

CUMULATIVE FREQUENCY

DATE OF SOLUTIONS: 15/05/2018
MAXIMUM MARK: 37

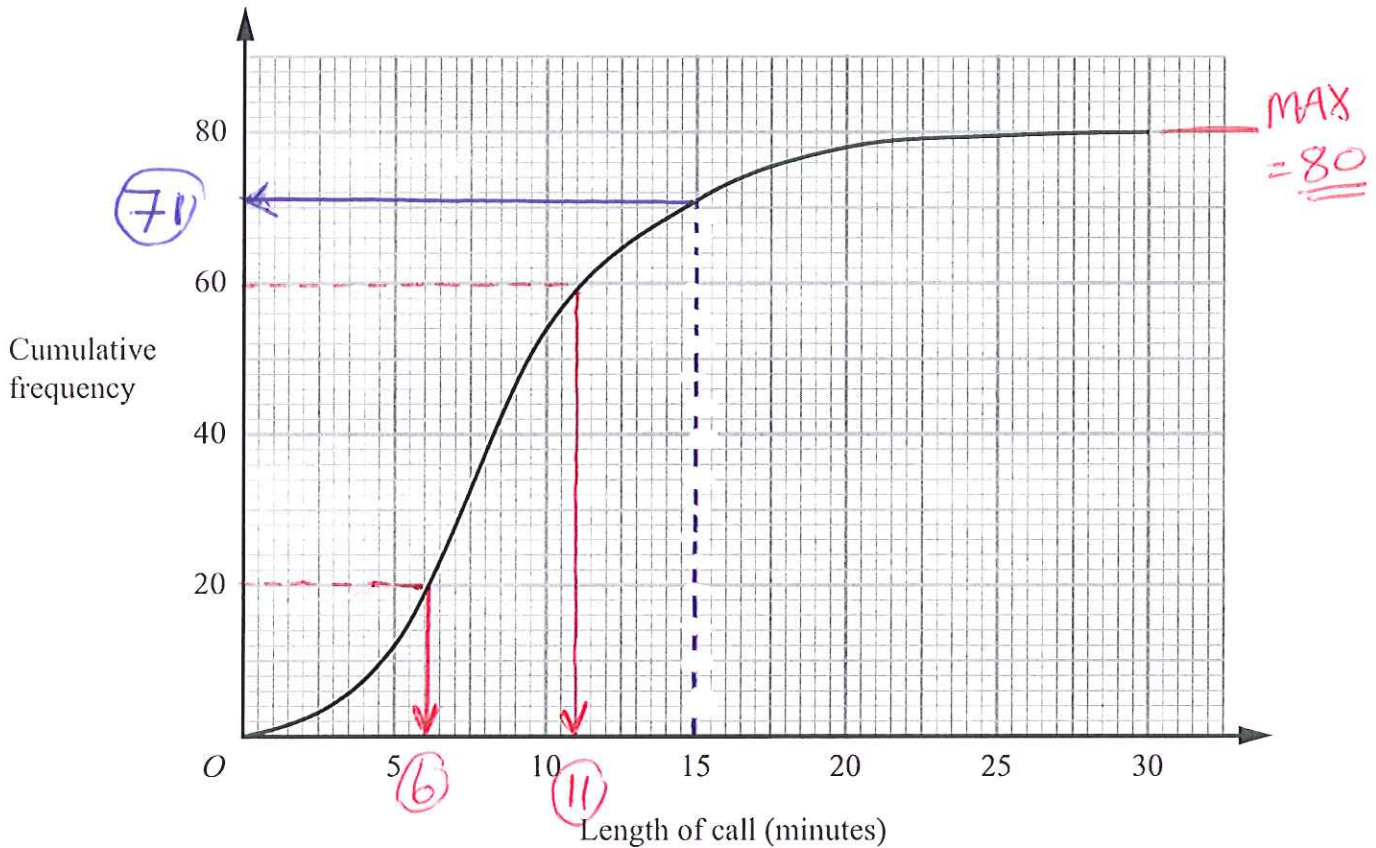
SOLUTIONS

GCSE (+ IGCSE) EXAM QUESTION PRACTICE

1. [Edexcel, 2012]

Cumulative Frequency (Inc Interquartile Range) [4 Marks]

The cumulative frequency graph gives information about the lengths, in minutes, of 80 telephone calls.



(a) Find an estimate for the number of calls which were longer than 15 minutes.

$$80 - 71 \quad (m1)$$

$$\frac{9}{(2)} \quad (A1)$$

(b) Find an estimate for the interquartile range of the lengths of the 80 calls.

