

Name:

Exam Style Questions

Cumulative Frequency
Box Plots



Corbettmaths

Equipment needed: Ruler, pencil, calculator and pen

Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Video Tutorial

www.corbettmaths.com/contents

Videos 149, 150, 153, 154



Answers and Video Solutions

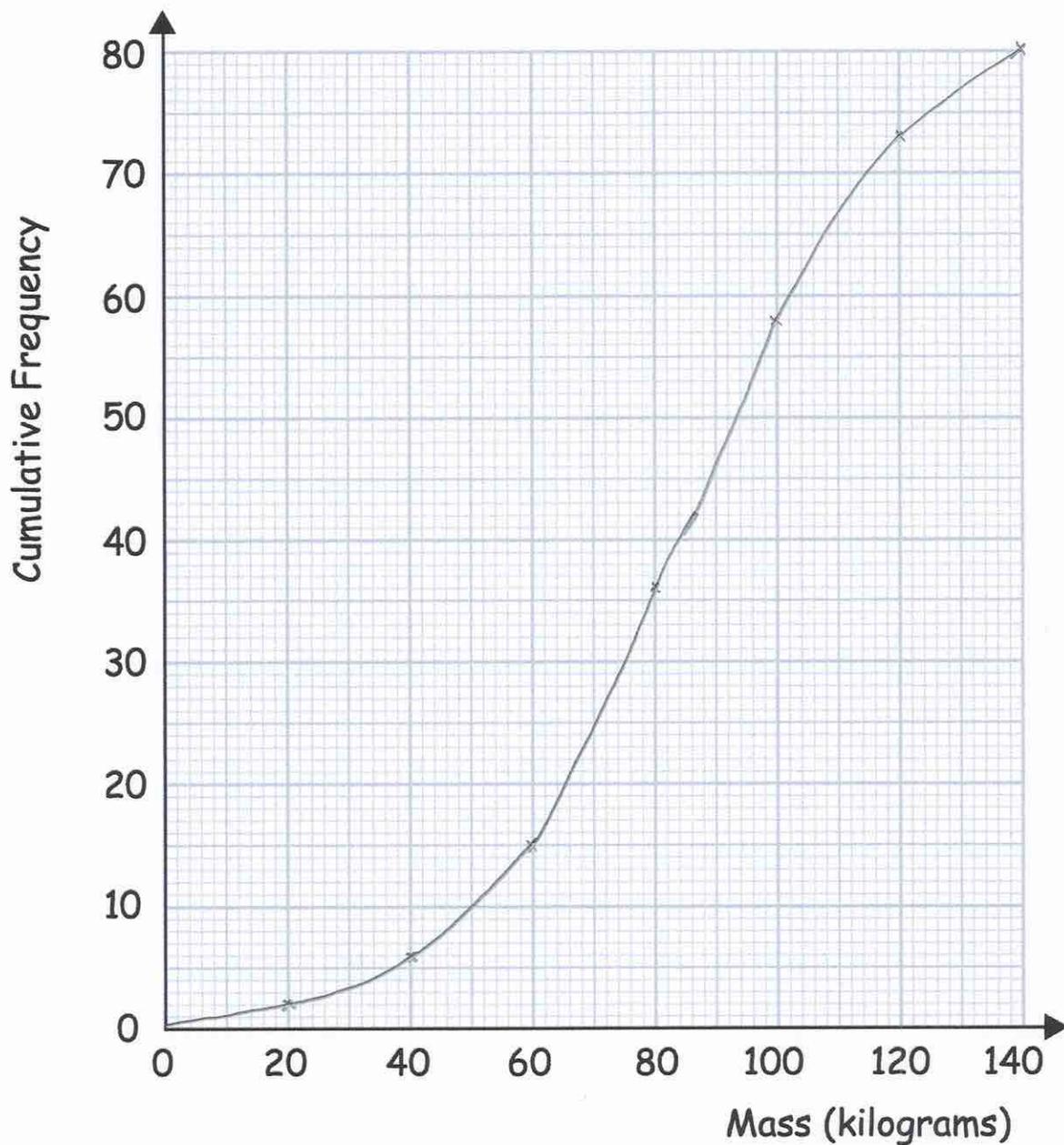


1. The mass of each deer kept in a zoo is recorded by staff. The table below shows this information.



Mass (m kg)	Cumulative Frequency
$0 < m \leq 20$	2
$0 < m \leq 40$	6
$0 < m \leq 60$	15
$0 < m \leq 80$	36
$0 < m \leq 100$	58
$0 < m \leq 120$	73
$0 < m \leq 140$	80

Draw a cumulative frequency graph for this information.



(2)

2. The ages of 100 teachers were recorded.
The table below shows this information.



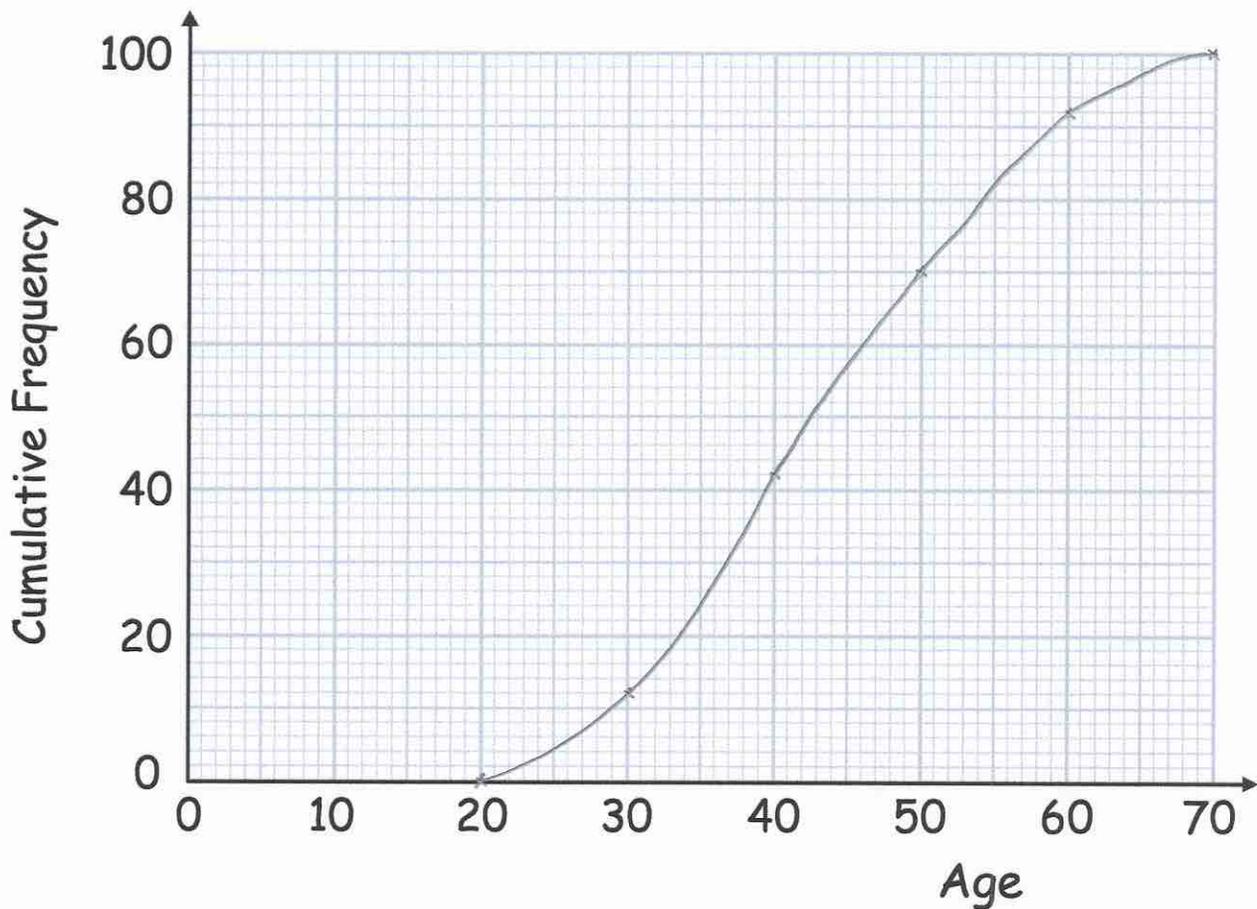
(a) Complete the cumulative frequency table.

Age (x years)	Frequency
$20 < x \leq 30$	12
$30 < x \leq 40$	30
$40 < x \leq 50$	28
$50 < x \leq 60$	22
$60 < x \leq 70$	8

Age (x years)	Cumulative Frequency
$20 < x \leq 30$	12
$20 < x \leq 40$	42
$20 < x \leq 50$	70
$20 < x \leq 60$	92
$20 < x \leq 70$	100

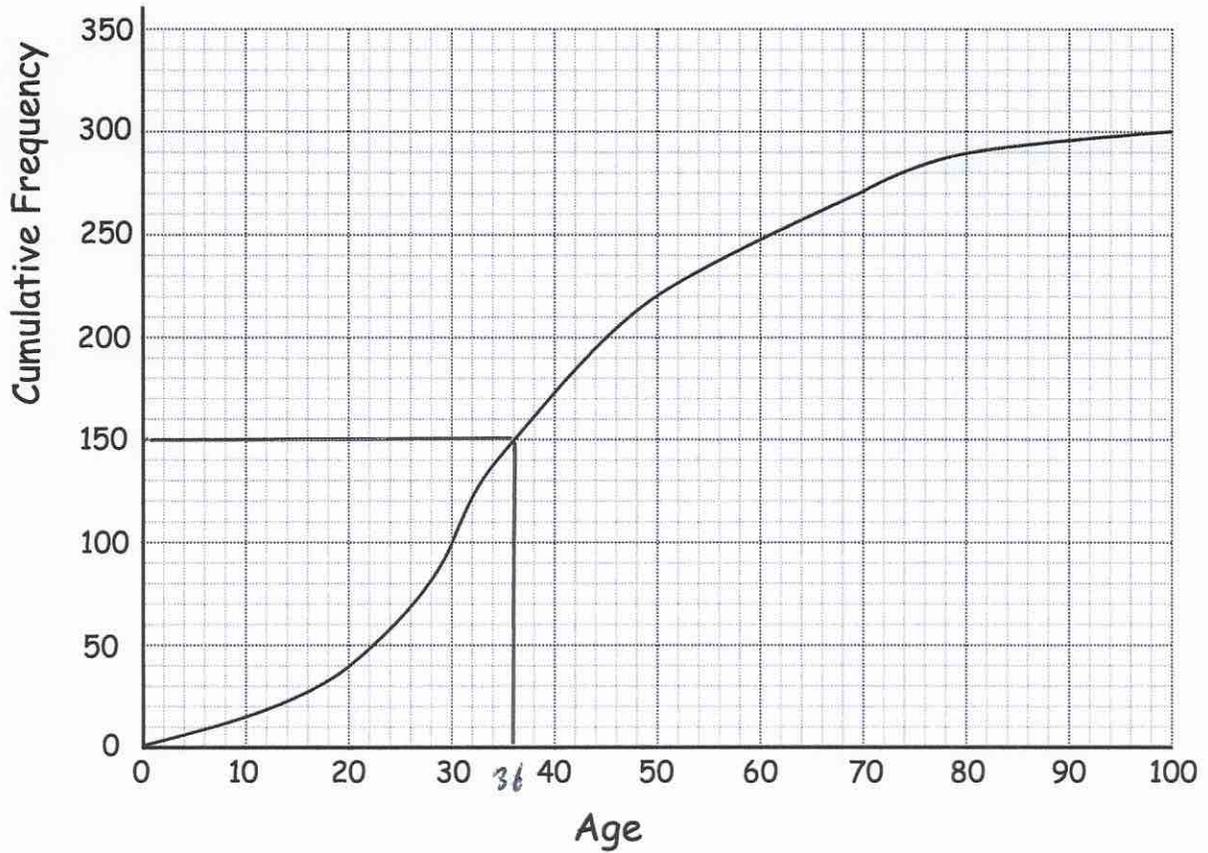
(1)

(b) Draw a cumulative frequency graph for this information.



