

Questions

SGS Mathematics Faculty

UNIT 1: Data Handling

Year 10

Saturday 16th June 2012

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Mean, Mode, Median and Range and Mean from a Table

1. Here are 10 numbers.

3 2 5 4 2 4 6 2 1 2

Find the mode of these numbers.

$$\text{Mode} = 2$$

(1 mark)

2. Work out the median of these 15 numbers.

~~7~~, ~~8~~, ~~8~~, ~~8~~, ~~4~~, ~~2~~, ~~8~~, 9, ~~4~~, ~~8~~, ~~1~~, ~~8~~, ~~1~~, ~~8~~, 9

In order

1, 2, 3, 4, 4, 5, 5, (6), 7, 8, 8, 8, 8, 9, 9

Median

(2 marks)

3. Chloe made a list of her homework marks.

4 5 5 5 4 3 2 1 4 5

(a) Write down the mode of her homework marks.

$$\text{Mode} = 5$$

(1 mark)

(b) Work out her mean homework mark.

$$\text{Mean} = \frac{38}{10} = 3.8$$

(2 marks)

4. Jalin wrote down the ages, in years, of seven of his relatives.

~~45~~, ~~38~~, ~~43~~, ~~43~~, ~~38~~, 40, ~~29~~

(a) Find the median age.

In order 38, 39, 39, (40), 43, 43, 45

Median

(1 mark)

(b) Work out the range of the ages.

$$\begin{aligned} \text{Range} &= \text{largest} - \text{smallest} \\ &= 45 - 38 = 7 \end{aligned}$$

(1 mark)

(c) Work out the mean age.

$$\text{Mean} = \frac{287}{7} = 41$$

(2 marks)

5. Andy did a survey of the number of cups of coffee some pupils in his school had drunk yesterday.

The frequency table shows his results.

Number of cups of coffee	Frequency
2	1
3	3
4	5
5	8
6	5

- (a) Work out the number of pupils that Andy asked.

$$\text{Add up frequencies} = 1 + 3 + 5 + 8 + 5 = 22$$

(2 marks)

Andy thinks that the average number of drinks pupils in his survey had drunk is 7.

- (b) Explain why Andy cannot be correct.

Mean cannot be larger than highest value (6)

(1 mark)

6. There are 10 children in a playgroup.
The table shows information about the ages, in years, of these children.

x Age in years	f Frequency
2	3
3	5
4	2

$$\begin{array}{r}
 x \times f \\
 \hline
 2 \times 3 = 6 \\
 3 \times 5 = 15 \\
 4 \times 2 = 8 \\
 \hline
 \end{array}$$

Work out the mean age of the children (in years).
Total = 10 Total = 29

$$\text{Mean} = 29 \div 10 = 2.9$$

(3 marks)

7. 20 students scored goals for the school hockey team last month. The table gives information about the number of goals they scored.

x Goals scored	f Number of students	$x \times f$
1	9	$1 \times 9 = 9$
2	3	$2 \times 3 = 6$
3	5	$3 \times 5 = 15$
4	3	$4 \times 3 = 12$

Total = 20

Total = 42

Work out the mean number of goals scored.

$$\text{Mean} = 42 \div 20 = 2.1$$

(3 marks)

8. 22 students took a short test. The table gives information about their marks in the test.

x Mark	f Frequency	$x \times f$
7	1	$7 \times 1 = 7$
8	6	$8 \times 6 = 48$
9	5	$9 \times 5 = 45$
10	10	$10 \times 10 = 100$

Total = 22

Total =

- (a) Write down the modal mark.

Highest frequency (10) is 10

(1 mark)

- (b) Work out the range of the marks.

$$\text{Range} = \text{largest} - \text{smallest} = 10 - 7 = 3$$

(1 mark)

- (c) Work out the mean mark.

$$\begin{aligned} \text{Mean} &= 200 \div 22 \\ &= 9.1 \end{aligned}$$

(3 marks)

9. A teacher asked 50 children how much pocket money they got each week. The table shows some information about their replies.

Pocket money (£x)	(f) Frequency	(x) Midpoint	$x \times f$
$0 < x \leq 2$	1	1	$1 \times 1 = 1$
$2 < x \leq 4$	10	3	$10 \times 3 = 30$
$4 < x \leq 6$	23	5	$23 \times 5 = 115$
$6 < x \leq 8$	14	7	$14 \times 7 = 98$
$8 < x \leq 10$	2	9	$2 \times 9 = 18$
Total = 50			Total = 262

Work out the estimate for the mean amount of pocket money (£) the children got.

$$\begin{aligned} \text{Mean} &= 262 \div 50 \\ &= 5.24 \end{aligned}$$

(4 marks)

10. The table shows information about the number of hours that 120 children used a computer last week.

Number of hours (h)	(F) Frequency	(x) Midpoint	$x \times f$
$0 < h \leq 2$	10	1	$1 \times 10 = 10$
$2 < h \leq 4$	15	3	$3 \times 15 = 45$
$4 < h \leq 6$	30	5	$5 \times 30 = 150$
$6 < h \leq 8$	35	7	$7 \times 35 = 245$
$8 < h \leq 10$	25	9	$9 \times 25 = 225$
$10 < h \leq 12$	5	11	$11 \times 5 = 55$
Total = 120			Total = 730

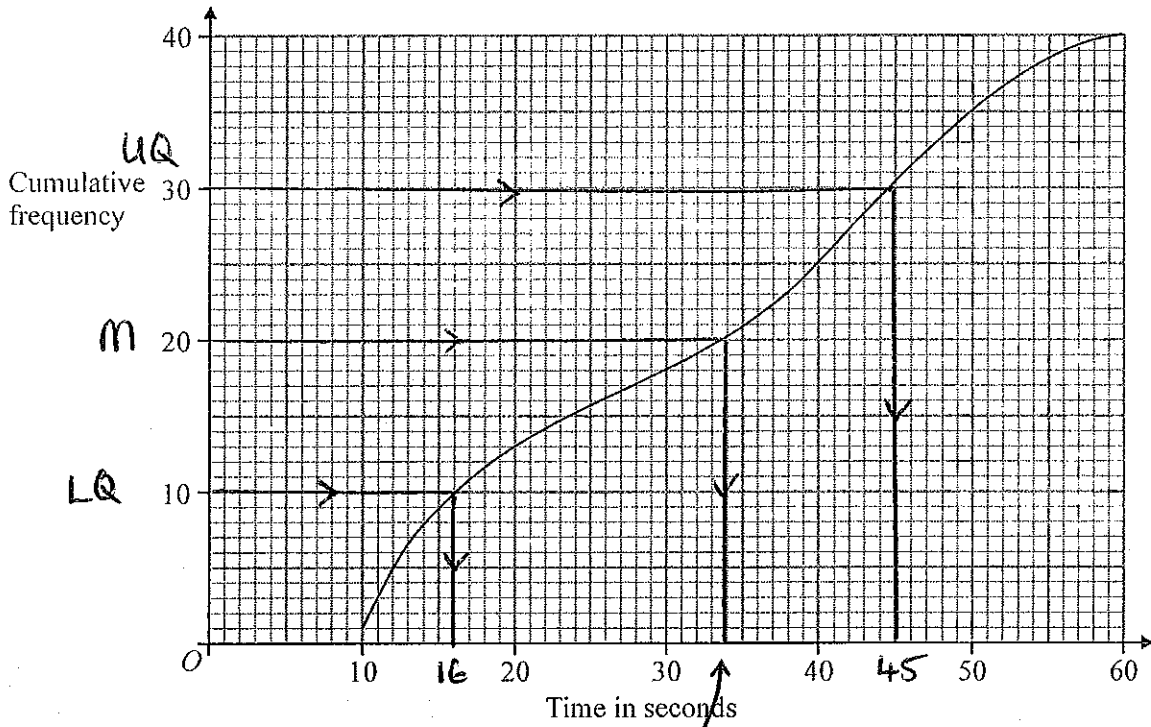
Work out an estimate for the mean number of hours that the children used a computer. Give your answer (hours) correct to 2 decimal places.

$$\begin{aligned} \text{Mean} &= 730 \div 120 \\ &= 6.1 \end{aligned}$$

(4 marks)