(ACCEPT 9 → 10)

$$Q_1 = \frac{80}{4} = 20^{th} = 6$$

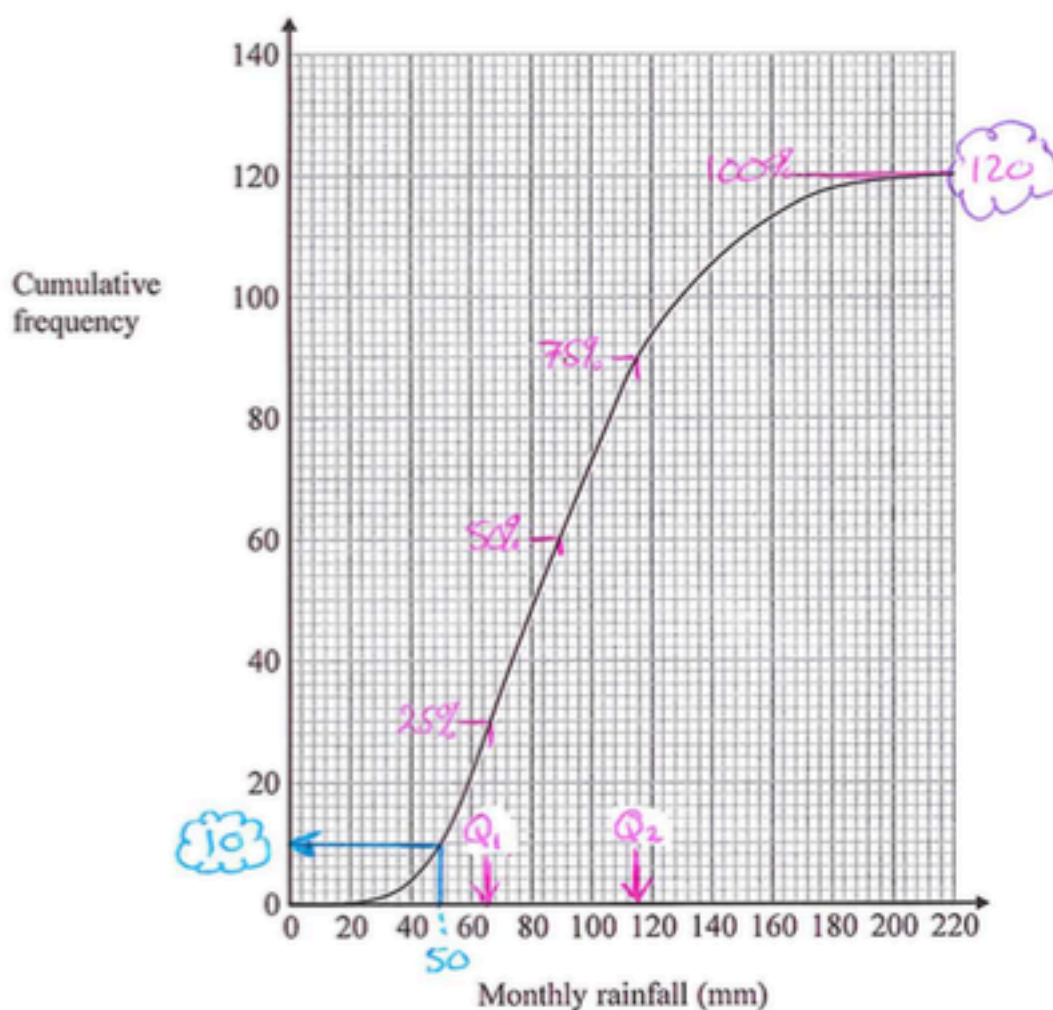
$$Q_3 - Q_1 = 11 - 6$$

$$Q_3 = 3 \times \frac{80}{4} = 60^{th} = 11$$

$$\frac{5}{(2)} \text{ minutes} \quad (A1)$$

(ACCEPT 4.5 → 5.5)

The cumulative frequency graph gives information about the monthly rainfall, in millimetres, in the United Kingdom during 120 months in the years 2001 to 2010.



- (a) Use the graph to estimate the number of months for which rainfall was less than 50 mm.

10 (AI)
(1)

- (b) Use the graph to find an estimate for the median monthly rainfall.

$$\frac{120}{2} = 60\text{th VALUE}$$

90 (AD) mm
(1)

- (c) Use the graph to find an estimate for the interquartile range of the monthly rainfall.