(2)

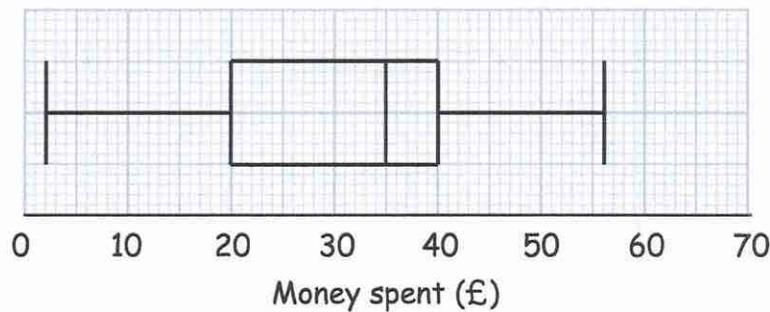
3. The cumulative frequency graph shows information about the ages of the 300 people who live in a village.



Find an estimate of the median age.

..... 36
(1)

4. The box plot represents the amounts of money the customers spent in a shop one morning.



Write down the median amount of money spent.

£ 35
(1)

5. The table shows information about the number of hours that 260 students spent revising for an exam.



Number of Hours (h)	Frequency
$0 < h \leq 2$	20
$2 < h \leq 4$	32
$4 < h \leq 6$	48
$6 < h \leq 8$	120
$8 < h \leq 10$	24
$10 < h \leq 12$	16

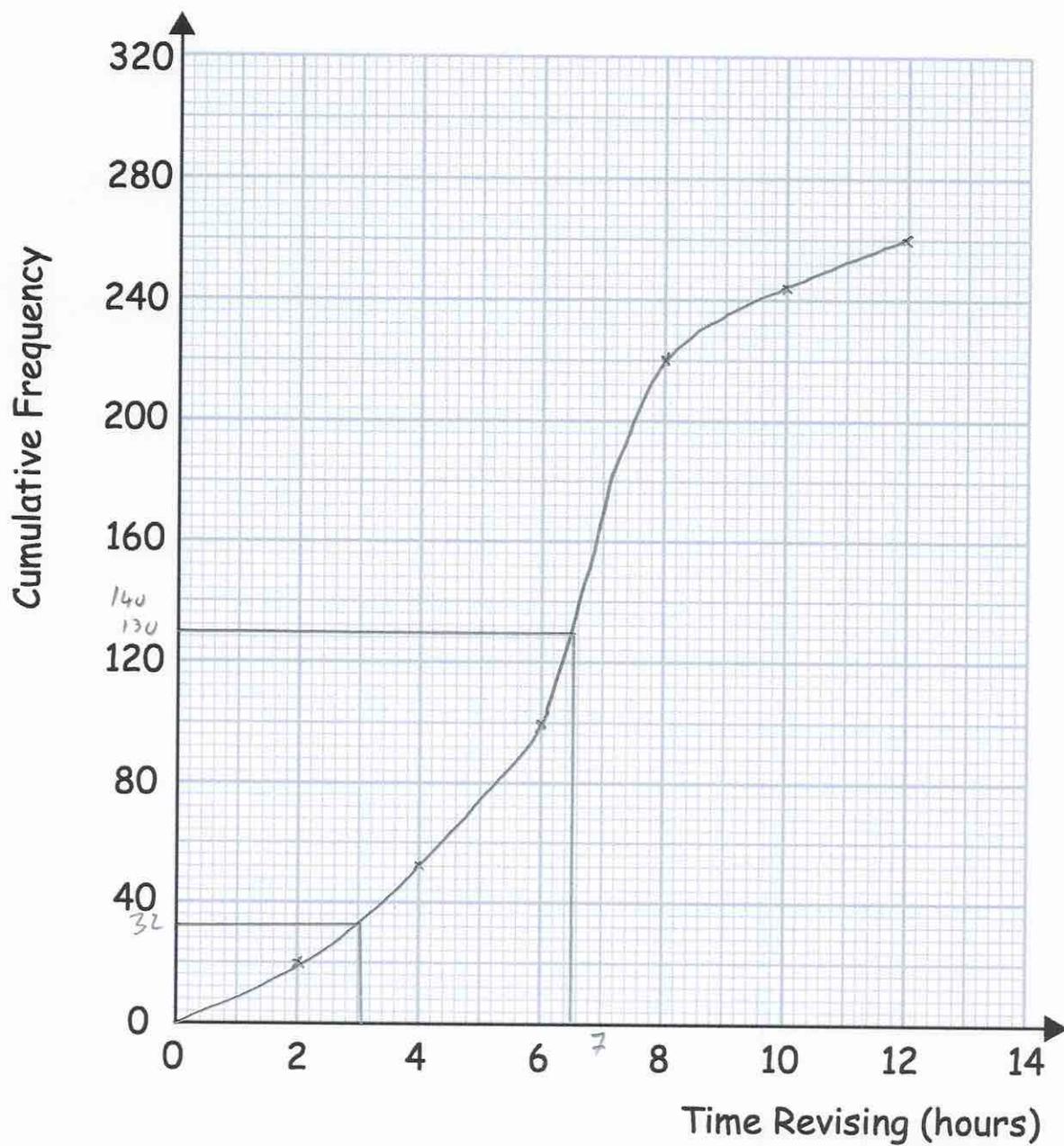
- (a) Complete the cumulative frequency table.

Number of Hours (h)	Cumulative Frequency
$0 < h \leq 2$	20
$0 < h \leq 4$	52
$0 < h \leq 6$	100
$0 < h \leq 8$	220
$0 < h \leq 10$	244
$0 < h \leq 12$	260

(1)

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

(2)



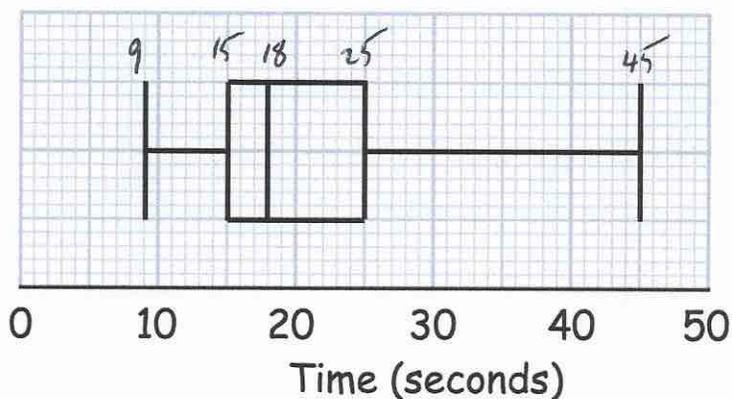
- (c) Use your graph to find an estimate for the median number of hours spent revising.

.....6.5.....hours
(1)

- (d) Use your graph to find an estimate for the number of students who spent **less** than 3 hours revising.

.....32.....
(2)

6. As part of a dog show, each dog completes an obstacle course. The box plot shows the distribution of times taken to complete the obstacle course.



- (a) Write down the median.

18
seconds
 (1)

- (b) Write down the upper quartile.

25
seconds
 (1)

- (c) Work out the range.

$$45 - 9 = 36$$

36
seconds
 (1)

- (d) Work out the interquartile range.

$$25 - 15$$

10
seconds
 (1)

7. Shown below is information about the total tips received by a waiter over his last 100 shifts at a restaurant.



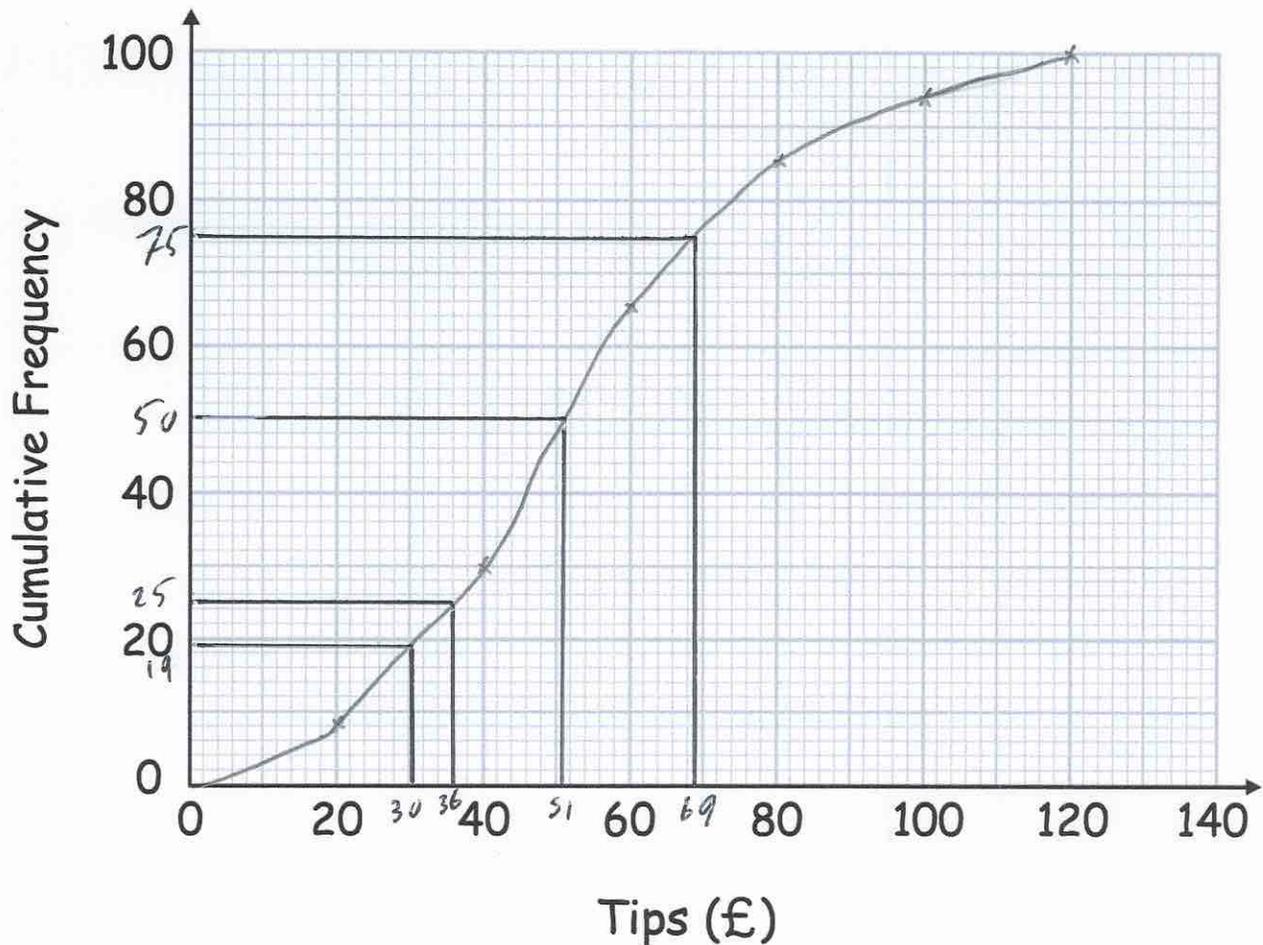
Tips (£x)	Frequency
$0 < x \leq 20$	8
$20 < x \leq 40$	22
$40 < x \leq 60$	35
$60 < x \leq 80$	20
$80 < x \leq 100$	9
$100 < x \leq 120$	6

- (a) Complete the cumulative frequency table.

Tips (£x)	Cumulative Frequency
$0 < x \leq 20$	8
$0 < x \leq 40$	30
$0 < x \leq 60$	65
$0 < x \leq 80$	85
$0 < x \leq 100$	94
$0 < x \leq 120$	100

(1)

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



(2)

(c) Use your graph to find an estimate for the number of shifts the total tips was less than £30.

19
.....
(1)

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

£51
.....
(1)

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

69 - 36

£33
.....
(2)

8. 50 students take part in a javelin competition
The table below shows the distances thrown by the competitors.