Reading Cumulative Frequency Diagrams

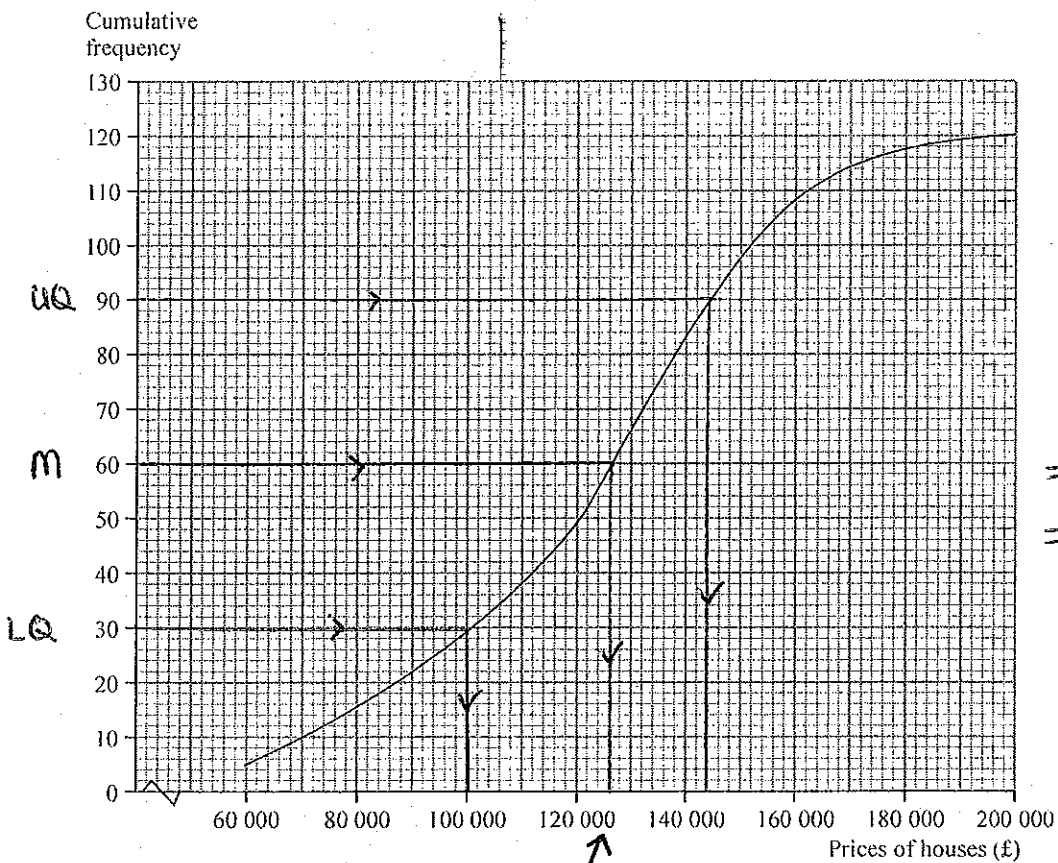
1.



$$\begin{aligned} \text{IQR} &= 45 - 16 \\ &= 29 \end{aligned}$$

Median = 34

2.

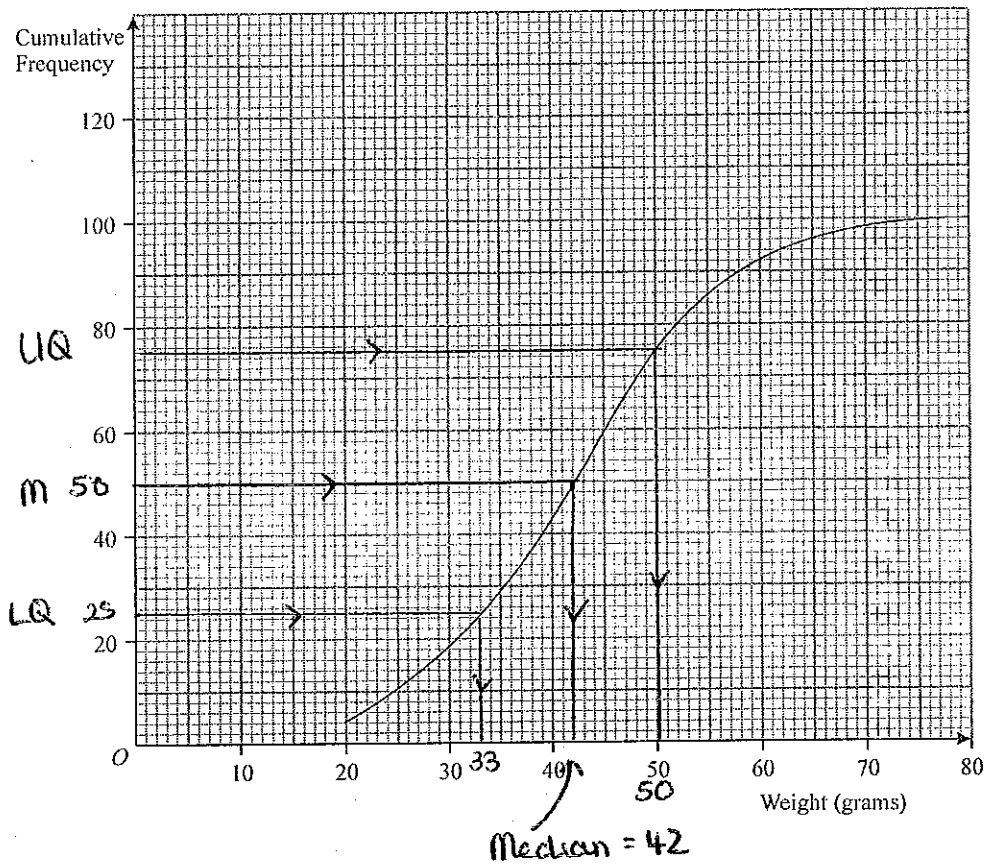


read from top of graph
not top of scale.

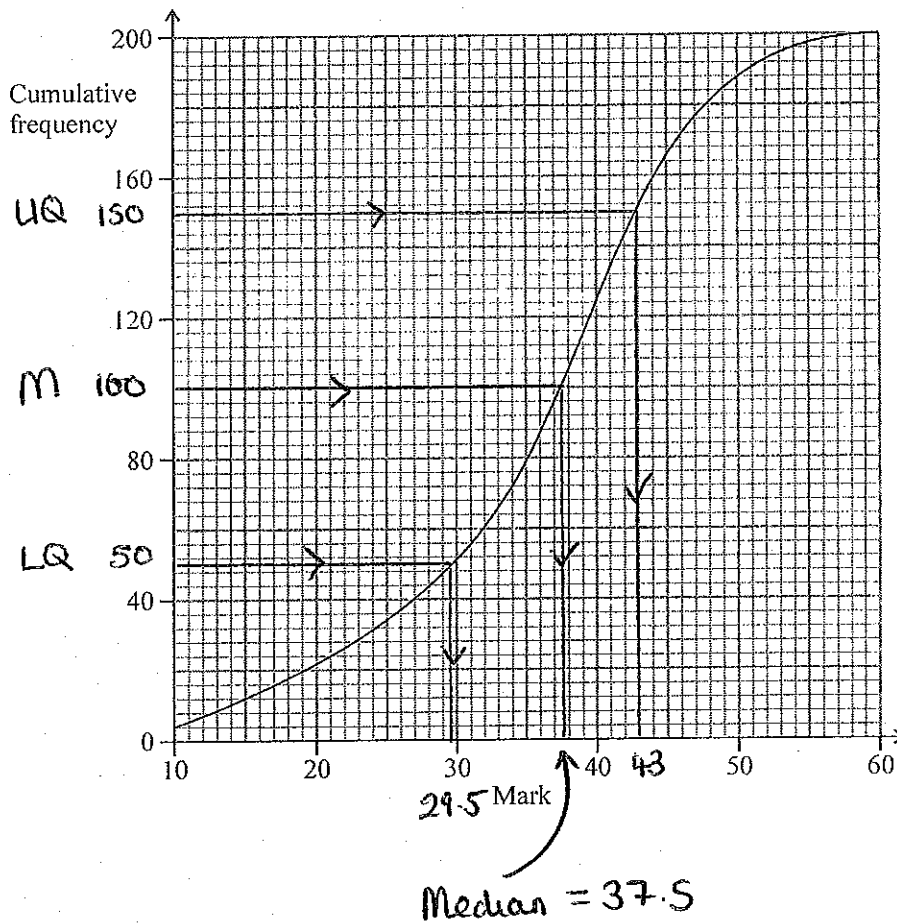
$$\begin{aligned} \text{IQR} &= 144,000 - 100,000 \\ &= 44,000 \end{aligned}$$