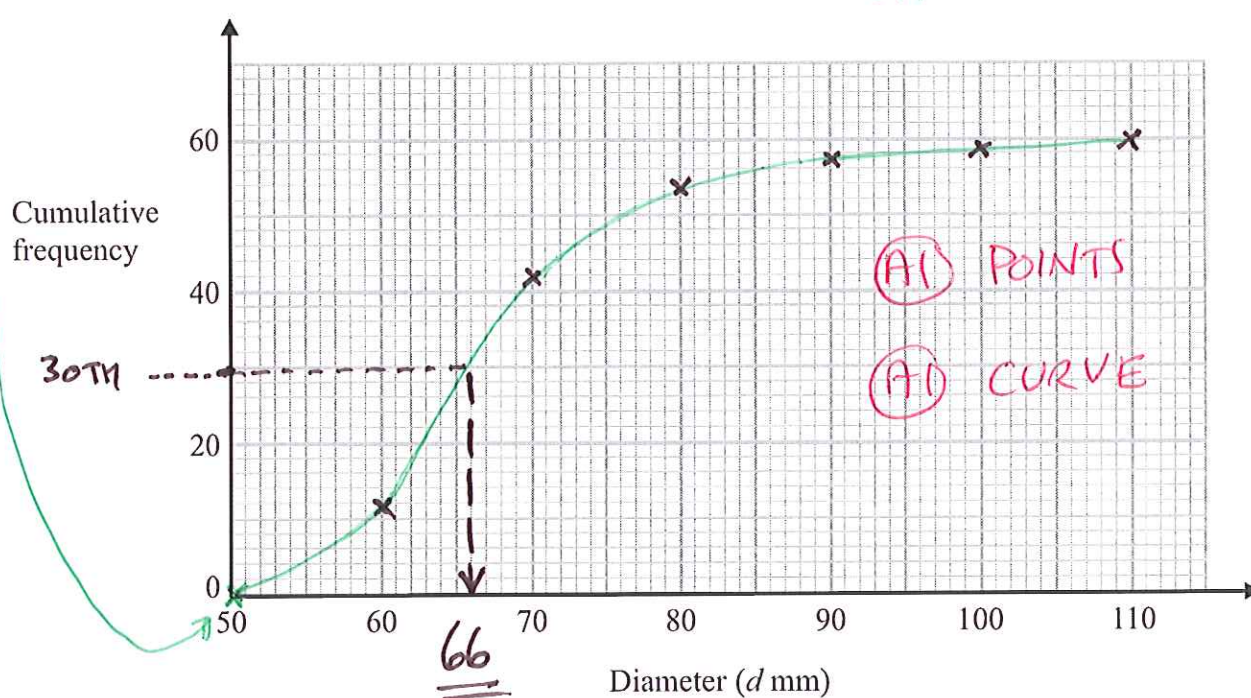
$$\begin{aligned} \text{IQR} &= Q_3 - Q_1 \\ &= 116 - 66 \end{aligned}$$

50 (AI) mm
(2)

The cumulative frequency table shows information about the diameters of 60 oranges.

Diameter (d mm)	Cumulative frequency	COORDINATES
$50 < d \leq 60$	12	$(60, 12)$
$50 < d \leq 70$	42	$(70, 42)$
$50 < d \leq 80$	54	$(80, 54)$
$50 < d \leq 90$	57	$(90, 57)$
$50 < d \leq 100$	59	$(100, 59)$
$50 < d \leq 110$	60	$(110, 60)$