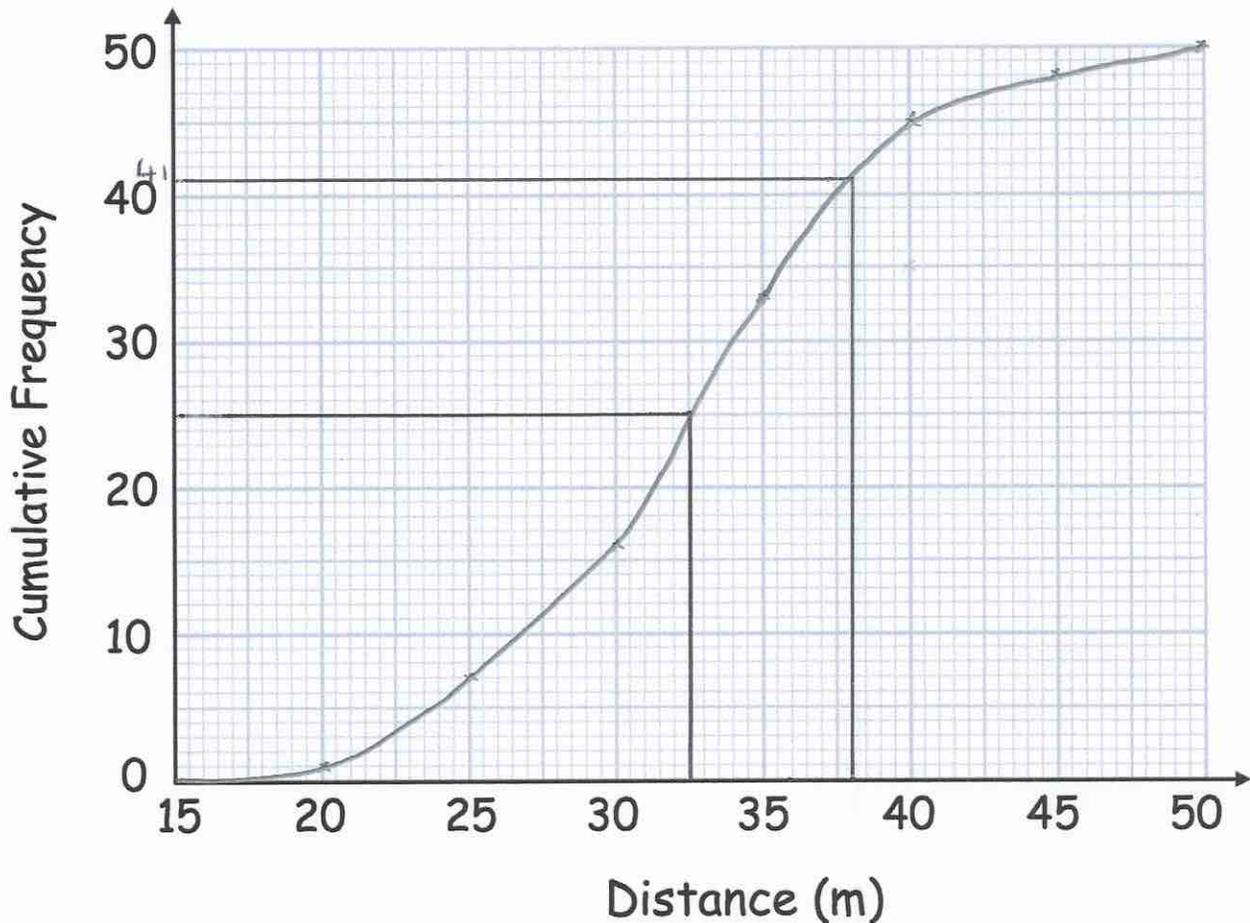
(a) Complete the cumulative frequency table.

Distance (d metres)	Frequency
$15 < d \leq 20$	1
$20 < d \leq 25$	6
$25 < d \leq 30$	9
$30 < d \leq 35$	17
$35 < d \leq 40$	12
$40 < d \leq 45$	3
$45 < d \leq 50$	2

Distance (d metres)	Cumulative Frequency
$15 < d \leq 20$	1
$15 < d \leq 25$	7
$15 < d \leq 30$	16
$15 < d \leq 35$	33
$15 < d \leq 40$	45
$15 < d \leq 45$	48
$15 < d \leq 50$	50

(1)

(b) Draw a cumulative frequency graph for this information.



(2)

(c) Use your graph to estimate the median distance thrown.

32.5
.....m
(1)

A student qualifies for the regional competition if they thrown over 38m.

(d) Use your graph to estimate the number of students that qualified for the regional competition.

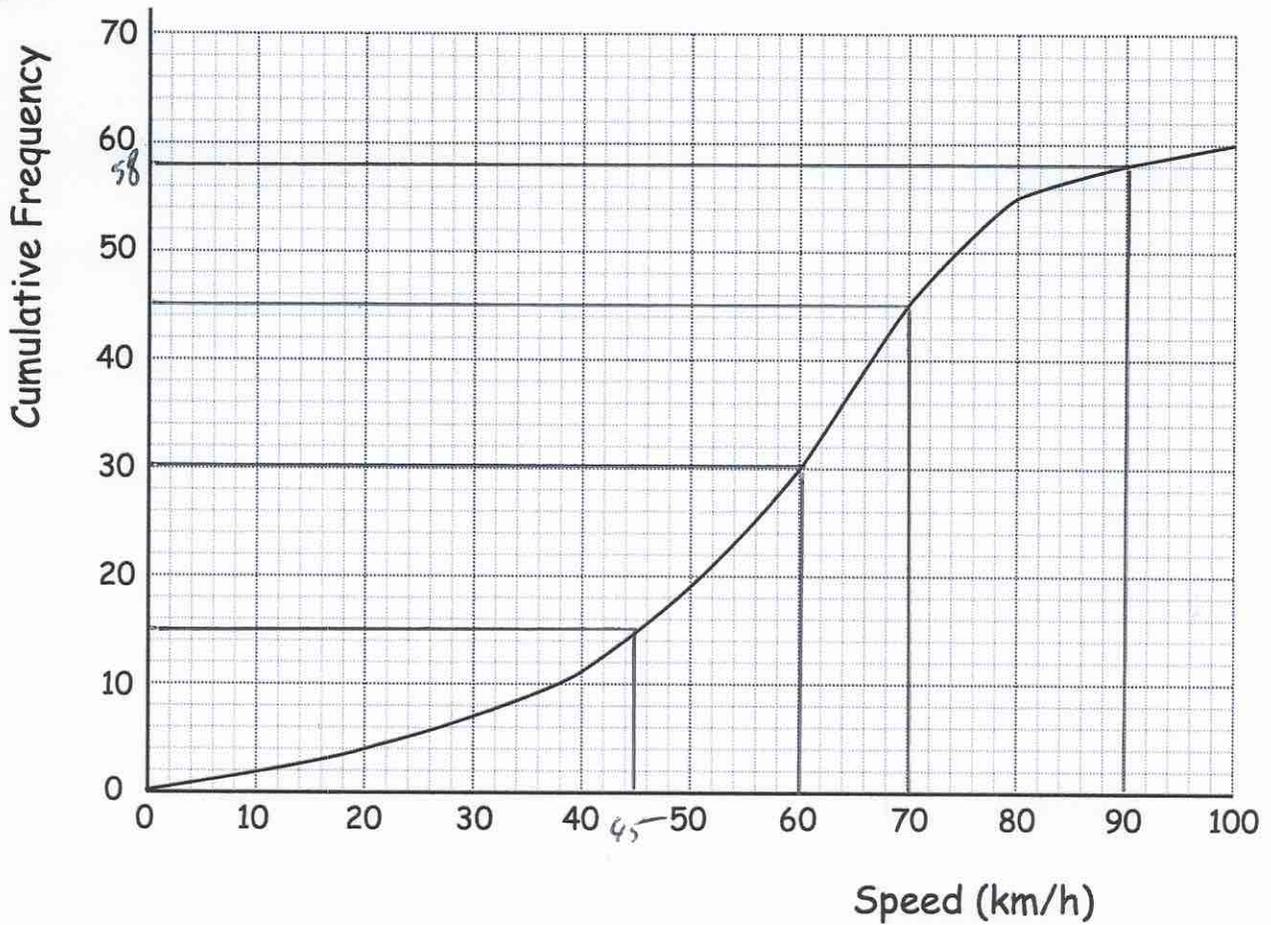
$$50 - 41 = 9$$

9
.....
(2)

9.



The cumulative frequency diagram shows the distribution of speeds for 60 cars on a road.



(a) Estimate the median speed.

$$\frac{60 \text{ km/h}}{(1)}$$

(b) Estimate the interquartile range of the speeds.

$$70 - 45 = 25$$

$$\frac{25 \text{ km/h}}{(2)}$$

The speed limit on the road is 90 km/h.

(c) How many cars exceeded the speed limit?

$$60 - 58$$

$$\frac{2}{(2)}$$

10. The table gives information about the weights of 50 male rugby players.

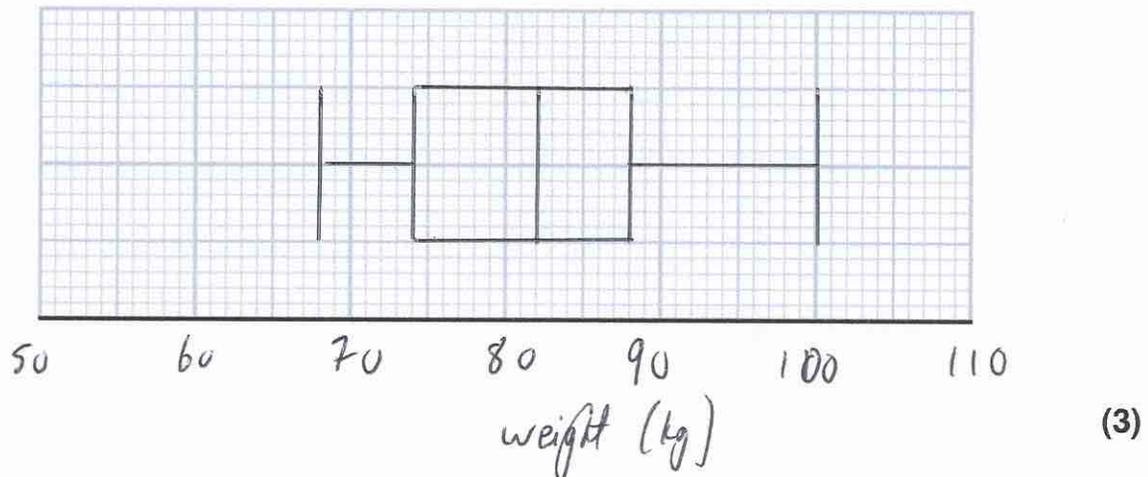


Lowest	68kg
Lower Quartile	74kg
Median	82kg
Upper Quartile	88kg
Highest	100kg

$$IQR = 14 \text{ kg}$$

$$\text{range} = 32 \text{ kg}$$

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



The weights of 50 female rugby players are also recorded.

The lightest female rugby player is 51kg.

The lower quartile is 60kg.

The median is 71kg.

The range and interquartile range for the female rugby players is the same as the male rugby players.

