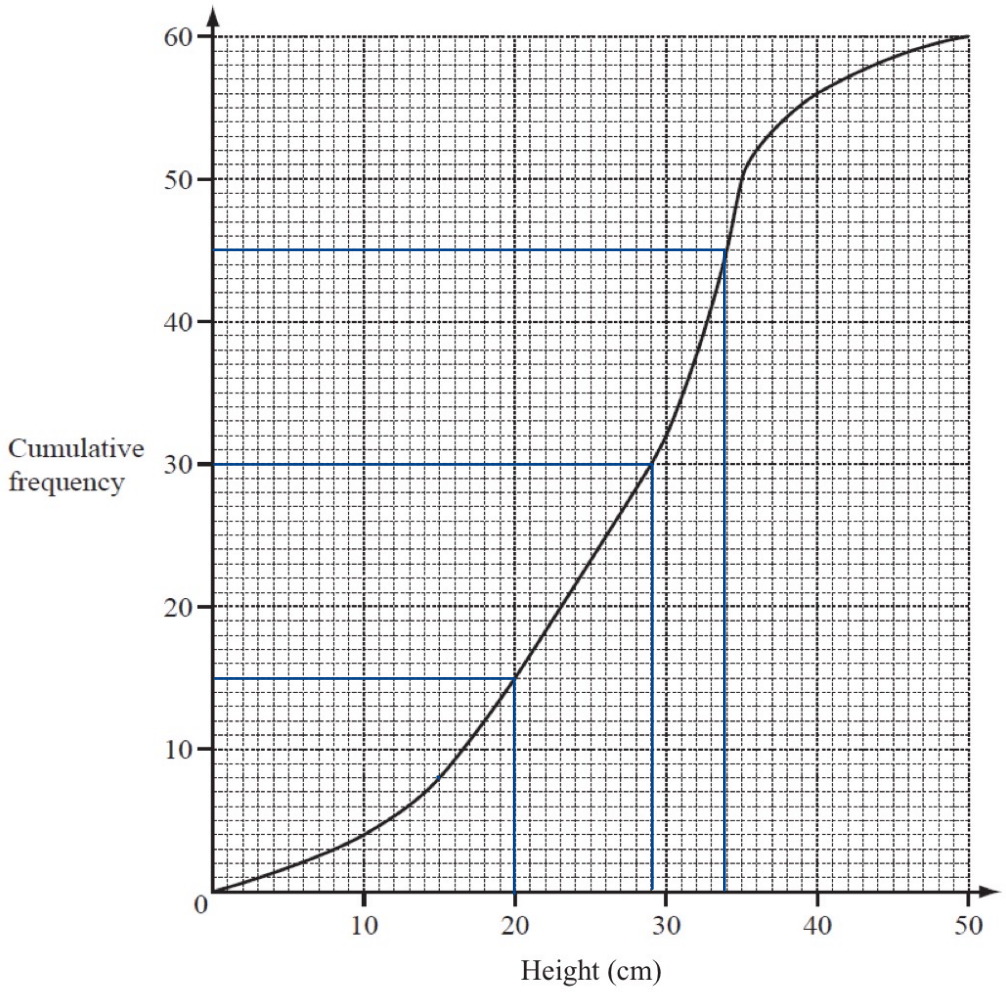
The table above shows information about parcels in a delivery van.

John wants to draw a histogram using this information.
Complete the table below.

Mass of parcel (m kilograms)	$0 < m \leqslant 0.5$	$0.5 < m \leqslant 1.5$	$1.5 < m \leqslant 3$
Frequency density	40	18	6

[2]

Question 4



The cumulative frequency diagram shows information about the heights of 60 tomato plants.
Use the diagram to find

(a) the median,

29

[1]

(b) the lower quartile,

20

[1]

(c) the interquartile range,

34 − 20 = 14

[1]

(d) the probability that the height of a tomato plant, chosen at random, will be more than 15 cm.