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

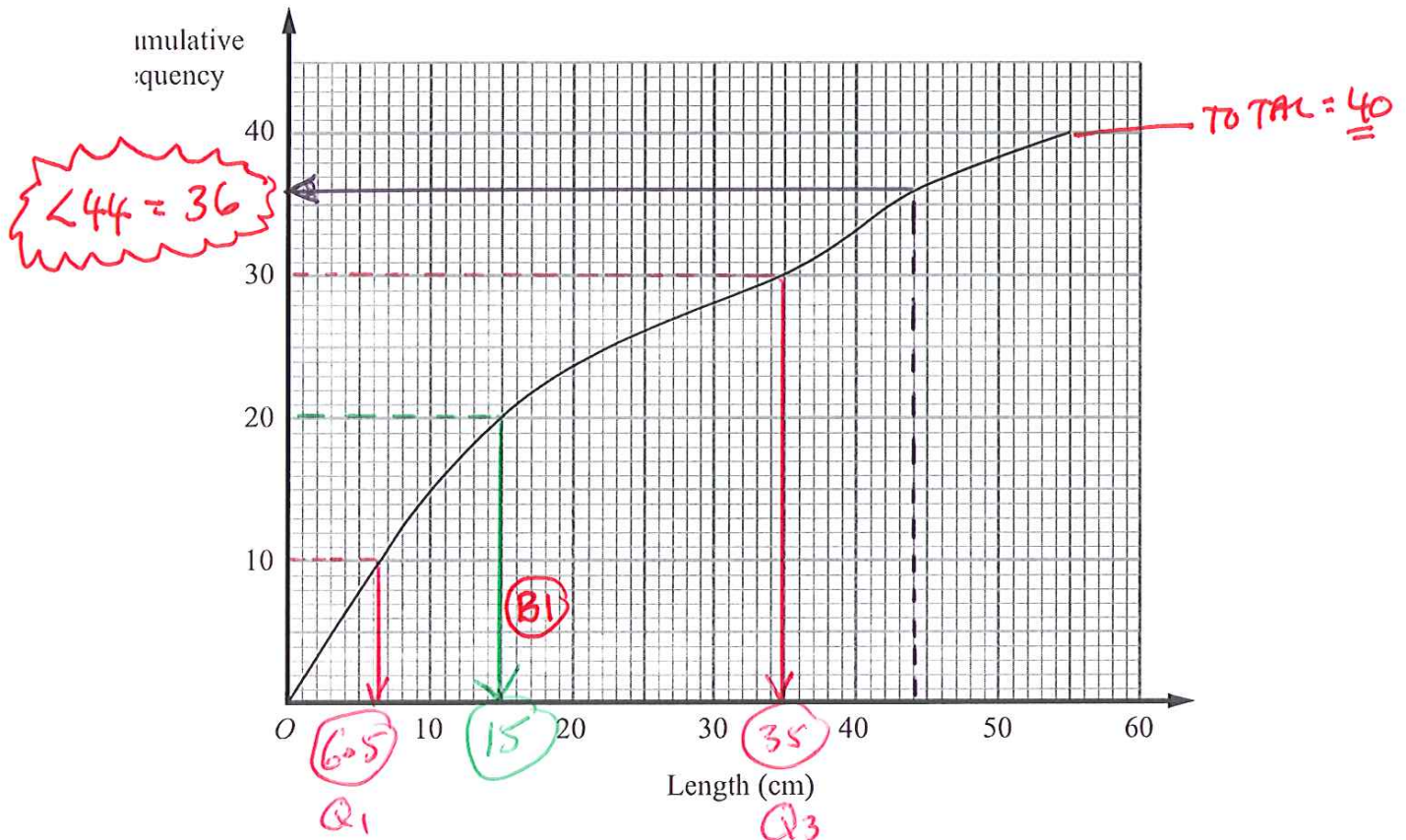


(b) Use your graph to find an estimate for the median diameter of the 60 oranges.

$$\text{MEDIAN} = \frac{60}{2} = \underline{\underline{30\text{TH VALUE}}}$$

$$= \underline{\underline{66}} \quad (\text{LOOKED UP ON GRAPH})$$

The cumulative frequency graph gives information about the lengths of 40 tree branches.



- (a) Find an estimate for the median length.

$$\frac{40}{2} = 20\text{th VALUE}$$

$$\begin{array}{r} 15 \text{ (A1)} \\ \dots\dots\dots \text{cm} \\ (14 - 16) \quad (2) \end{array}$$

- (b) Find an estimate for the interquartile range of the lengths.

$$\text{(B1)} \left\{ \begin{array}{l} Q_1 = \frac{40}{4} = 10\text{th VALUE} \\ Q_3 = \frac{40}{4} \times 3 = 30\text{th VALUE} \end{array} \right.$$

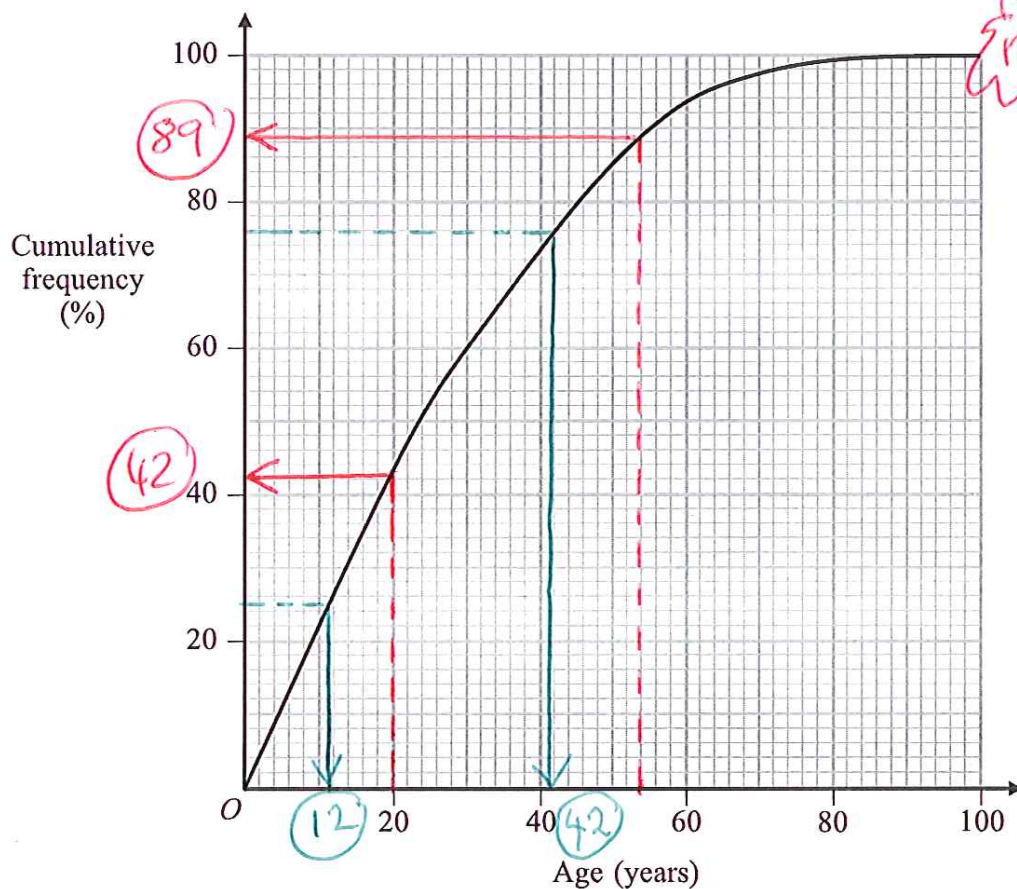
$$\begin{array}{r} \text{IQR} = Q_3 - Q_1 \\ = 35 - 6.5 \\ \dots\dots\dots 28.5 \text{ (A1)} \\ (27 - 30) \quad (2) \end{array}$$