Median = 126,000

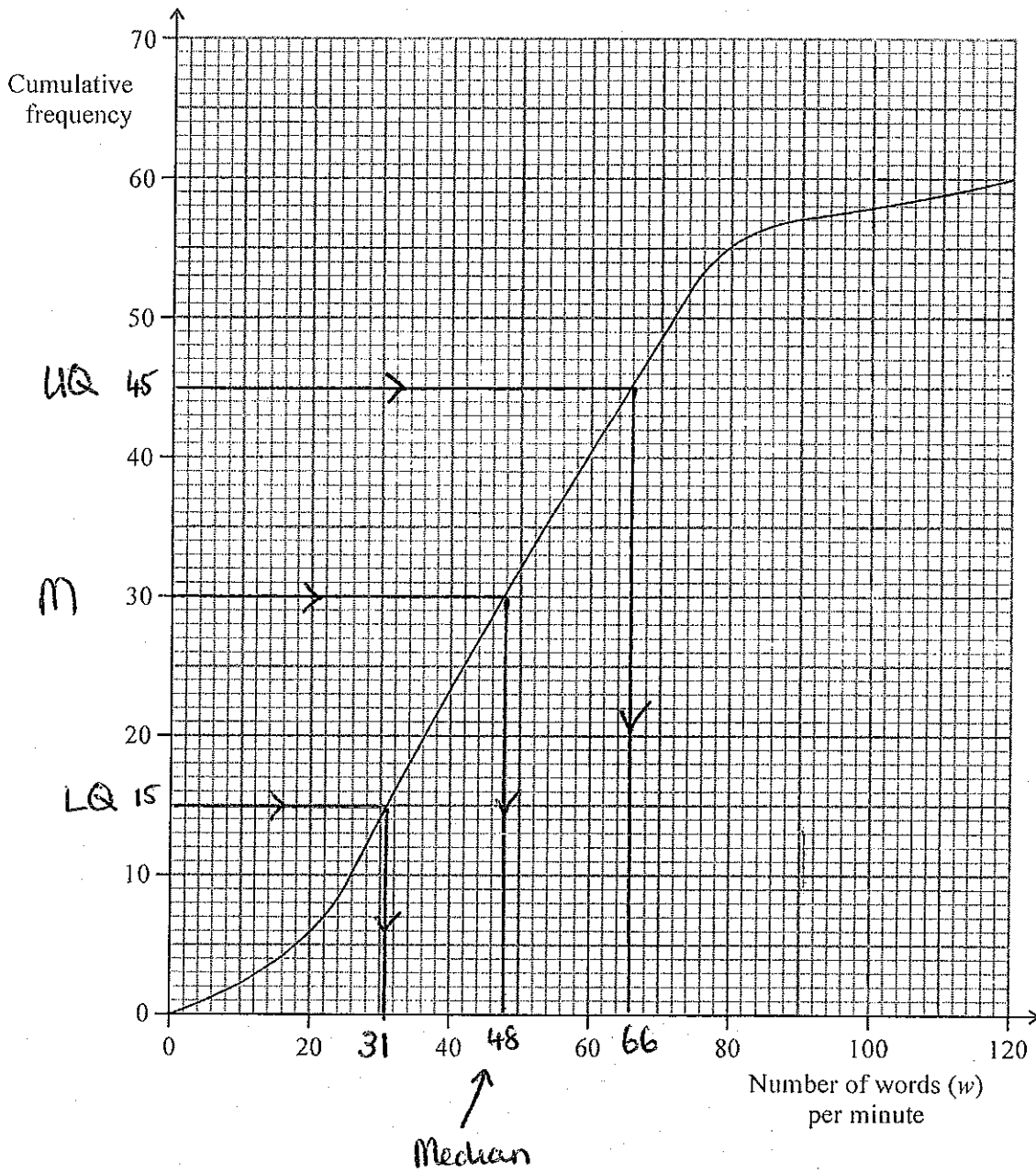
3.



4.



5.



$$IQR = 66 - 31 = 35.$$

Plotting Cumulative Frequency Diagrams

1. The table shows information about the heights of 40 bushes.

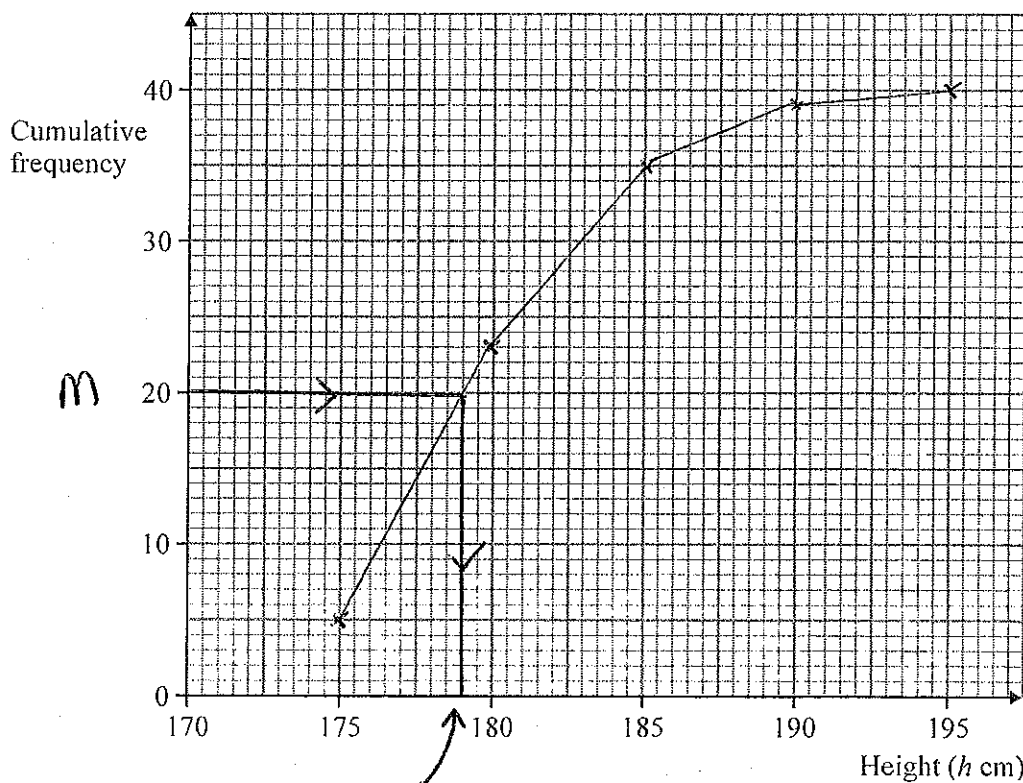
Height (h cm)	Frequency	Cumulative Frequency
$170 \leq h < 175$	5	5
$175 \leq h < 180$	18	23
$180 \leq h < 185$	12	35
$185 \leq h < 190$	4	39
$190 \leq h < 195$	1	40

(a) Complete the cumulative frequency table.

Plot at end of interval.

(1 mark)

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



Median = 179cm

(2 marks)

(c) Use the graph to find an estimate for the median height of the bushes.