60 − 8 = 52

[2]

$\frac{52}{60} = \frac{13}{15}$

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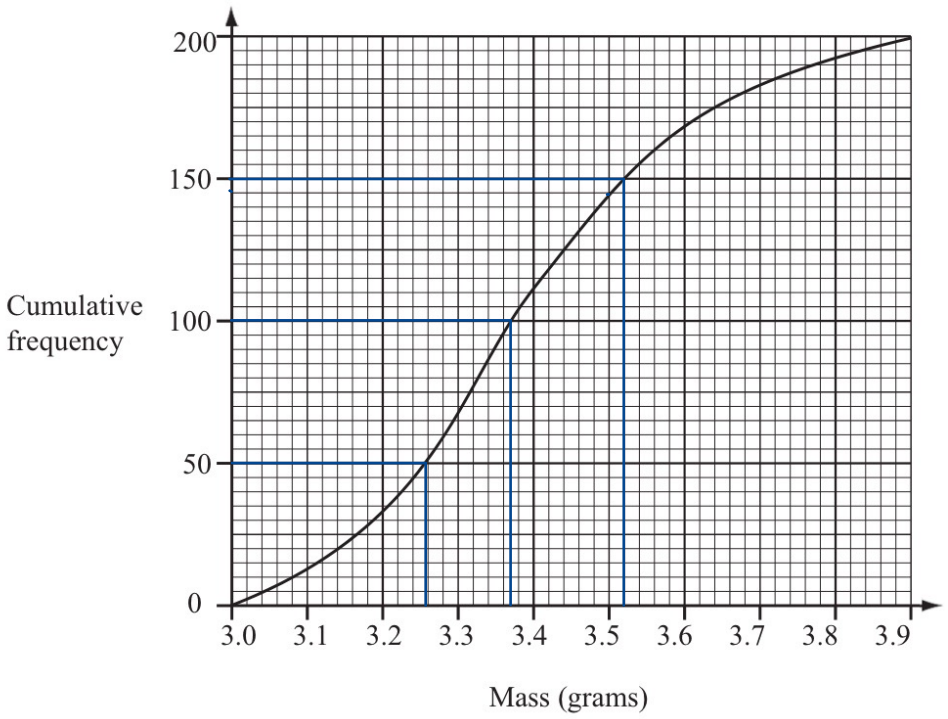
Question 5

The mass of each of 200 tea bags was checked by an inspector in a factory.
The results are shown by the cumulative frequency curve.



Use the cumulative frequency curve to find

(a) the median mass, [1]

3.37

(b) the interquartile range, [2]

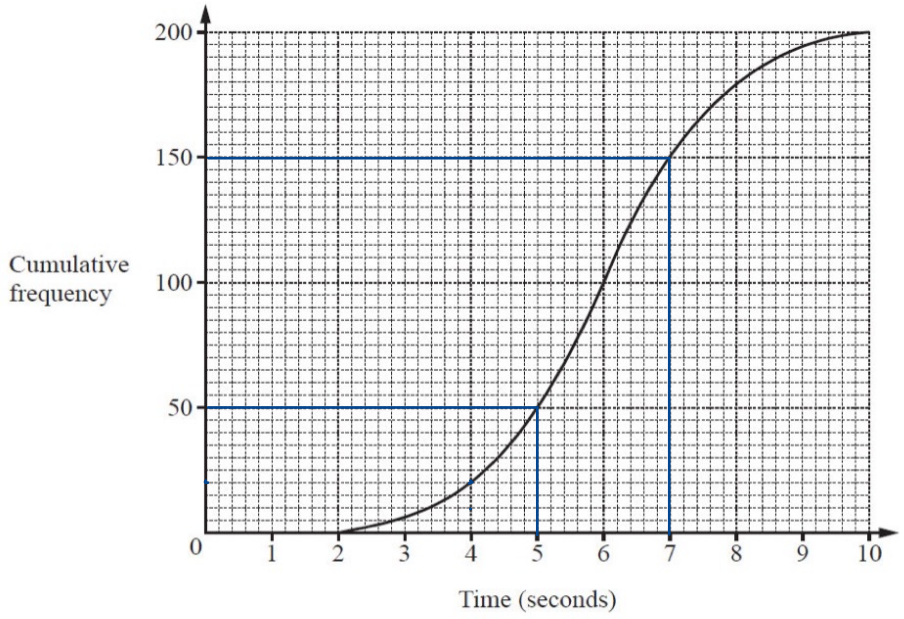
LQ = 3.26 , UQ = 3.52

IQ = 3.52 − 3.26 = 0.26

(c) the number of tea bags with a mass greater than 3.5 grams. [1]

200 − 145 = 55

Question 1



200 students take a reaction time test.
The cumulative frequency diagram shows the results.

Find

(a) the median,

6

[1]

(b) the inter-quartile range,

LQ = 5, UQ = 7

IQ = 7 − 5 = 2

[2]

(c) the number of students with a reaction time of more than 4 seconds.