- (c) Find an estimate for the number of branches with lengths of more than 44 cm.

$$40 - 36 = 4$$

$$\begin{array}{r} 4 \text{ (A1)} \\ \dots\dots\dots \end{array} \quad (1)$$

The cumulative frequency graph gives information about the ages of people in India.
The cumulative frequency is given as a percentage of all the people in India.



(a) Use the cumulative frequency graph to find an estimate for the percentage of people in India who are

(i) aged less than 20, $\frac{42}{100}$ 42 (AU) %

(ii) aged 54 or over.
 $100 - 89 = 11$ $\frac{11}{100} = 11\%$ 11 (AU) %
(2)

(b) Find an estimate for the interquartile range of the ages of people in India.

Q_1 $\frac{100}{4} = 25\text{th VALUE}$
 Q_3 $\frac{100}{4} \times 3 = 75\text{th VALUE}$

$Q_3 - Q_1 = 42 - 12 = 30$ (2) (MI)

30 (AU) years (29-31)

The table gives some information about the incomes, £ I , of 100 people in the UK.

Income (£ I)	Frequency
$0 < I \leq 10\,000$	12
$10\,000 < I \leq 20\,000$	41
$20\,000 < I \leq 30\,000$	25
$30\,000 < I \leq 40\,000$	12
$40\,000 < I \leq 50\,000$	6
$50\,000 < I \leq 60\,000$	4

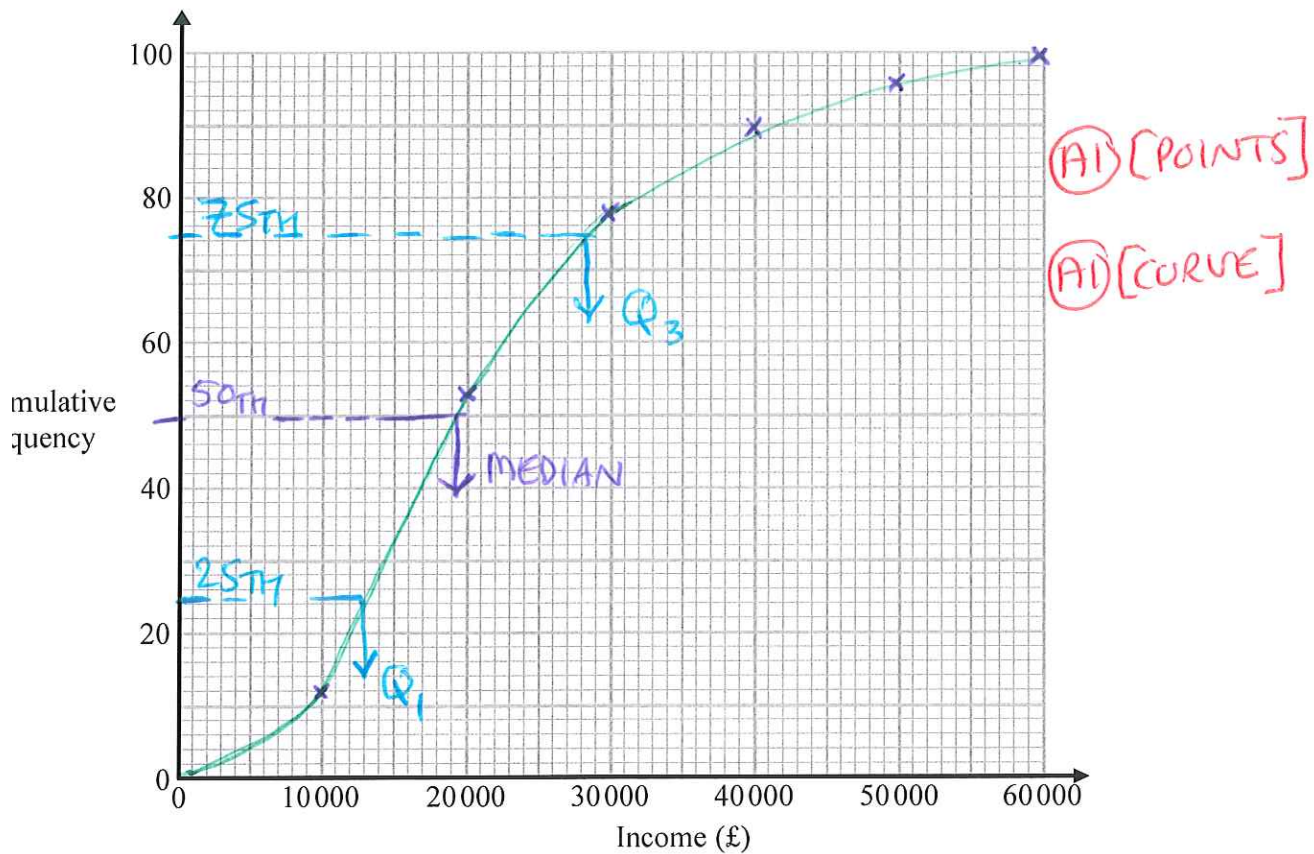
(a) Complete the cumulative frequency table.