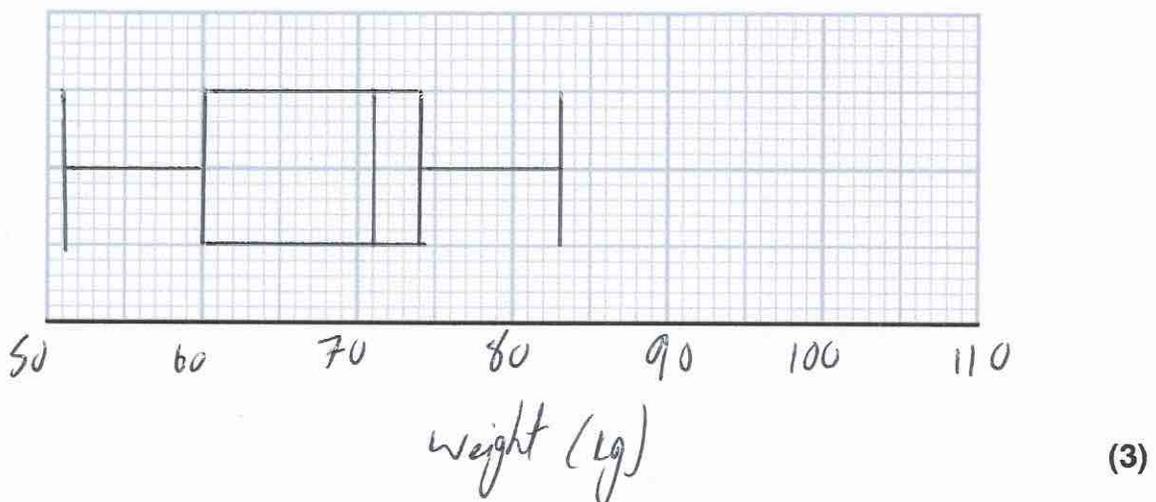
$$IQR = 14$$

$$60 + 14 = 74 \text{ kg (UQ)}$$

$$\text{range} = 32$$

(b) Draw a box plot to show this information.

$$51 + 32 = 83 \text{ (highest)}$$



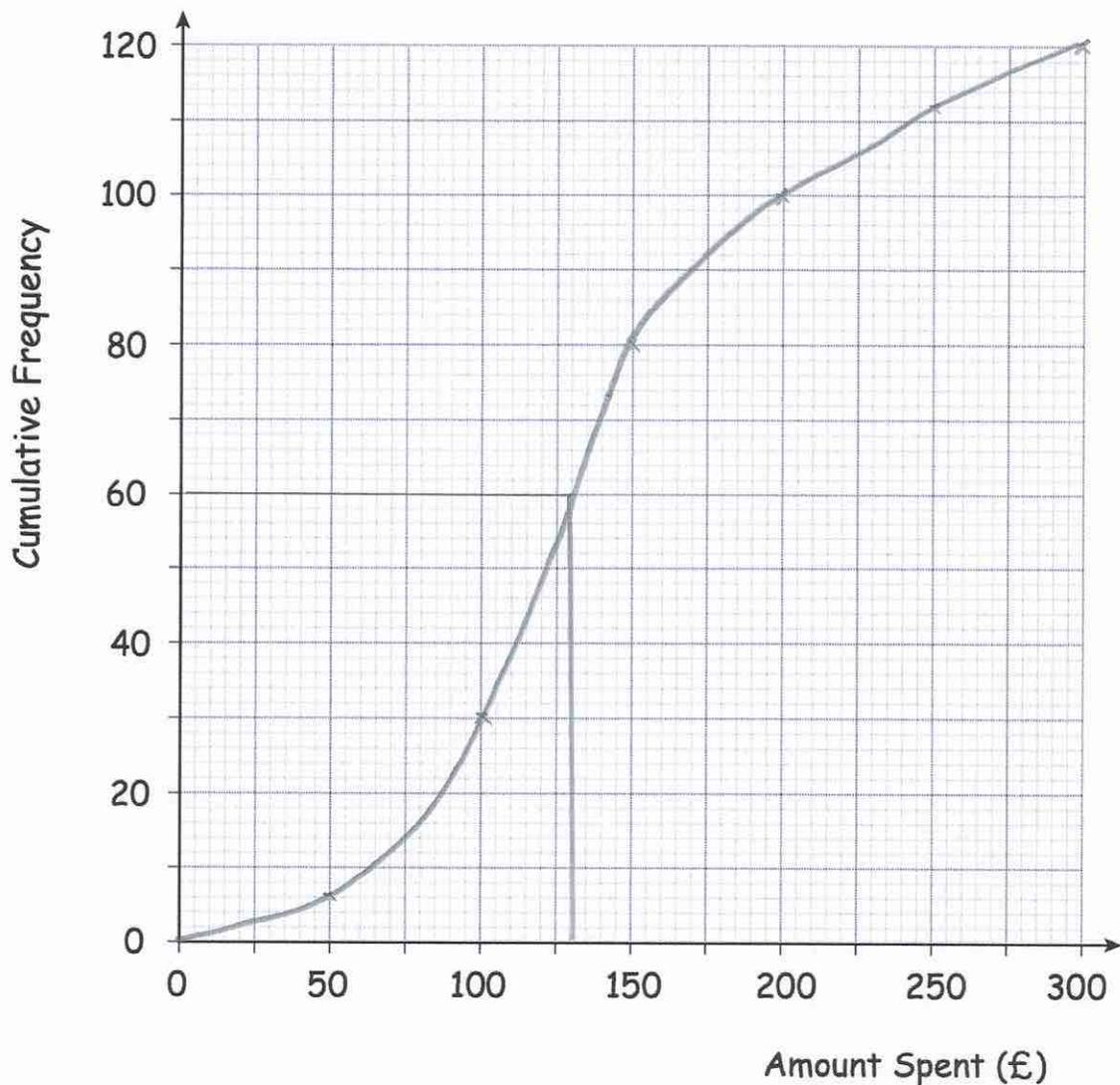
11. John did a survey about the amounts of money spent by 120 women while Christmas shopping.



The cumulative frequency table shows this information.

Amount spent, £ x	Cumulative frequency
$0 < x \leq 50$	6
$0 < x \leq 100$	30
$0 < x \leq 150$	80
$0 < x \leq 200$	100
$0 < x \leq 250$	112
$0 < x \leq 300$	120

- (a) On the grid, draw a cumulative frequency diagram.



(2)

(b) Use the cumulative frequency diagram to estimate the median.

£ 130

(2)

John then surveyed men about the amount of money they spent while Christmas shopping.

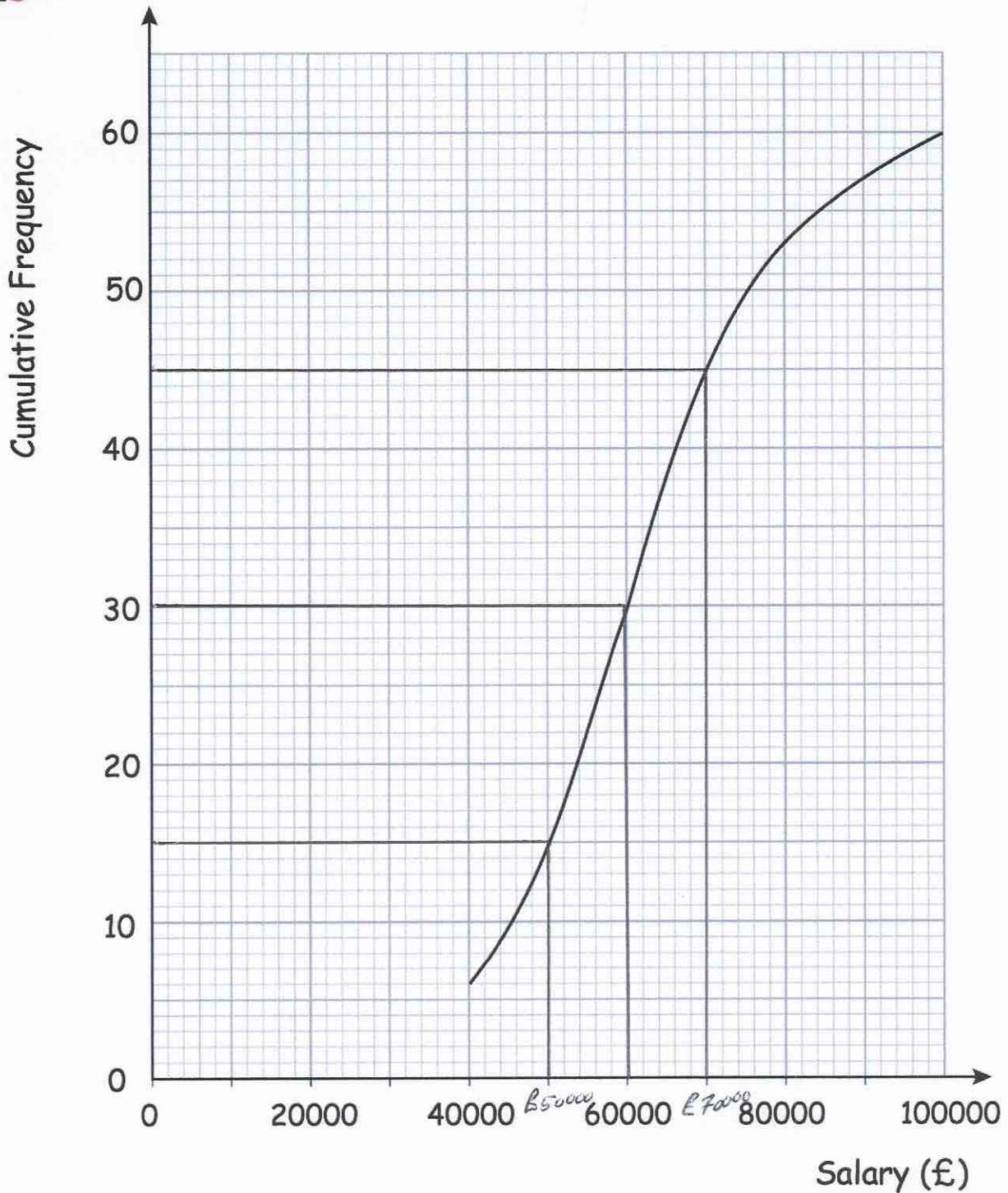
The median was £160.

(c) Compare the amounts of money spent by the women with the amounts of money spent by the men.

The ~~women~~ men spent more than the women
with a median of £160 compared to £130.

(1)

12. A university surveyed 60 mathematics graduates on their starting salary. The cumulative frequency graph shows some information about the salaries.



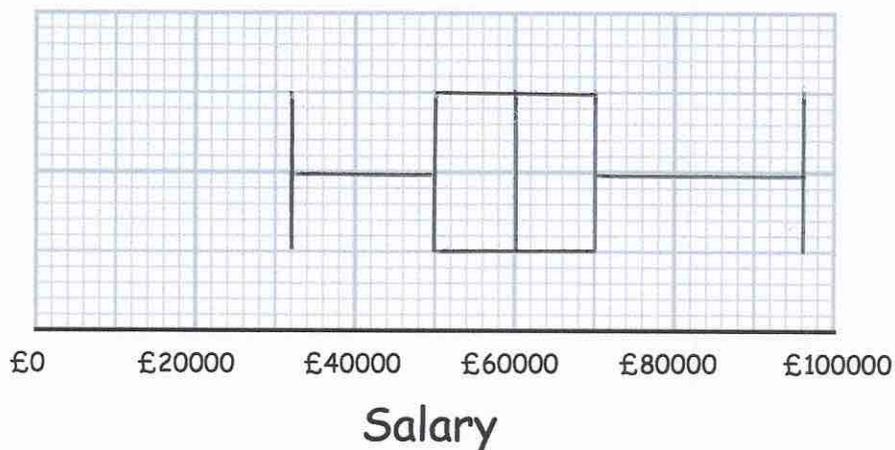
- (a) Use the graph to find an estimate for the median salary.