200 − 20 = 180

[2]

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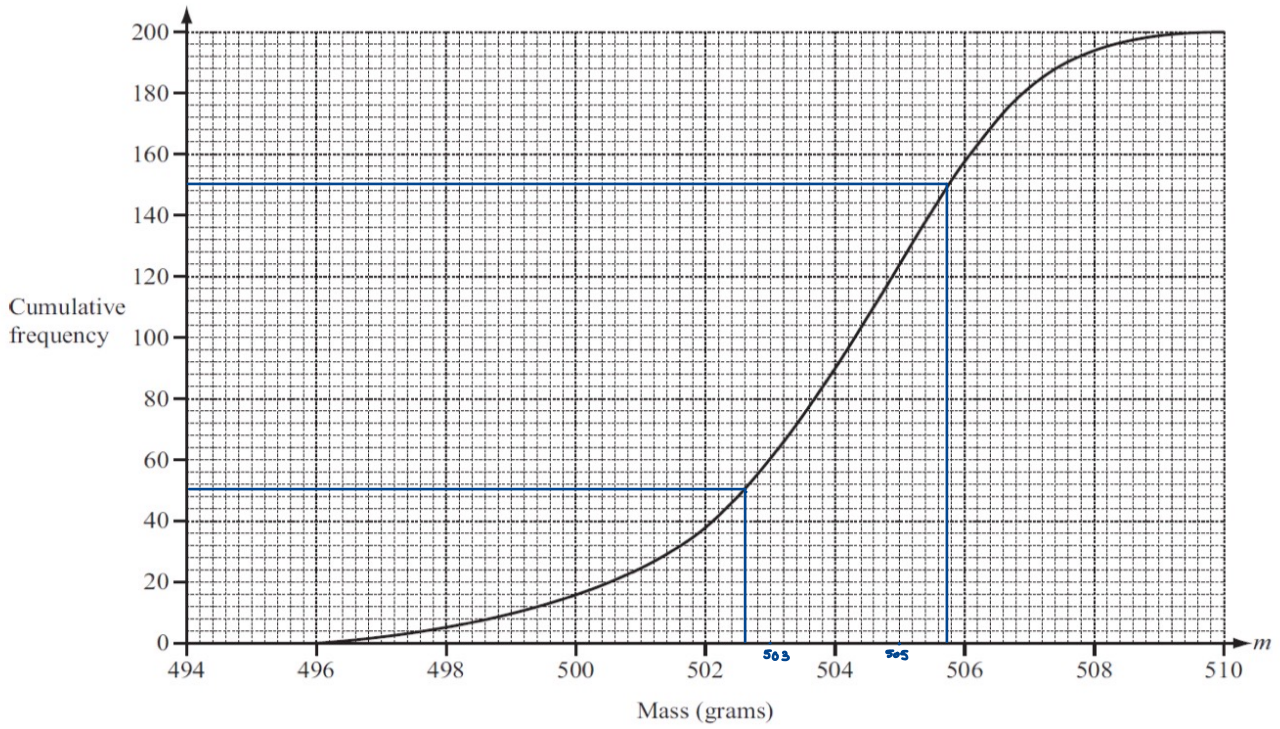
Question 2

The mass, m grams, of cornflakes in each of 200 boxes is recorded.
The cumulative frequency diagram shows the results.



(a) Use the diagram to estimate the inter-quartile range. [2]

LQ = 502.6 , UQ = 505.8

IQ = 505.8 − 502.6 = 3.2

(b) Find the probability that a box chosen at random has a mass of 500 grams or less. [2]

$\frac{16}{200} = \frac{2}{25}$

(c)

Mass (m grams)	$496 < m \leqslant 500$	$500 < m \leqslant 504$	$504 < m \leqslant 508$	$508 < m \leqslant 510$
Frequency	16	74	104	6