Income (£ I)	Cumulative frequency
$0 < I \leq 10\,000$	12
$0 < I \leq 20\,000$	53
$0 < I \leq 30\,000$	78
$0 < I \leq 40\,000$	90
$0 < I \leq 50\,000$	96
$0 < I \leq 60\,000$	100

(10 000, 12)
(20 000, 53)
(30 000, 78)
⋮

(AI)

(1)



(2)

(c) Use your graph to find an estimate for

(i) the median,

$$\frac{100}{2} = \boxed{50\text{th}} \text{ VALUE}$$

£ 19 000 (AI)

(ii) the interquartile range.

[18 000 - 20 000]

$$Q_1 = \frac{100}{4} = \boxed{25\text{th}} \text{ VALUE}$$

$$Q_3 = 3 \times \frac{100}{4} = \boxed{75\text{th}} \text{ VALUE}$$

$$IQR = Q_3 - Q_1$$

$$= 28 000 - 13 000$$

(MI)

(MI)

£ 15 000 (AI)
(3)

[14 000 - 16 000]

The grouped frequency table gives information about the ages of 200 elephants.

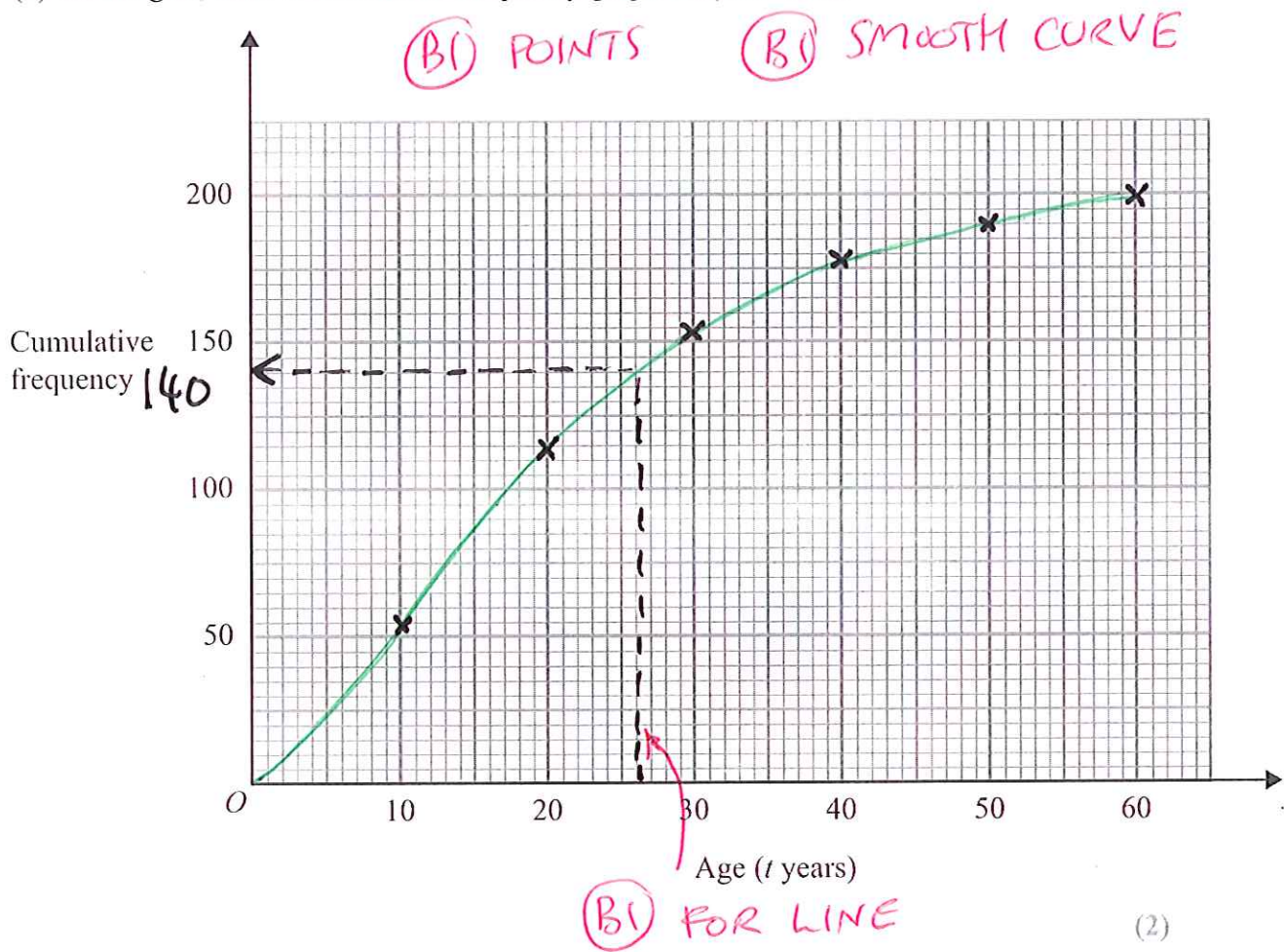
Age (t years)	Frequency
$0 < t \leq 10$	55
$10 < t \leq 20$	60
$20 < t \leq 30$	40
$30 < t \leq 40$	22
$40 < t \leq 50$	13
$50 < t \leq 60$	10