£ 60000
(1)

The 60 mathematics graduates
 had a minimum salary of £32,000
 and a maximum salary of £96,000

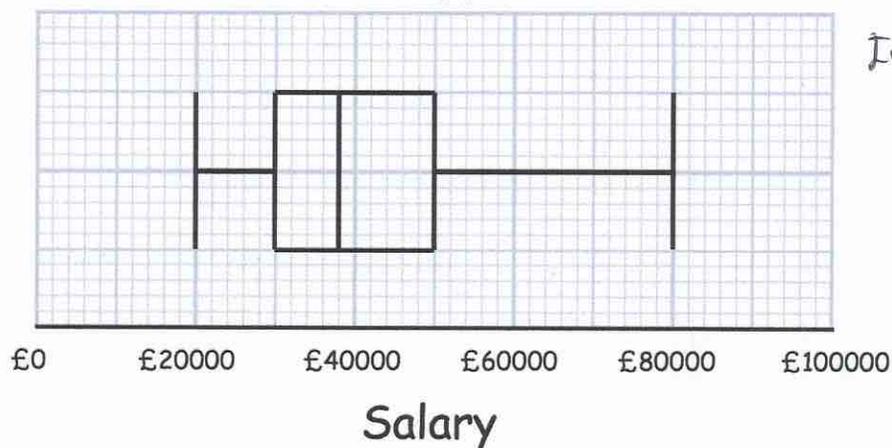
- (b) Use this information and the cumulative frequency graph to draw a box plot for the 60 mathematics graduates.

Maths Graduates



The university also surveyed 60 archaeology graduates.
 The box plot below shows information about their salaries.

Archaeology Graduates

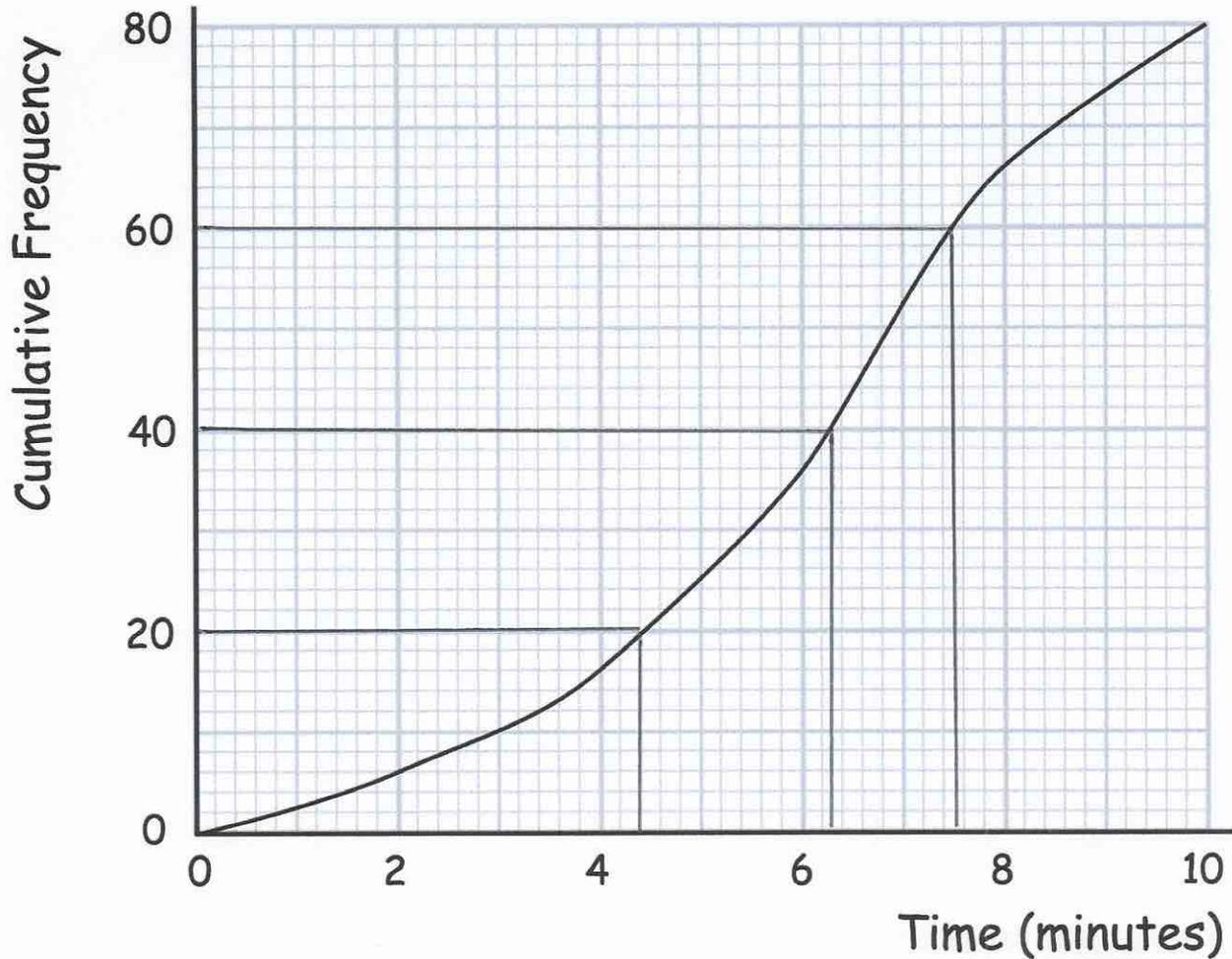


- (c) Compare the distribution of the salaries of the mathematics graduates with the distribution of the salaries of the archaeology graduates.

The salaries have a similar spread as both $IQR = £20,000$.
 The mathematics graduates clearly earn more, with
 a median of £60,000, compared to £38,000.

(2)

13. The length of time, in minutes, that 80 customers spend in a shop was recorded. A cumulative frequency diagram of this data is below.



- (a) Find an estimate of the median.

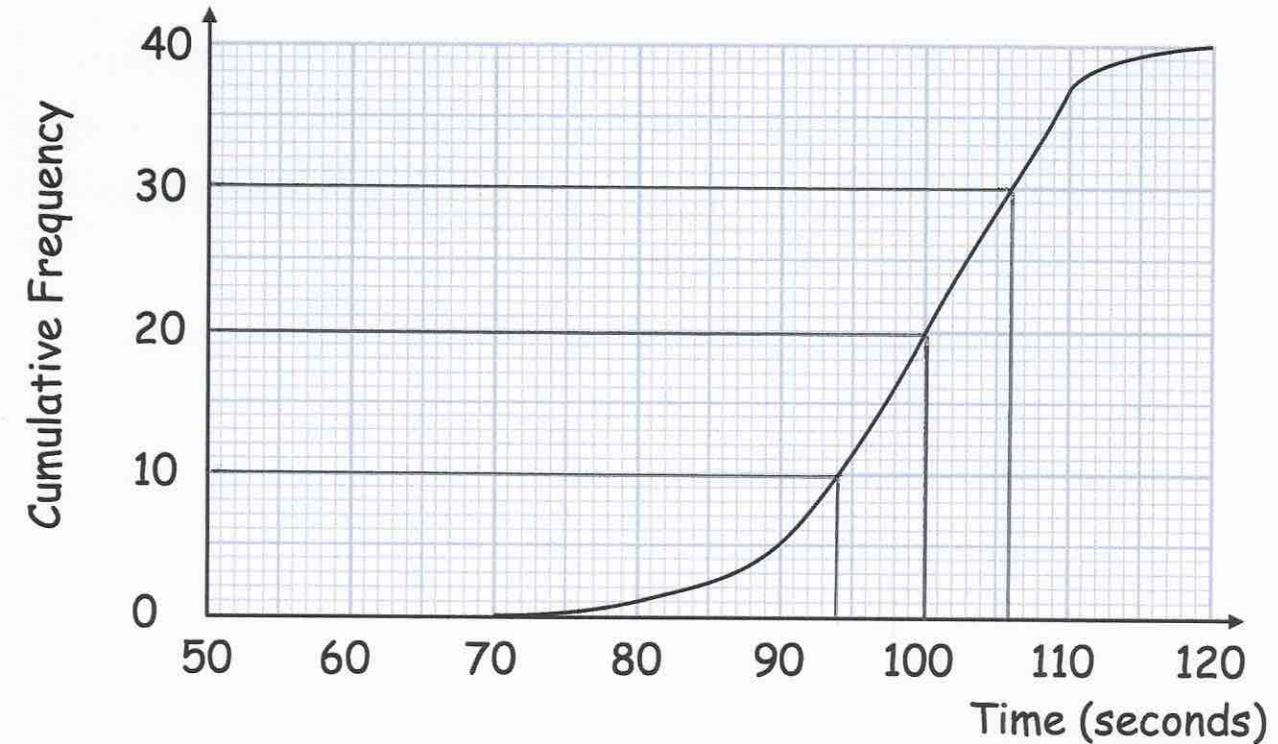
6.3
.....minutes
(1)

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

$$7.5 - 4.4 = 3.1$$

3.1
.....minutes
(2)

14. 40 students complete a puzzle and the time taken is recorded.
 The quickest time was 72 seconds and the slowest time was 117 seconds.
 The cumulative frequency diagram shows the information about the times taken.



(a) Find an estimate of the median time taken.

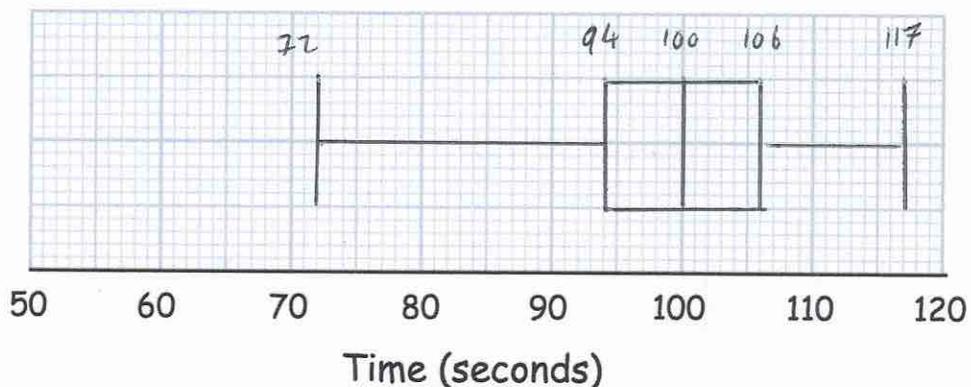
..... 100seconds
 (1)

(b) Find an estimate of the interquartile range.

106 - 94

..... 12seconds
 (2)

(c) Complete a box plot for times taken.



(2)

15. A supermarket surveys all of its 120 employees about how long it takes them to travel to work.



The table shows some information of the times taken.

Shortest time	3 minutes
Median	18 minutes
Upper Quartile	25 minutes
Range	34 minutes

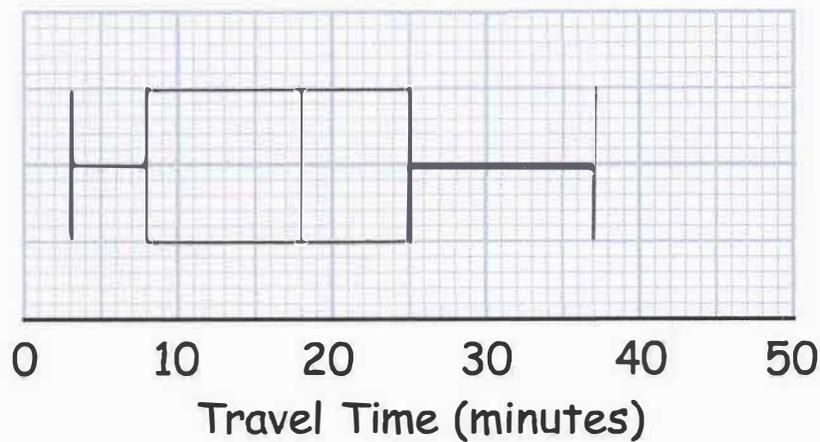
The range is twice the interquartile range.

$$IQR = 17 \text{ mins}$$

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

$$25 - 17 = 8$$

$$3 + 34 = 37$$



(3)