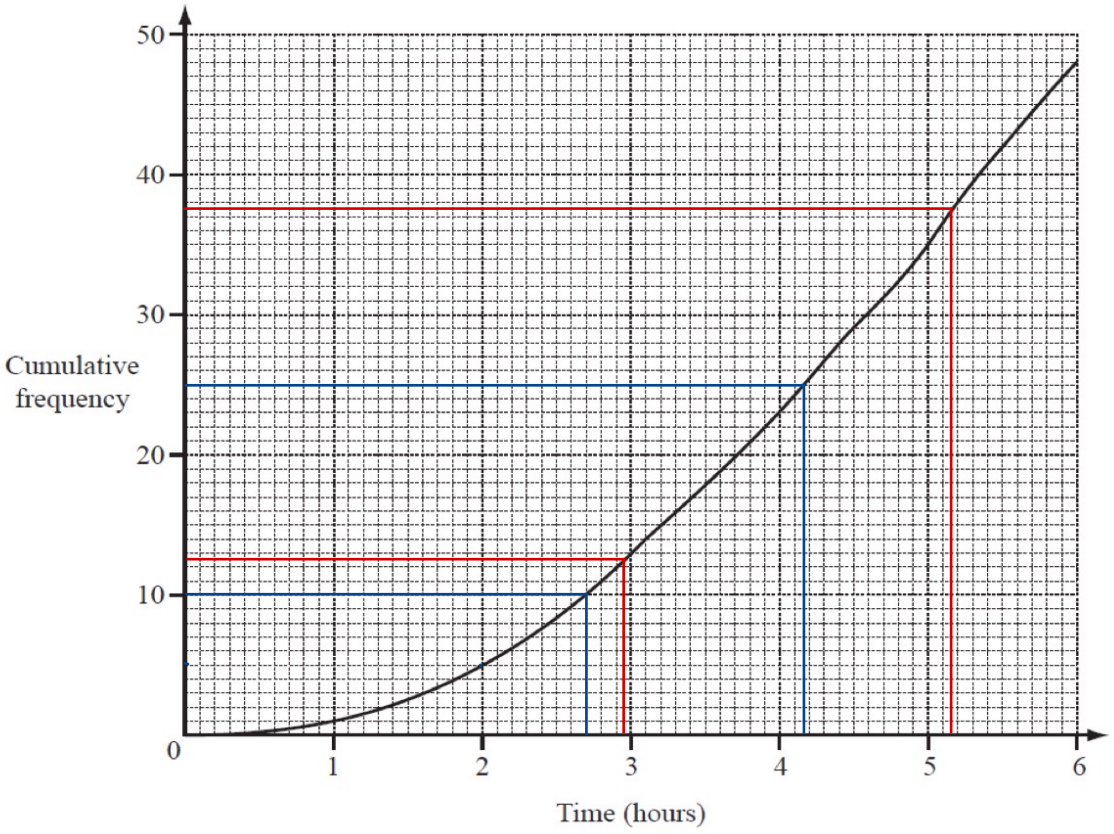
The data in this frequency table is to be shown in a histogram.

Complete the frequency density table below. [2]

Mass (m grams)	$496 < m \leqslant 500$	$500 < m \leqslant 504$	$504 < m \leqslant 508$	$508 < m \leqslant 510$
Frequency density	4	18.5	26	1.5

Question 3

During one day 48 people visited a museum.
The length of time each person spent in the museum was recorded.
The results are shown on the cumulative frequency diagram.



Work out

(a) the median, [1]

4.15

(b) the 20th percentile, [2]

2.7

(c) the inter-quartile range, [2]