(a) Complete the cumulative frequency table.

Age (t years)	Cumulative frequency
$0 < t \leq 10$	55
$0 < t \leq 20$	115
$0 < t \leq 30$	155
$0 < t \leq 40$	177
$0 < t \leq 50$	190
$0 < t \leq 60$	200

(AI)

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



(c) Use the graph to find an estimate for the number of elephants with ages of more than 26 years.

$$\text{LESS THAN } 26 = 140$$

$$\therefore \text{MORE THAN } 26 = 200 - 140$$

$$= \underline{\underline{60}}$$

60 (A1)

The table shows information about the lengths of time that 120 people spent in a supermarket.

Time (t minutes)	Frequency
$0 < t \leq 10$	8
$10 < t \leq 20$	17
$20 < t \leq 30$	25
$30 < t \leq 40$	40
$40 < t \leq 50$	22
$50 < t \leq 60$	8

(a) Complete the cumulative frequency table.

Time (t minutes)	Cumulative frequency
$0 < t \leq 10$	8
$0 < t \leq 20$	25
$0 < t \leq 30$	50
$0 < t \leq 40$	90
$0 < t \leq 50$	112
$0 < t \leq 60$	120

COORDINATES

(10, 8)

(20, 25)

(30, 50)

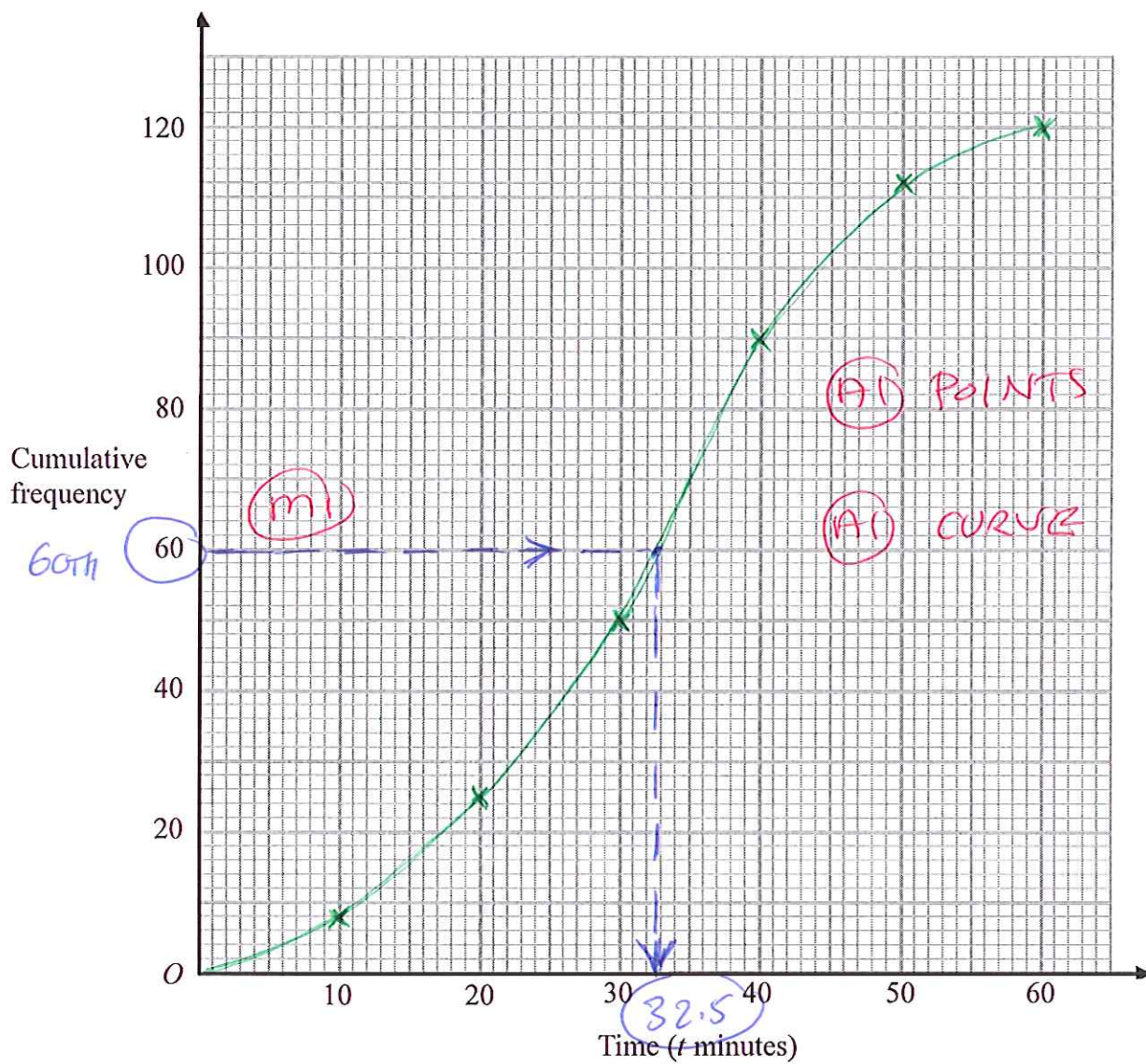
(40, 90)