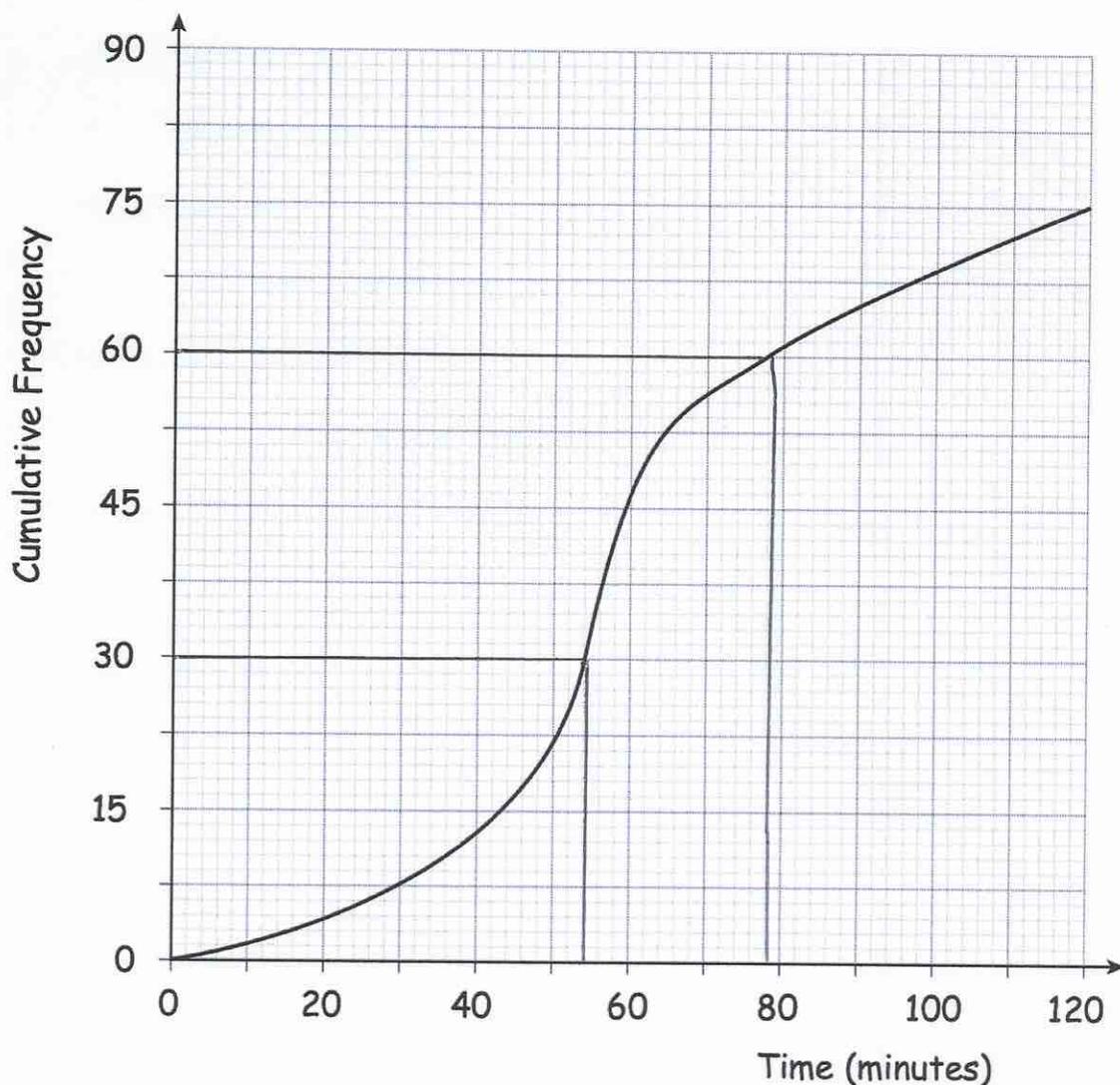
- (b) Work out an estimate for the number of employees that take between 18 minutes and 25 minutes to travel to work.

$$25\% \text{ of } 120 = 30$$

30

(2)

16. A teacher asked 75 students how long they revised for a class test. The cumulative frequency graph shows information about the amount of time the students spent revising.



40% of the students spent less than X minutes revising.

(a) Find an estimate of X

$$40\% \text{ of } 75 = 30$$

54
.....minutes
(2)

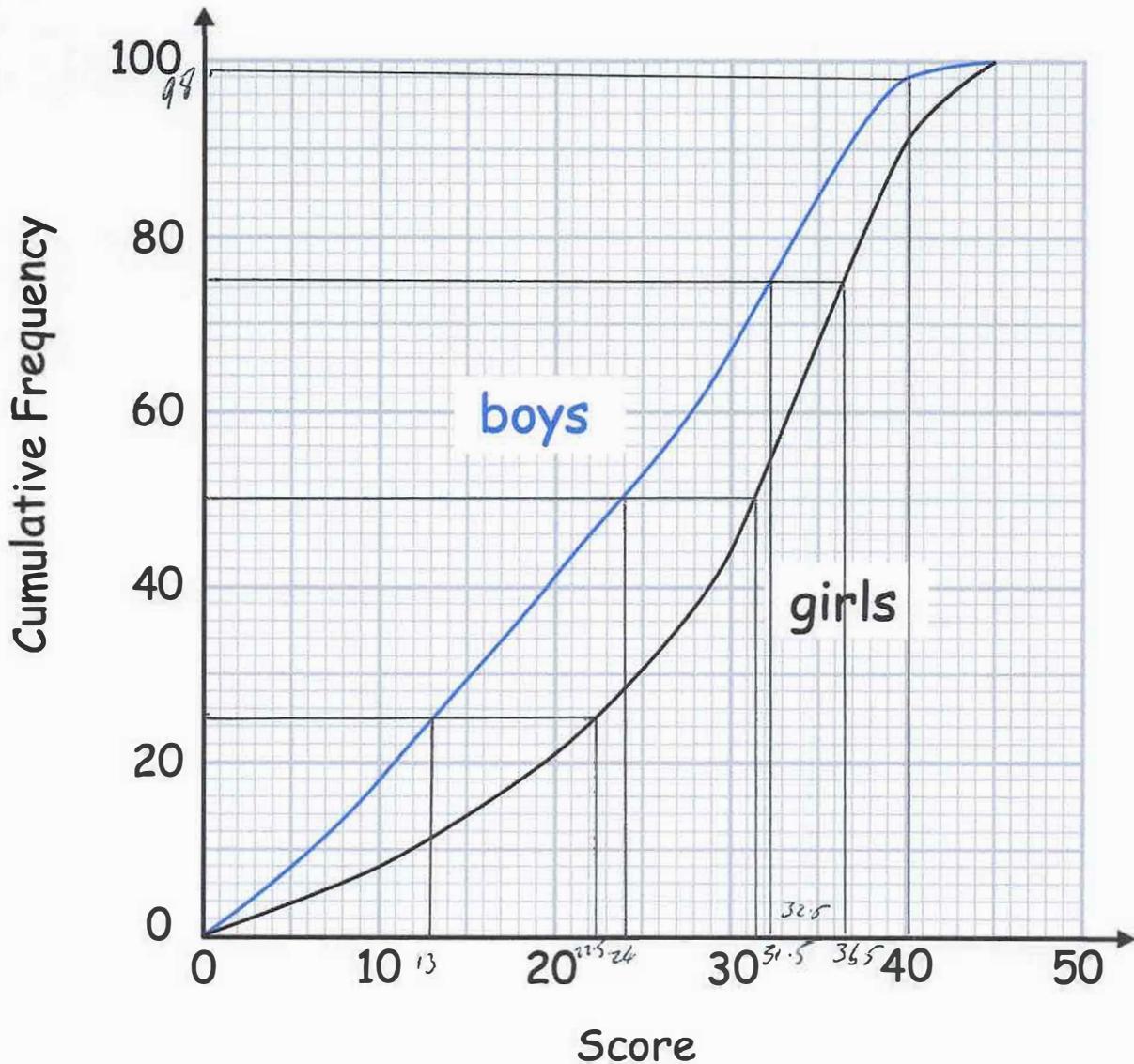
20% of the students spent longer than Y minutes revising.

(a) Find an estimate of Y

$$20\% \text{ of } 75 = 15$$

78
.....minutes
(2)

17. A teacher gave 100 boys and 100 girls a maths test. The test was out of 45 marks. The cumulative frequency graphs show how each group performed.



- (a) Find an estimate for the number of boys who scored over 40 marks.

	boys	girls	
median	24	31.5	2
IQR	19.5	14	(1)

- (b) Make two comparisons between the distributions of the boys and girls scores.

The girls scored more than the boys as their median is 31.5, compared to 24 for the boys.

The boys results are more spread out as their IQR of 19.5 is greater than the girls' IQR of 14.

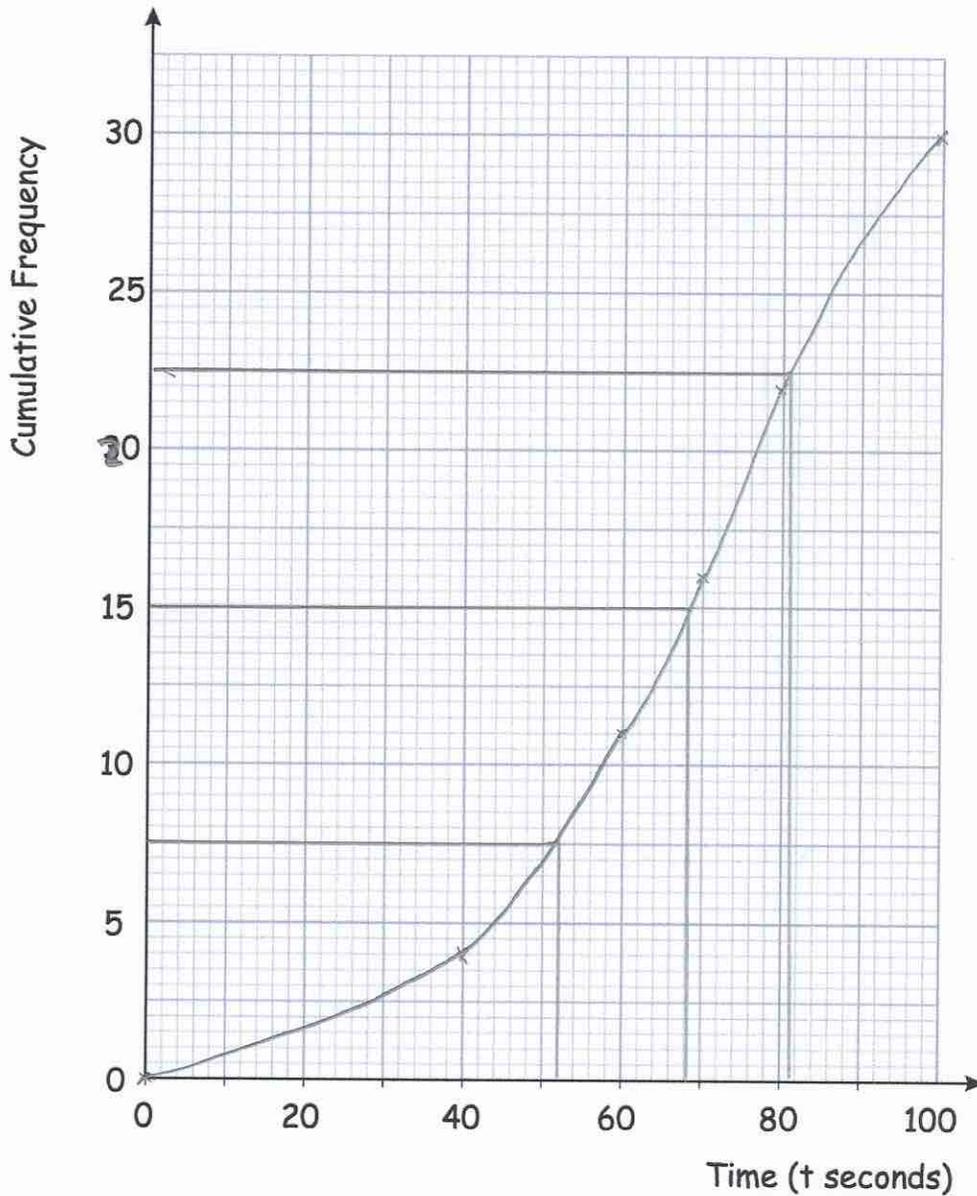
18. A group of primary school students run an obstacle course.



The table below shows some information about their times.