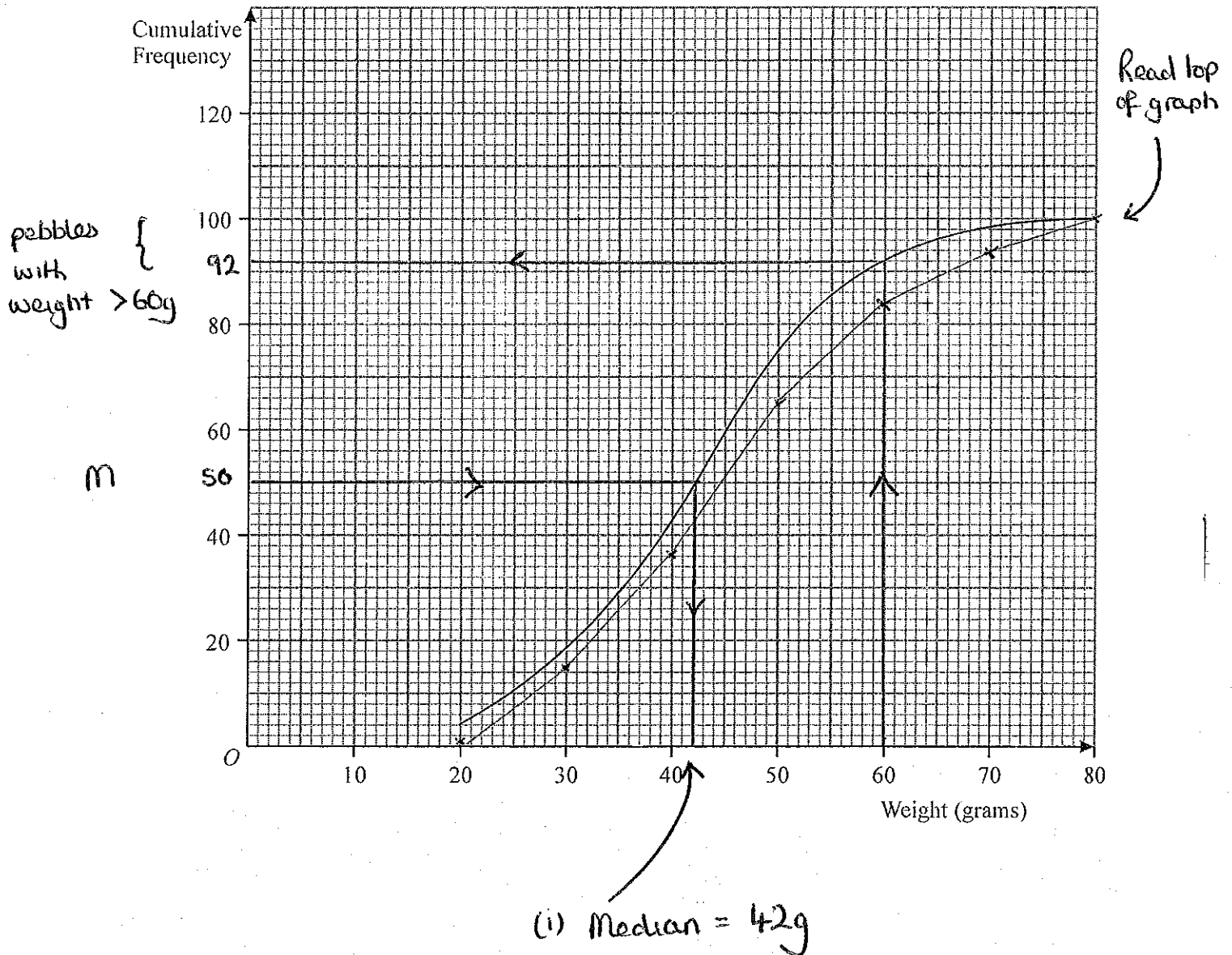
(1 mark)

2. Daniel took a sample of 100 pebbles from Tawny Beach. He weighed each pebble and recorded its weight. He used the information to draw the cumulative frequency graph shown on the grid.

(a) Use the cumulative frequency graph to find an estimate for

(i) the median weight of these pebbles (in grams). *42g*

(ii) the number of pebbles with a weight more than 60 grams. *8 pebbles (100-92)*
(3 marks)



Daniel also took a sample of 100 pebbles from Golden Beach.
The table shows the distribution of the weights of the pebbles in the sample from Golden Beach.

Weight (w grams)	Cumulative frequency
$0 < w \leq 20$	1
$0 < w \leq 30$	15
$0 < w \leq 40$	36
$0 < w \leq 50$	65
$0 < w \leq 60$	84
$0 < w \leq 70$	94
$0 < w \leq 80$	100

Plot at end point of intervals.

- (b) On the same grid, draw the cumulative frequency graph for the information shown in the table.

(2 marks)

3. 90 students took an examination.
The grouped frequency table shows information about their results.

Mark (x)	Frequency	Cumulative Frequency
$0 < x \leq 10$	3	3
$10 < x \leq 20$	10	13
$20 < x \leq 30$	17	30
$30 < x \leq 40$	30	60
$40 < x \leq 50$	21	81
$50 < x \leq 60$	7	88
$60 < x \leq 70$	2	90

Plot at end points of intervals

- (a) Complete the cumulative frequency table.

(1 mark)

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

(2 marks)

- (c) Use your graph to find an estimate for the median mark. *Median = 35*

(1 mark)

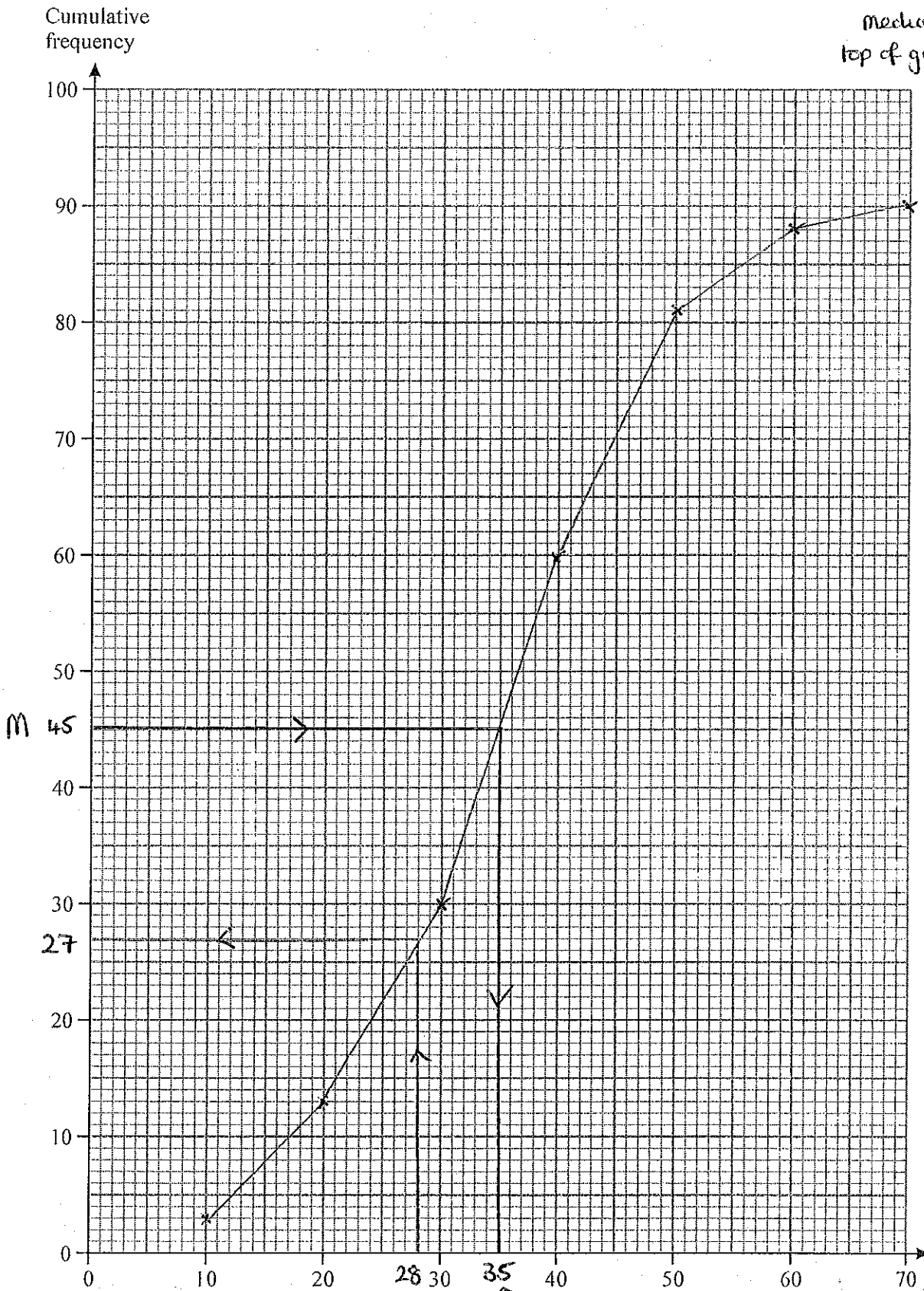
The pass mark for the examination was 28.

- (d) Use your graph to find an estimate for the number of students who passed the examination.

(2 marks)

$$90 - 27 = 63 \text{ students (above pass mark)}$$

When finding median read from top of graph, not top of scale.