(50, 112)

(60, 120)

(1)

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



(2)

(c) Use your graph to find an estimate for the median length of time spent in the supermarket by these people.

$$\begin{aligned} \text{MEDIAN} &= \frac{120}{2} \\ &= 60\text{TH VALUE} \end{aligned}$$

$$\begin{aligned} &32.5 \text{ minutes} \\ &[\pm \frac{1}{2} \text{ SQUARE}] \end{aligned}$$

Disclaimer

While reasonable endeavours have been used to verify the accuracy of these solutions, these solutions are provided on an “as is” basis and no warranties are made of any kind, whether express or implied, in relation to these solutions.

There is no warranty that these solutions will meet Your requirements or provide the results which You want, or that they are complete, or that they are error-free. If You find anything confusing within these solutions then it is Your responsibility to seek clarification from Your teacher, tutor or mentor.

Please report any errors or omissions that You find*. These solutions will be updated to correct errors that are discovered. It is recommended that You always check that You have the most up-to-date version of these solutions.

The methods used in these solutions, where relevant, are methods which have been successfully used with students. The method shown for a particular question is not always the only method and there is no claim that the method that is used is necessarily the most efficient or ‘best’ method. From time to time, a solution to a question might be updated to show a different method if it is judged that it is a good idea to do so.

Sometimes a method used in these solutions might be unfamiliar to You. If You are able to use a different method to obtain the correct answer then You should consider to keep using your existing method and not change to the method that is used here. However, the choice of method is always up to You and it is often useful if You know more than one method to solve a particular type of problem.

Within these solutions there is an indication of where marks **might** be awarded for each question. B marks, M marks and A marks have been used in a similar, but **not identical**, way that an exam board uses these marks within their mark schemes. This slight difference in the use of these marking symbols has been done for simplicity and convenience. Sometimes B marks, M marks and A marks have been interchanged, when compared to an examiners’ mark scheme and sometimes the marks have been awarded for different aspects of a solution when compared to an examiners’ mark scheme.

B1 - This is an unconditional accuracy mark (the specific number, word or phrase must be seen. This type of mark cannot be given as a result of ‘follow through’).

M1 - This is a method mark. Method marks have been shown in places where they might be awarded for the method that is shown. If You use a different method to get a correct answer, then the same number of method marks would be awarded but it is not practical to show all possible methods, and the way in which marks might be awarded for their use, within these particular solutions. When appropriate, You should seek clarity and download the relevant examiner mark scheme from the exam board’s web site.

A1 - These are accuracy marks. Accuracy marks are typically awarded after method marks. If the correct answer is obtained, then You should normally (but not always) expect to be awarded all of the method marks (provided that You have shown a method) and all of the accuracy marks.

Note that some questions contain the words ‘show that’, ‘show your working out’, or similar. These questions require working out to be shown. Failure to show sufficient working out is likely to result in no marks being awarded, even if the final answer is correct.

* The best way to inform of errors or omissions is a direct Twitter message to @Maths4Everyone