Time, (t)	Cumulative frequency
$0 < t \leq 40$	4
$0 < t \leq 60$	11
$0 < t \leq 70$	16
$0 < t \leq 80$	22
$0 < t \leq 100$	30

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



$$\text{Median} = 68$$

$$LQ = 52$$

$$UQ = 81$$

$$\begin{aligned} IQR &= 81 - 52 \\ &= 29 \end{aligned}$$

(2)

A group of secondary school students did the same obstacle course.
Their median time was 72 seconds and interquartile range was 34 seconds.

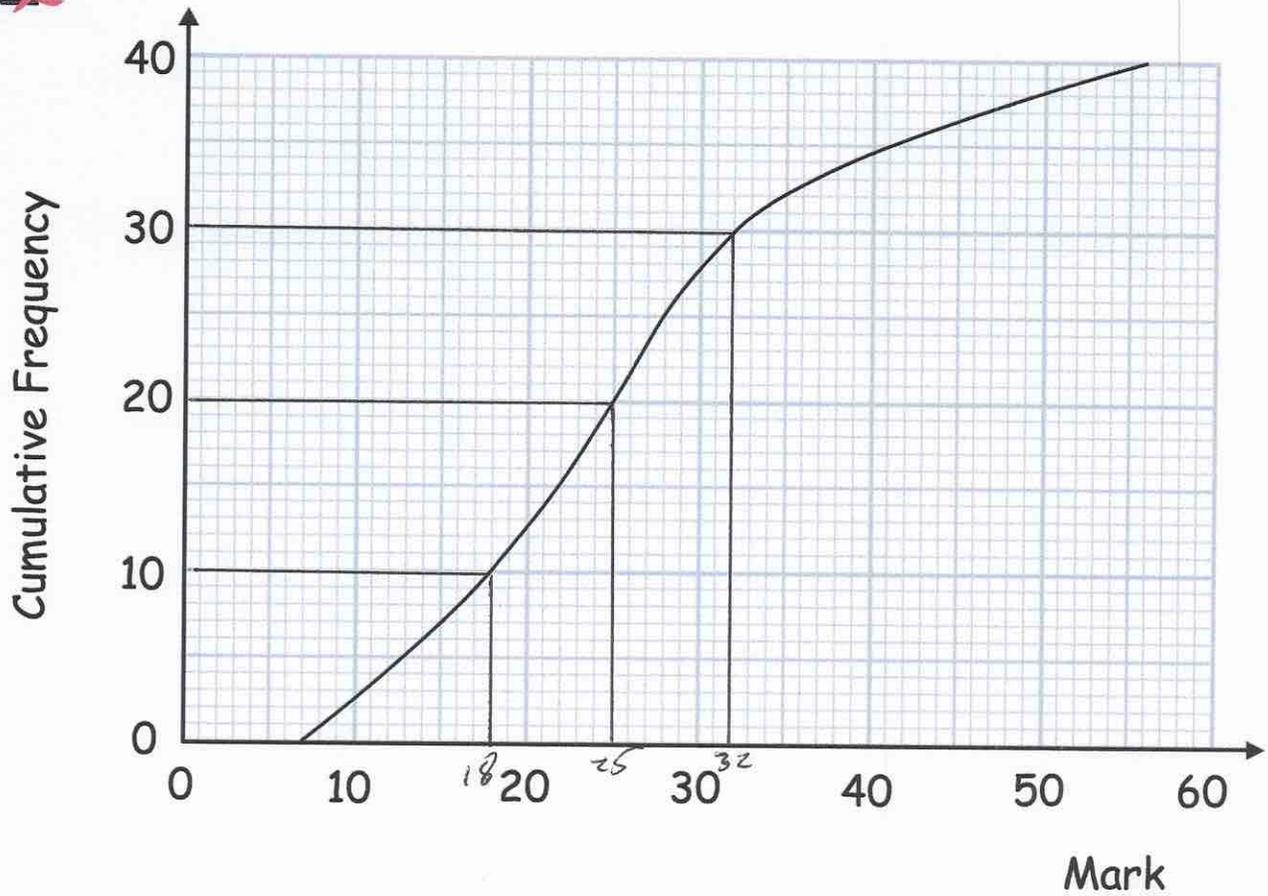
(b) Compare the times taken of these two groups of students.

The primary school students were slightly quicker with a median of 68 compared to 72.

The primary school students' times were less spread out (more consistent) than the secondary school students, as their IQR was 29, compared to 34.

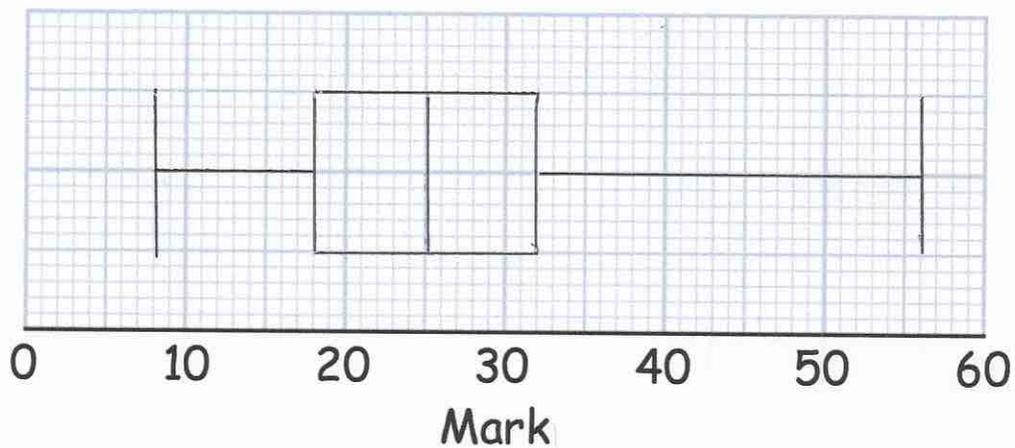
(5)

19. The cumulative frequency diagram below shows the distribution of marks in an Art exam.



The lowest mark is 8
The highest mark is 56

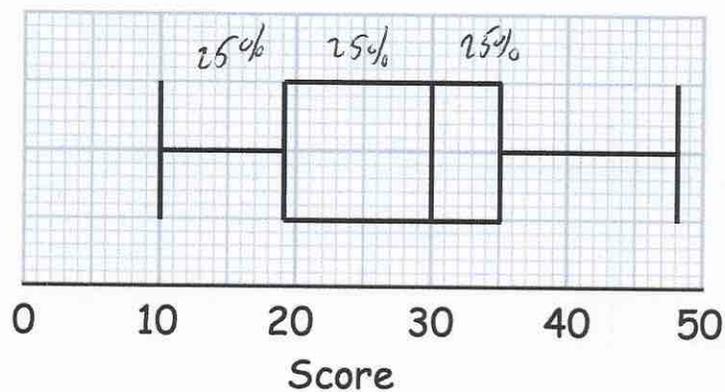
- (a) Draw a box plot for this data.



- (b) What percentage of students scored more than the upper quartile mark?

.....25%
(1)

20. Mrs Davis sets her class a quiz, which has a maximum score of 50. The distribution of the scores are shown in a box plot below.



- (a) Write down the median score.

30
.....
(1)

- (b) Write down the highest score.

48
.....
(1)

- (c) Find the interquartile range.

$$35 - 19$$

16
.....
(2)

Martin scored 35 marks.

- (d) Estimate the percentage of the class scored a lower mark than Martin.

75%
.....
(1)

The interquartile range is a better measure of the spread of a distribution than the range.

Explain why.

One outlier will affect the range but not the interquartile range.
.....
(1)

21.  The table shows information about the heights, in centimetres, of 40 sunflowers in a garden.

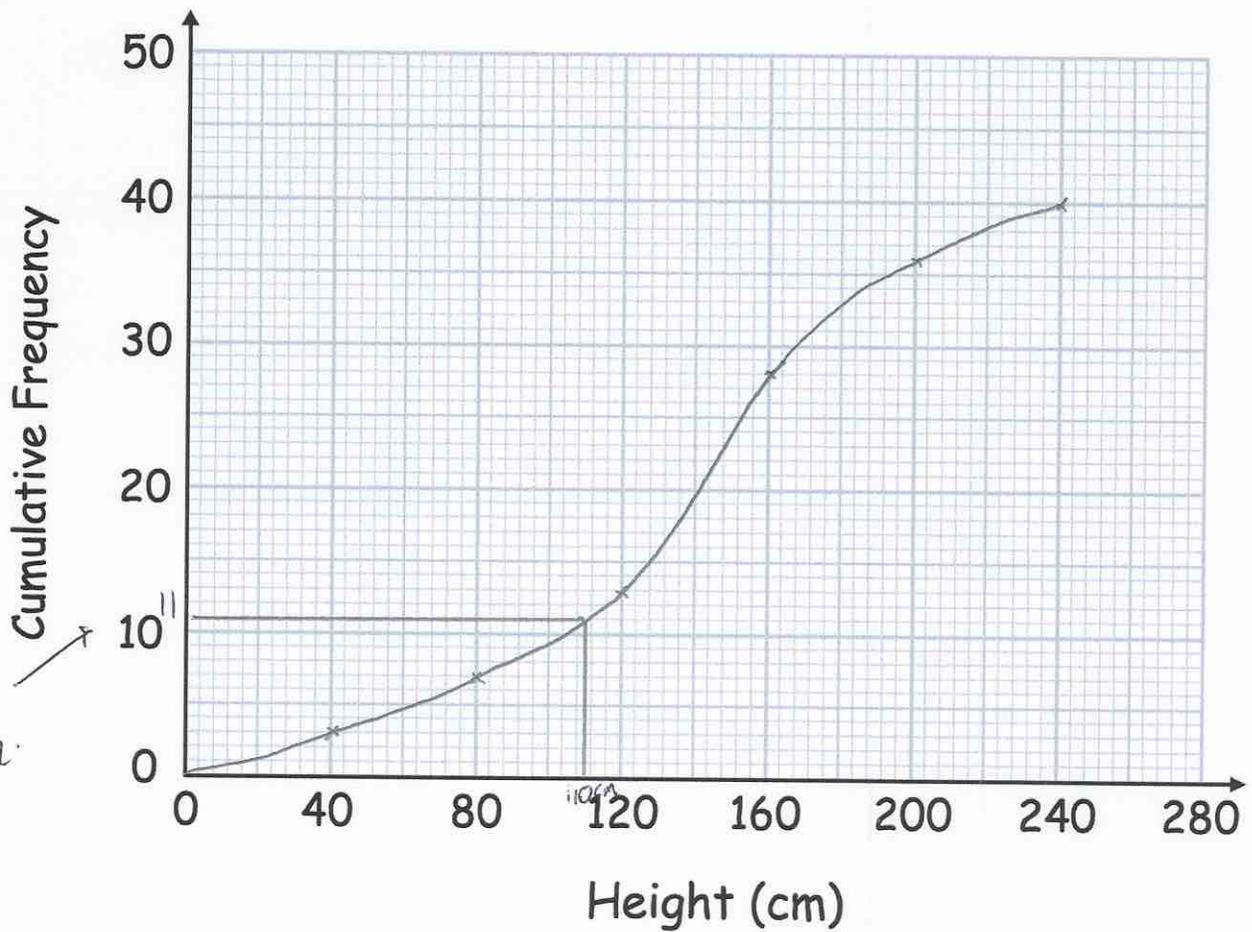
Height (cm)	Frequency
$0 < h \leq 40$	3
$40 < h \leq 80$	4
$80 < h \leq 120$	6
$120 < h \leq 160$	15
$160 < h \leq 200$	8
$200 < h \leq 240$	4

- (a) Complete the cumulative frequency table.

Height (cm)	Cumulative Frequency
$0 < h \leq 40$	3
$0 < h \leq 80$	7
$0 < h \leq 120$	13
$0 < h \leq 160$	28
$0 < h \leq 200$	36
$0 < h \leq 240$	40

(1)

(b) Draw a cumulative frequency graph for this information.