Pass mark

Median = 35

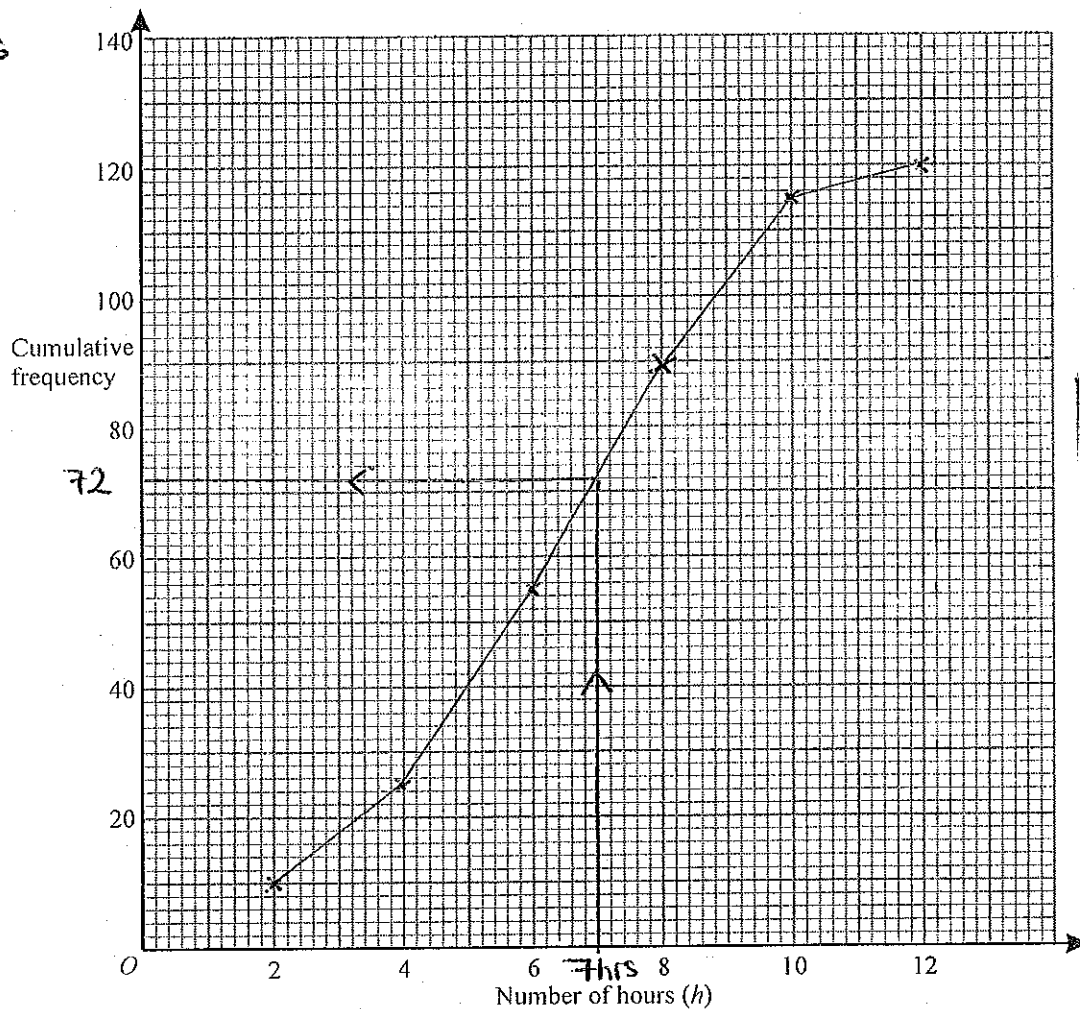
4. The table shows information about the number of hours that 120 children used a computer last week.

Number of hours (h)	Frequency	Cumulative Frequency
$0 < h \leq 2$	10	10
$2 < h \leq 4$	15	25
$4 < h \leq 6$	30	55
$6 < h \leq 8$	35	90
$8 < h \leq 10$	25	115
$10 < h \leq 12$	5	120

- (a) Complete the cumulative frequency table.

Plot at end points of intervals

(1 mark)



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

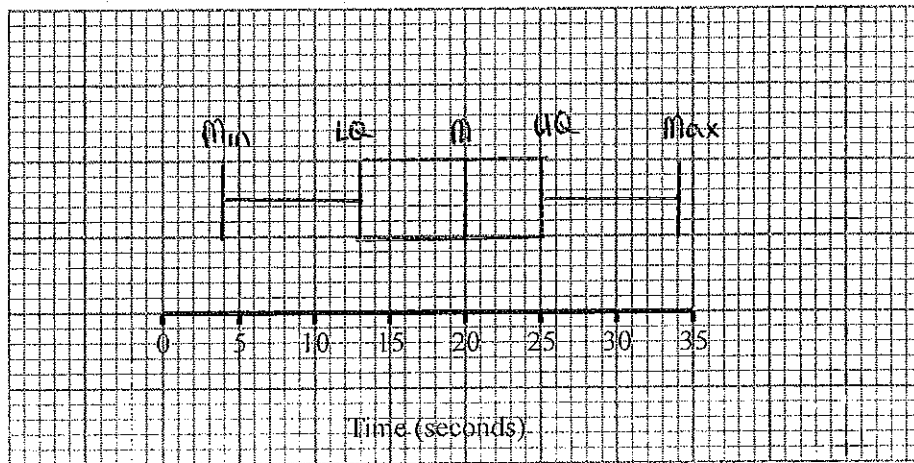
(2 marks)

- (c) Use your graph to find an estimate for the number of children who used a computer for less than 7 hours last week.

72 pupils used a computer for < 7 hrs per week.

(2 marks)

(b) Draw a box plot for this data.



$Min = 4$
 $LQ = 13$
 $UQ = 25$
 $Max = 34$
 $Median = 20$

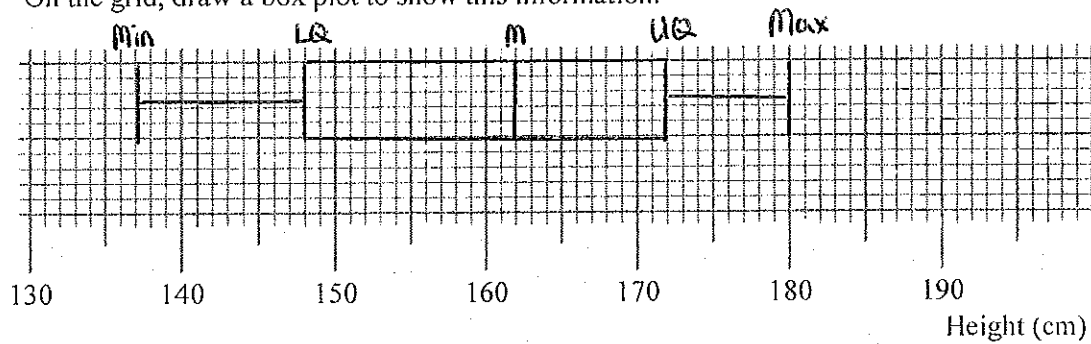
(3 marks)

3. Lottie measured the heights, in centimetres, of the girls in her class.

The table shows some information about the heights.

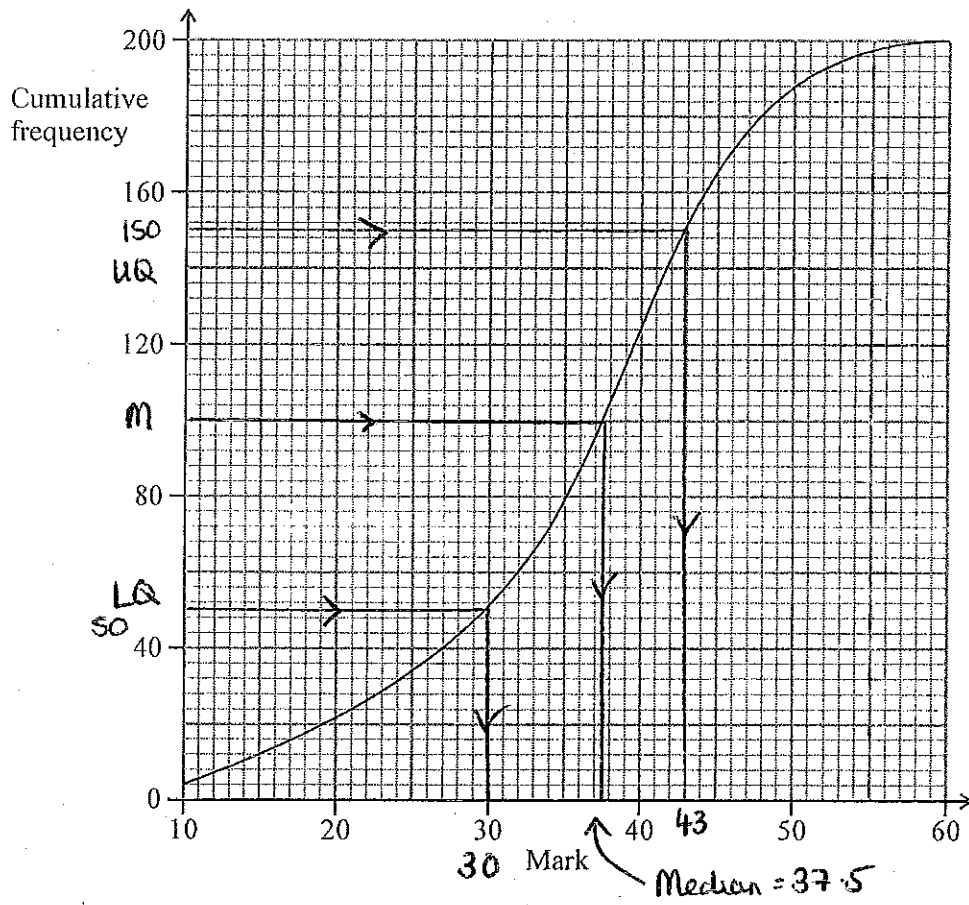
Height of shortest girl	137 cm	Min
Height of tallest girl	180 cm	Max
Median	162 cm	
Lower quartile	148 cm	
Upper quartile	172 cm	

On the grid, draw a box plot to show this information.