LQ = 2.95, UQ = 5.15

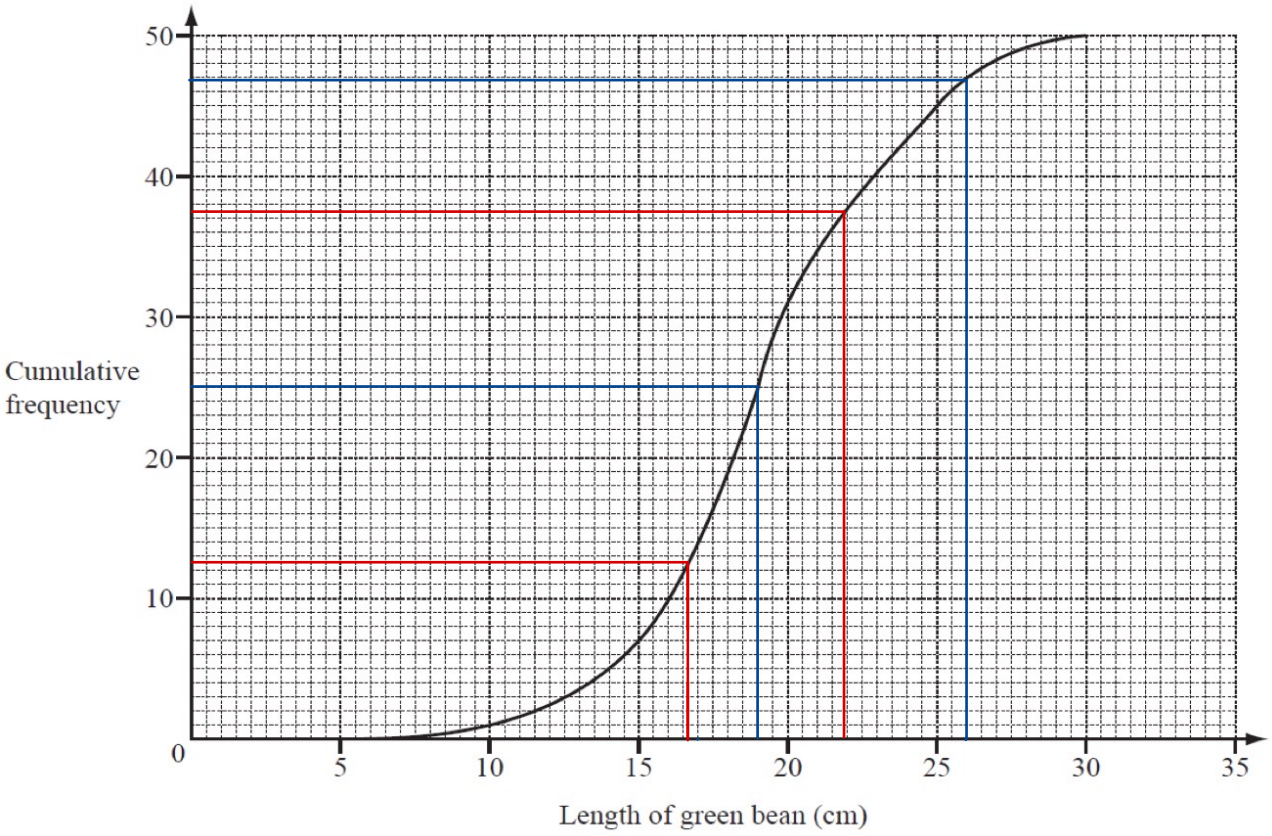
IQ = 5.15 − 2.95 = 2.2

(d) the probability that a person chosen at random spends 2 hours or less in the museum. [2]

$\frac{5}{50} = \frac{1}{10}$

Question 4

A gardener measured the lengths of 50 green beans from his garden.
The results have been used to draw this cumulative frequency diagram.



Work out

(a) the median, [1]

19

(b) the number of green beans that are longer than 26 cm, [2]

50 − 47 = 3

(c) the inter-quartile range, [2]