(2)

(c) Use your graph to estimate the percentage of sunflowers with a height more than 110cm

* if "11"

$$40 - 11 = 29$$

$$\frac{29}{40} = 0.725$$

72.5%

* if ~~11~~
"12"

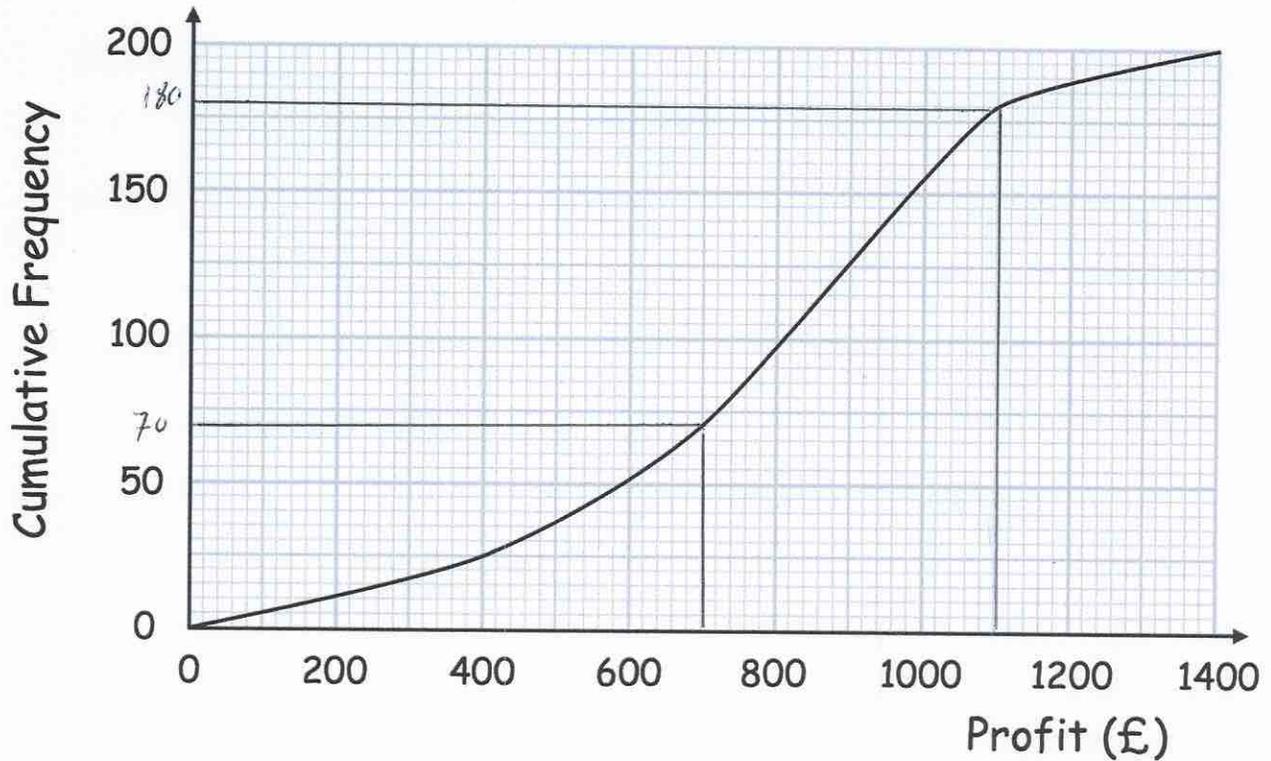
$$40 - 12 = 28$$

$$\frac{28}{40} = 0.7$$

70%

72.5 %
(3)

22. A shop records how much profit they make each day.
 The cumulative frequency graph shows information about the profit made over the past 200 days.



One of the 200 days is chosen at random.

Use your graph to find an estimate for the probability that the profit on this day is between £700 and £1100

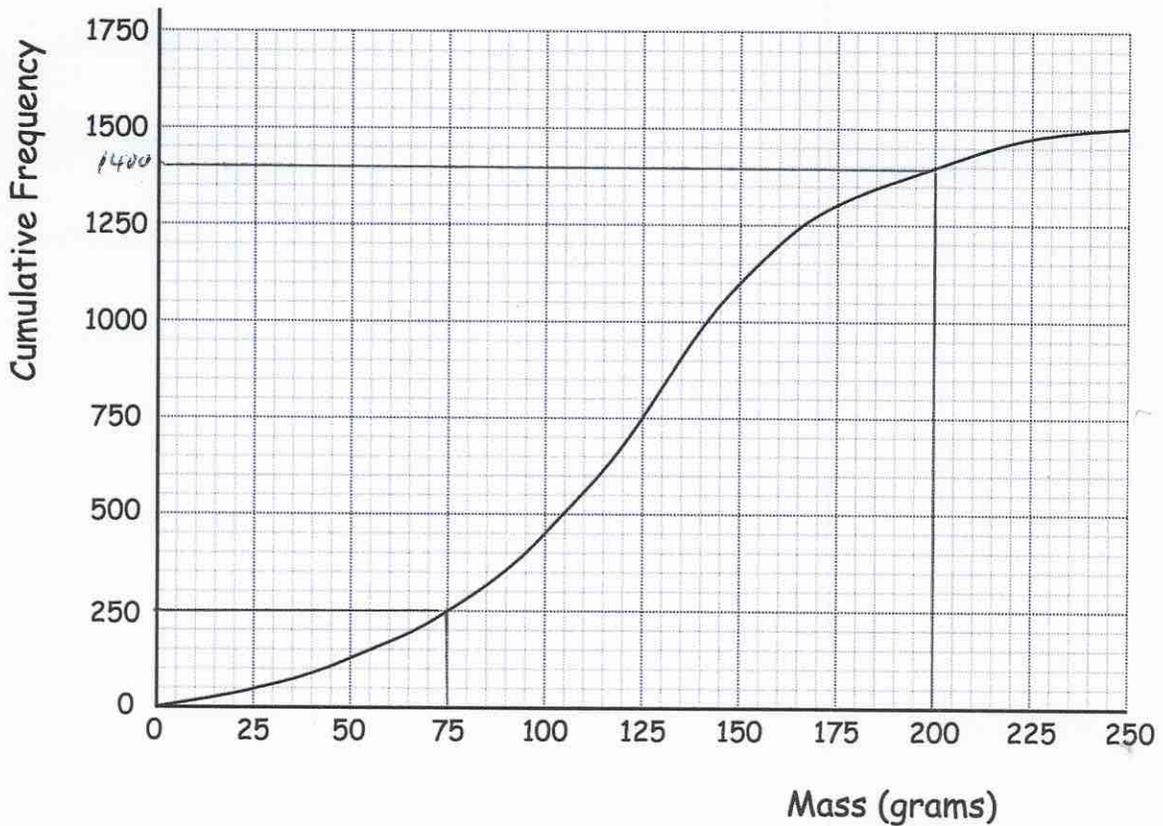
$$180 - 70 = 110$$

$$\frac{110}{200}$$

$$\frac{11}{20}$$

(3)

23. The cumulative frequency graph shows information about 1500 apples picked on a farm one day.



The farmer says that

Small apples weigh less than 75g 250
 Medium apples weigh from 75g to 200g 1150
 Large apples weigh more than 200g 100

Find

number of small apples : number of medium apples : number of large apples

Give the ratio in its simplest form.

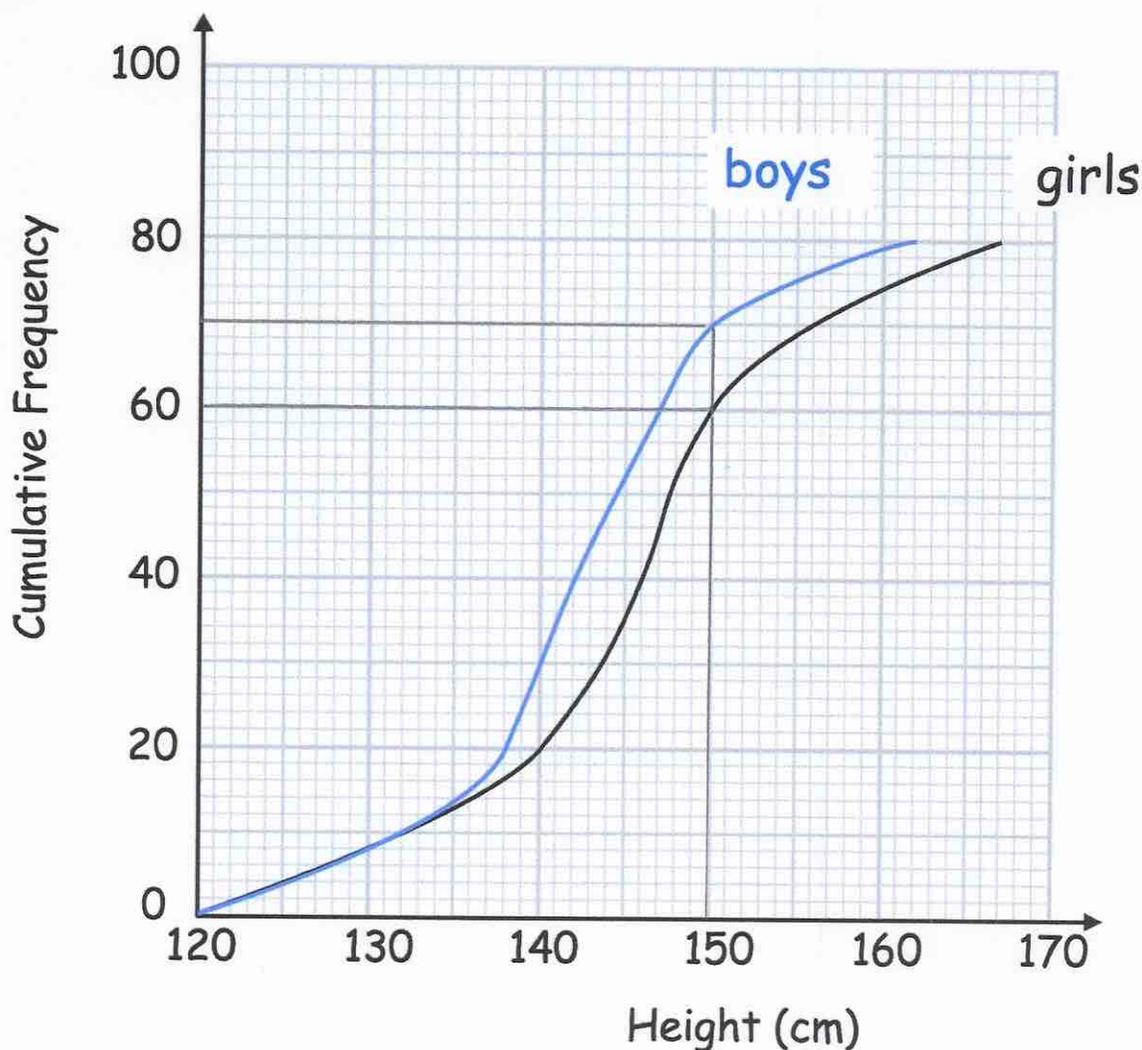
$$250 : 1150 : 100$$

$$5 : 23 : 2$$

$$\dots\dots\dots 5 : 23 : 2$$

(4)

24. The cumulative frequency graphs show information about the heights of the 80 boys and 80 girls in Year 7.



The headteacher picks one boy and one girl at random.

Find an estimate of the probability that both students are taller than 150cm.

$$P(\text{girl less than } 150\text{cm}) = \frac{60}{80} \\ = \frac{3}{4}$$

$$P(\text{girl more than } 150\text{cm}) = \frac{1}{4}$$

$$P(\text{boy less than } 150\text{cm}) = \frac{70}{80} \\ = \frac{7}{8}$$

$$P(\text{boy more than } 150\text{cm}) = \frac{1}{8}$$

$$P(\text{both more than } 150\text{cm}) = \frac{1}{4} \times \frac{1}{8}$$

$$\frac{1}{32}$$

(4)

$$= \frac{1}{32}$$