(2 marks)

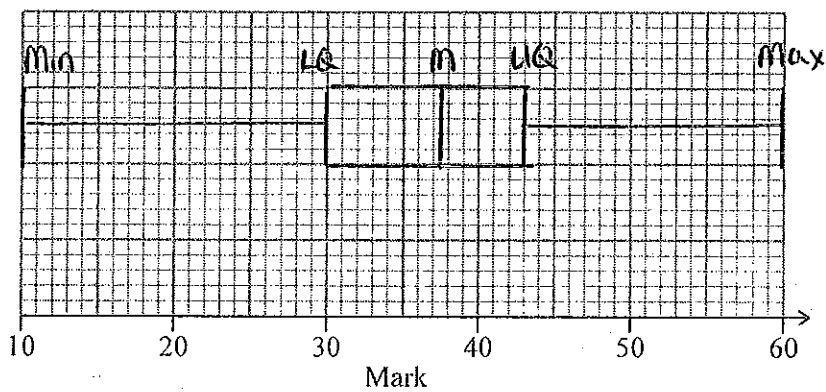
4. 200 students took a test.
The cumulative frequency graph gives information about their marks.



The lowest mark scored in the test was 10.
The highest mark scored in the test was 60.

Use this information and the cumulative frequency graph to draw a box plot showing information about the students' marks.

Min = 10
LQ = 30
Median = 37.5
UQ = 43
Max = 60



(3 marks)

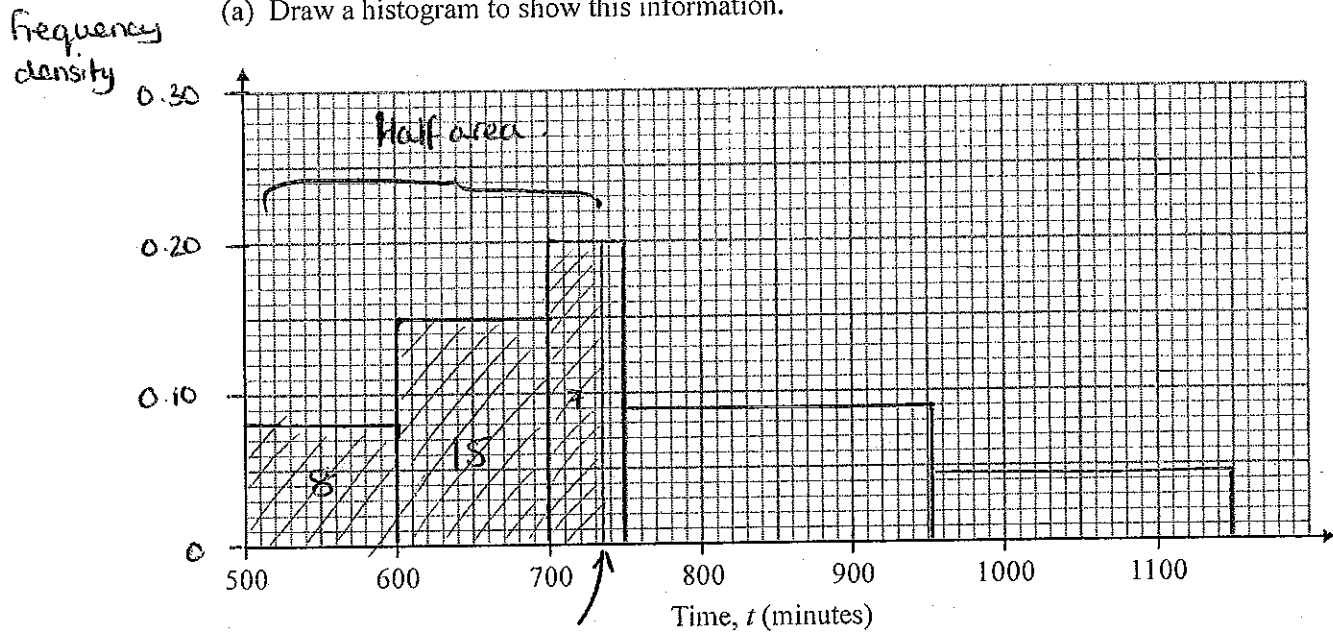
Drawing and Interpreting Histograms

1. Batteries are tested by putting them into toys and seeing how long they last. Here are the results of 60 tests.

Time, t (minutes)	Frequency	CW	fd.
$500 \leq t < 600$	8	100	$\frac{8}{100} = 0.08$
$600 \leq t < 700$	15	100	$\frac{15}{100} = 0.15$
$700 \leq t < 750$	10	50	$\frac{10}{50} = 0.20$
$750 \leq t < 950$	18	200	$\frac{18}{200} = 0.09$
$950 \leq t < 1150$	9	200	$\frac{9}{200} = 0.045$

fd = frequency density
 = $\frac{\text{frequency}}{\text{class width}}$

- (a) Draw a histogram to show this information.



Median = $700 + 35$
 = 735 minutes.

(3 marks)

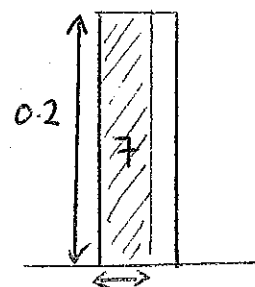
- (b) Use your histogram, or otherwise, to estimate the median (in minutes) life of a battery.

Find half the area. (30 units).

1st bar = 8
 2nd bar = 15
 3rd bar = need 7 units } total 30.

3rd bar.

(2 marks)



$x = 7 \div 0.2$
 = 35

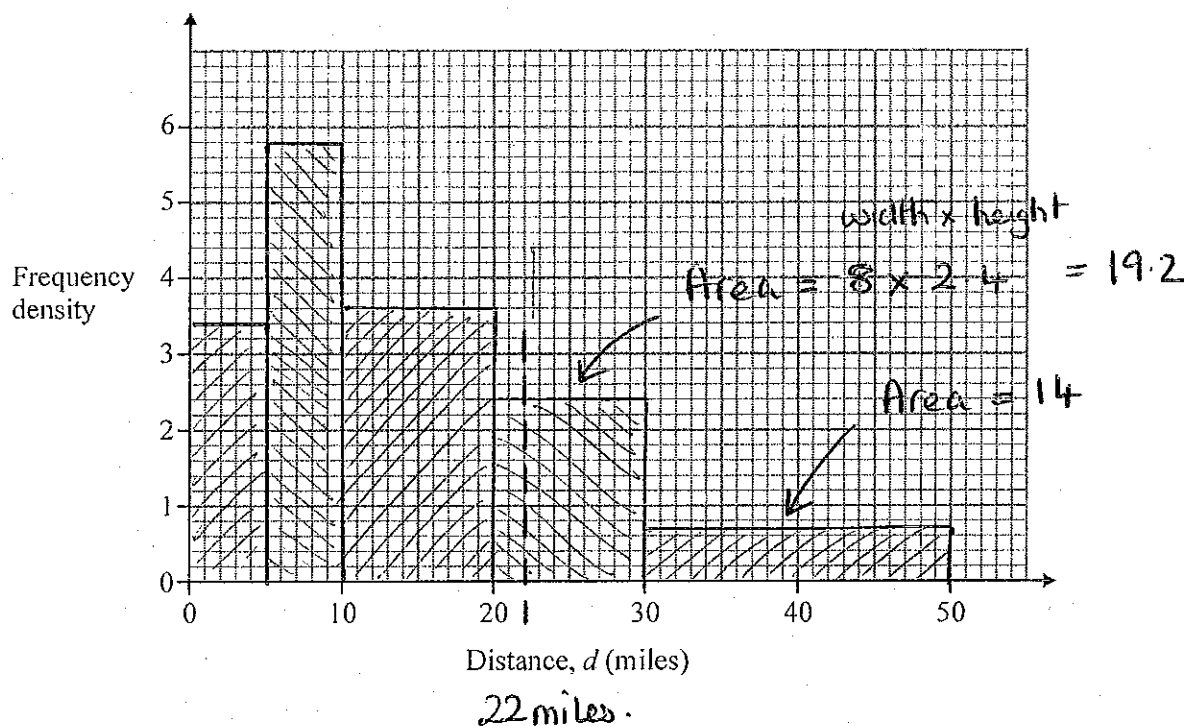
2. In a survey 120 people were asked how far they travel to work each day.