LQ = 16.5, UQ = 22

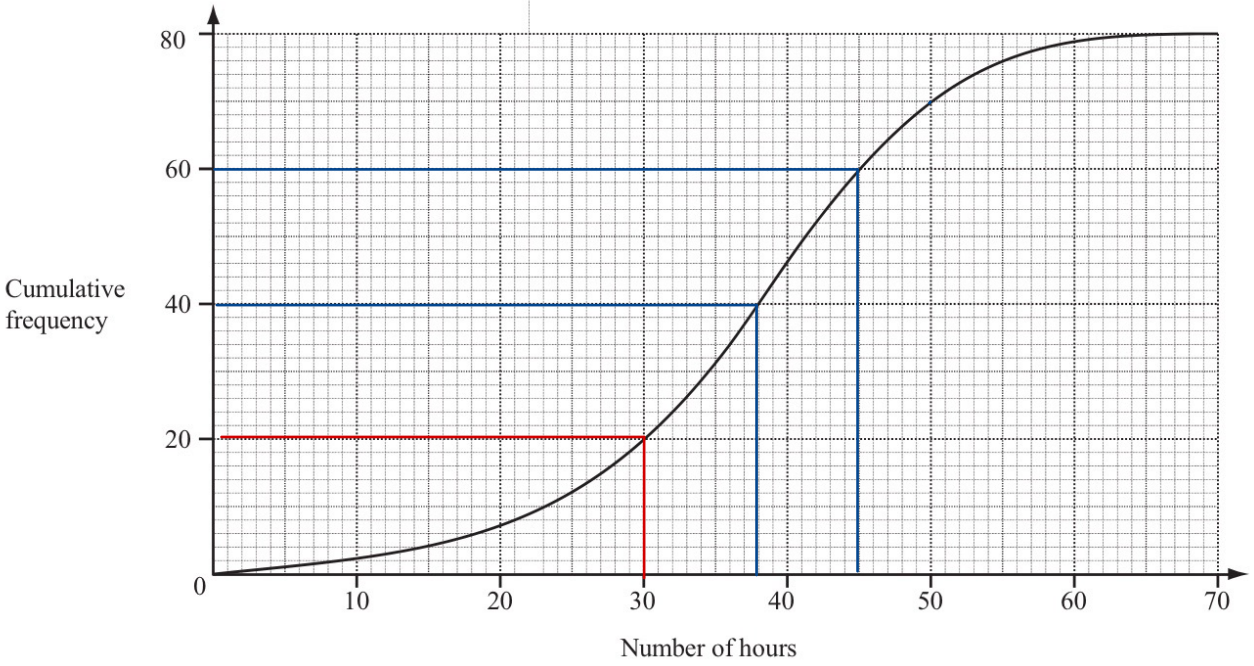
IQ = 22 − 16.5 = 5.5

(d) the probability that a green bean chosen at random is more than 14 cm long. [2]

$\frac{45}{50} = \frac{9}{10}$

Question 5

The number of hours that a group of 80 students spent using a computer in a week was recorded. The results are shown by the cumulative frequency curve.



Use the cumulative frequency curve to find

(a) the median,

38

[1]

(b) the upper quartile,

45

[1]

(c) the interquartile range,

45 - 30 = 15

[1]

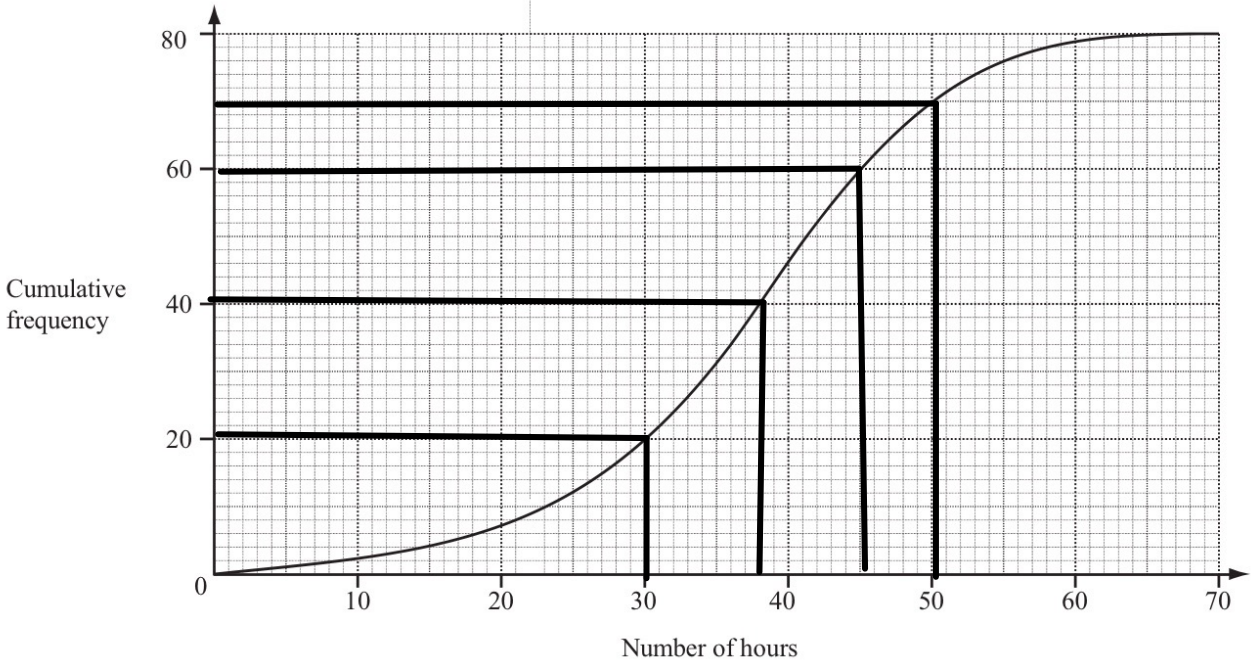
(d) the number of students who spent more than 50 hours using a computer in a week.

80 - 70 = 10

[2]

Question 5

The number of hours that a group of 80 students spent using a computer in a week was recorded. The results are shown by the cumulative frequency curve.



Use the cumulative frequency curve to find

(a) the median,

38

[1]

(b) the upper quartile,

45

[1]

(c) the interquartile range,

45 - 30 = 15

[1]

(d) the number of students who spent more than 50 hours using a computer in a week.

80 - 70 = 10

[2]

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