The table shows the results.

$$fd = f \div cw$$

Distance, d (miles)	Frequency	cw	$fd.$
$0 < d \leq 5$	17	5	$\frac{17}{5} = 3.4$
$5 < d \leq 10$	29	5	$\frac{29}{5} = 5.8$
$10 < d \leq 20$	36	10	$\frac{36}{10} = 3.6$
$20 < d \leq 30$	24	10	$\frac{24}{10} = 2.4$
$30 < d \leq 50$	14	20	$\frac{14}{20} = 0.7$

(a) Draw a histogram to represent this information.



(3 marks)

(b) Estimate how many people travel more than 22 miles to work.

Total Area above 22 miles

$$= 19.2 + 14$$

(2 marks)

$$= 33.2$$

~ 33 people.

3. 50 customers leaving a shop were asked how much money they had spent.

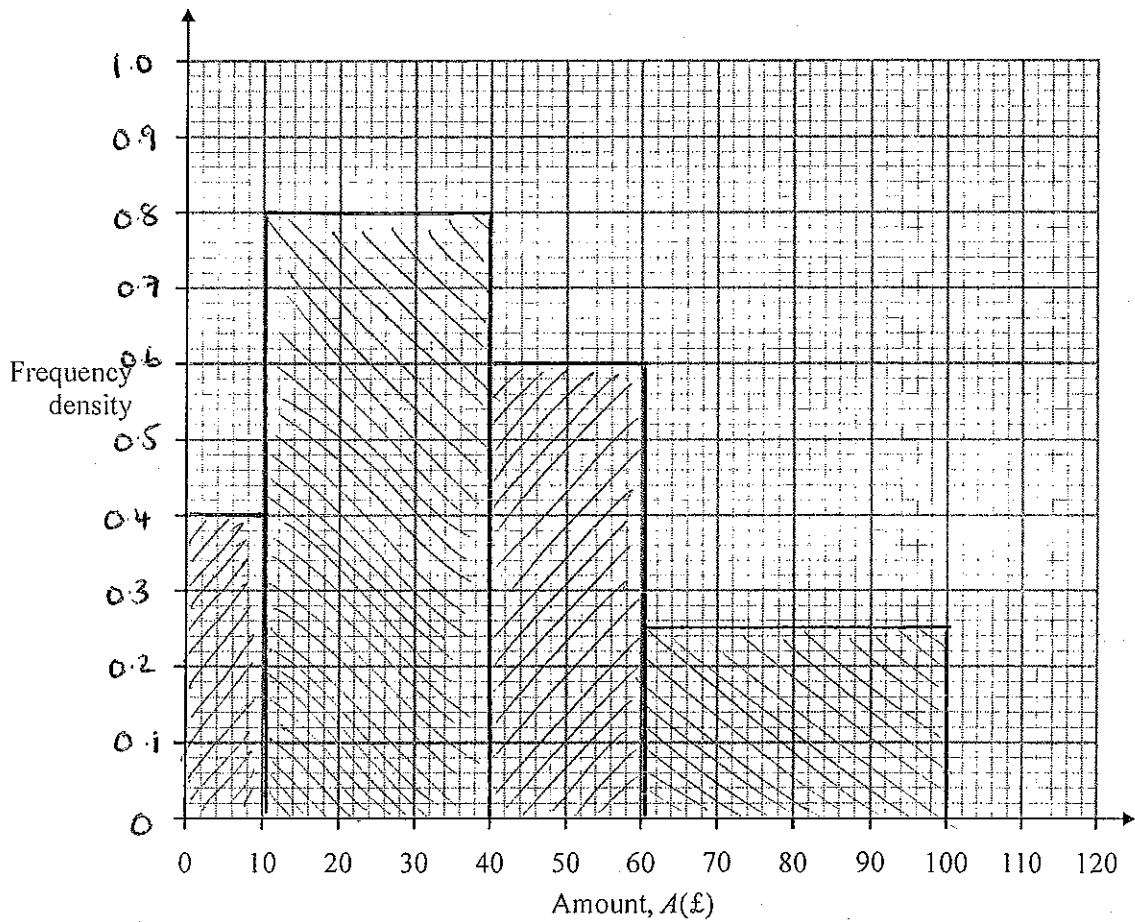
The table shows the results.

Amount A (£)	Number of customers
$0 < A \leq 10$	4
$10 < A \leq 40$	24
$40 < A \leq 60$	12
$60 < A \leq 100$	10

cw
 10
 30
 20
 40

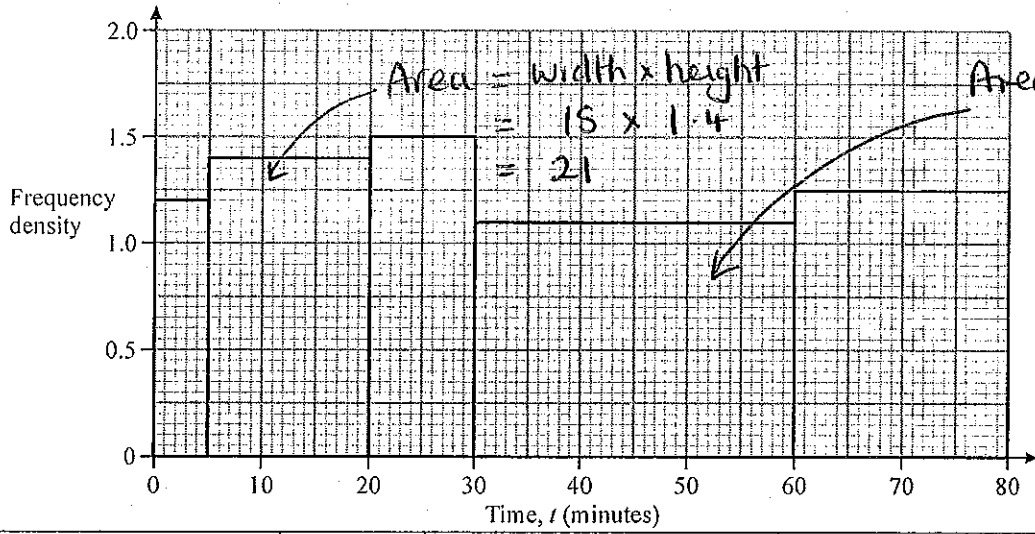
$fd.$
 $4 \div 10 = 0.4$
 $24 \div 30 = 0.8$
 $12 \div 20 = 0.6$
 $10 \div 40 = 0.25$

Draw a histogram to show this information.



(3 marks)

4. The histogram shows information about how much time was spent in a supermarket by 100 shoppers. Complete this frequency table: (2)



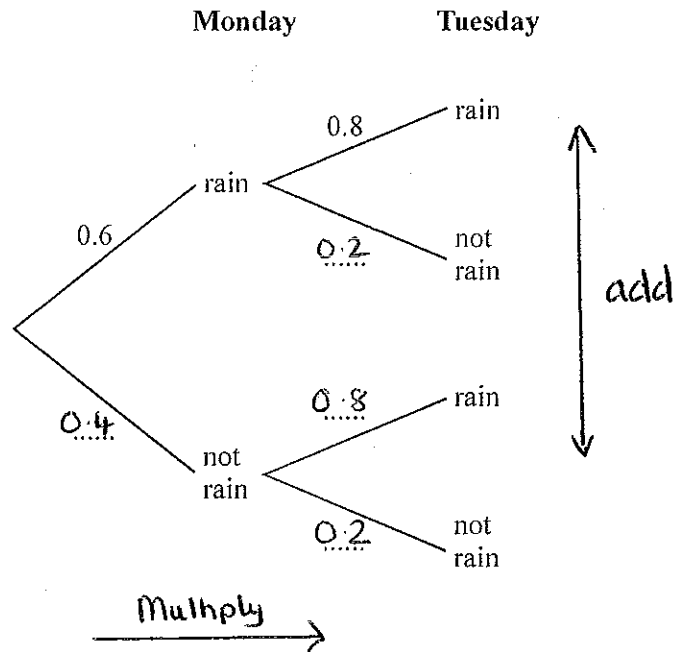
Time, t (minutes)	$0 < t \leq 5$	$5 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 60$	$60 < t \leq 80$
Number of shoppers	6	21	15	33	25

Probability and Tree Diagrams

1. A weather forecast says

The probability that it will rain on Monday is 0.6
 The probability that it will rain on Tuesday is 0.8

- (a) Complete the tree diagram showing the possible outcomes



(1 mark)

- (b) Calculate the probability that it rains on just one of the two days.

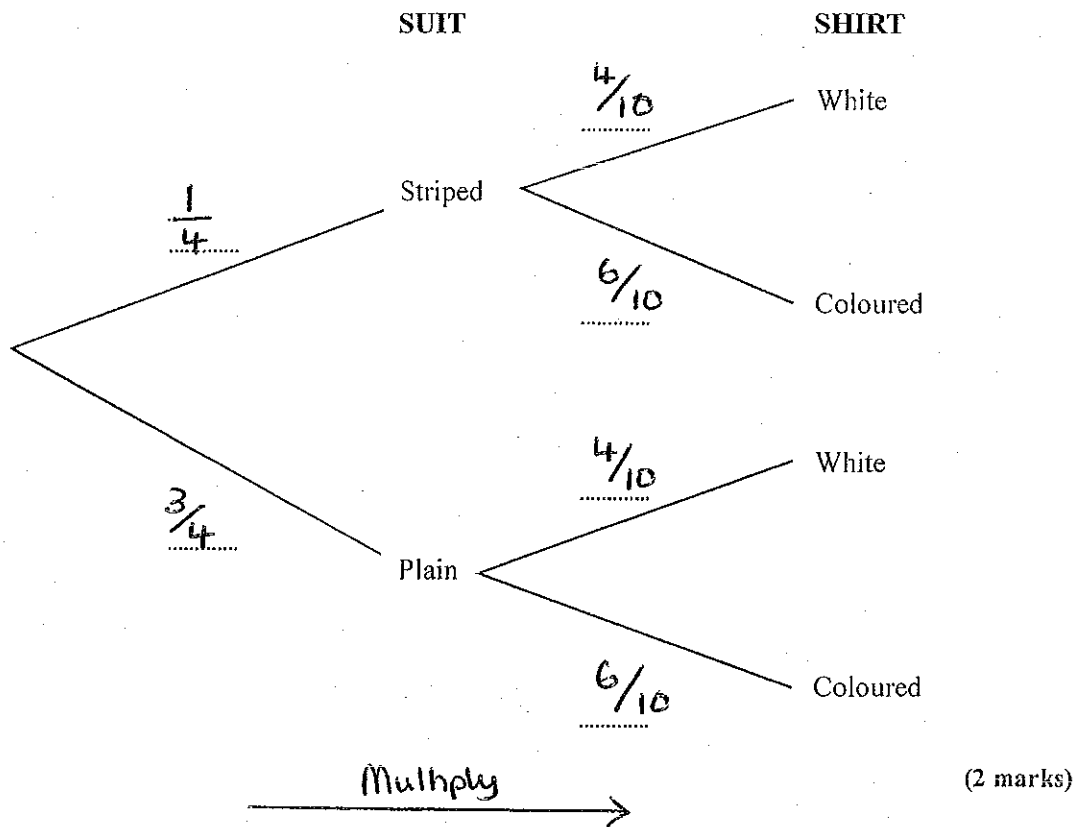
$$\begin{aligned}
 &= \left(\begin{array}{c} \text{rain} \\ \text{mon} \end{array} \times \begin{array}{c} \text{not} \\ \text{tues} \end{array} \right) + \left(\begin{array}{c} \text{not} \\ \text{mon} \end{array} \times \begin{array}{c} \text{rain} \\ \text{tues} \end{array} \right) \\
 &= (0.6 \times 0.2) + (0.4 \times 0.8) \\
 &= 0.12 + 0.32 \\
 &= 0.44
 \end{aligned}$$

(3 marks)

2. Greg has four suits, one is striped and the other three are plain.
He also has ten shirts, four are white and the other six are coloured.

Greg chooses a suit at random and then chooses a shirt at random.

- (a) Fill in the probabilities on the branches of the tree diagram.



- (b) Calculate the probability that Greg chooses a plain suit and a coloured shirt.

$$= \frac{3}{4} \times \frac{6}{10}$$

(2 marks)

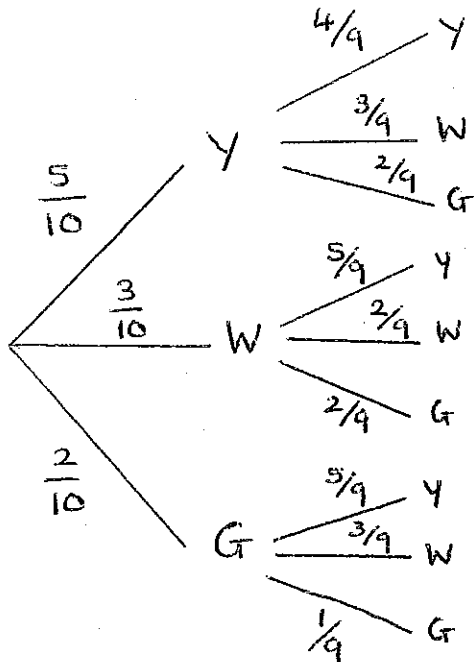
$$= \frac{18}{40}$$

$$= \frac{9}{20} \quad (\text{or } 0.45)$$

4. A bucket contains tennis balls which are identical apart from their colour. There are 5 yellow balls, 3 white balls and 2 green balls in the bucket.

Martina chooses two of the balls at random and without replacement. What is the probability that the balls are the same colour?

← conditional probability.



Probability balls same colour

$$= P(Y \text{ and } Y) + P(W \text{ and } W) + P(G \text{ and } G)$$

$$= \left(\frac{5}{10} \times \frac{4}{9}\right) + \left(\frac{3}{10} \times \frac{2}{9}\right) + \left(\frac{2}{10} \times \frac{1}{9}\right)$$

$$= \frac{20}{90} + \frac{6}{90} + \frac{2}{90}$$

$$= \frac{28}{90} = \frac{14}{45}$$

(5 marks)

5. In Britain the probability of a 17 year old passing the driving test at the first attempt is 0.6.

Three people are chosen at random from the population of 17 year olds in Britain who are about to take their driving test.

What is the probability that exactly two of them pass the driving test at the first attempt?

$$\text{Pass} = 0.6, \text{ Fail} = 0.4$$

Person	1	2	3
	Pass	Pass	Fail
	Pass	Fail	Pass
	Fail	Pass	Pass

} 2 out of 3 pass.

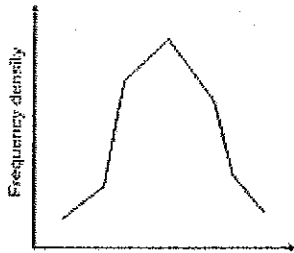
$$\text{Probability} = (0.6 \times 0.6 \times 0.4) + (0.6 \times 0.4 \times 0.6) + (0.4 \times 0.6 \times 0.6)$$

(3 marks)

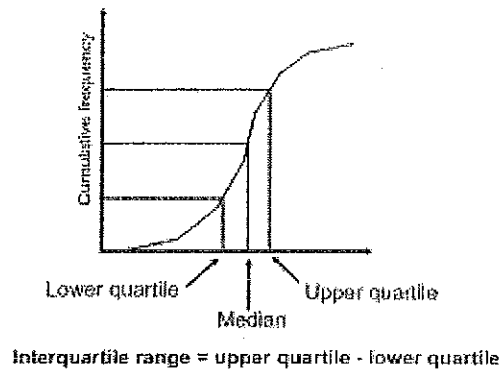
$$= 0.432$$

Statistical Diagrams Summary

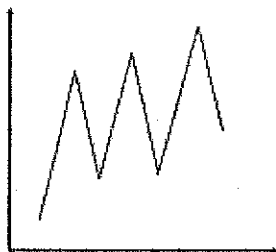
Frequency polygon
Plot mid points of each group



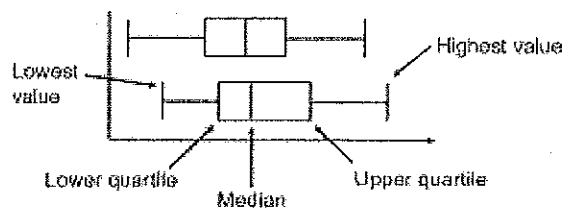
Cumulative frequency polygon
Plot upper values of each group



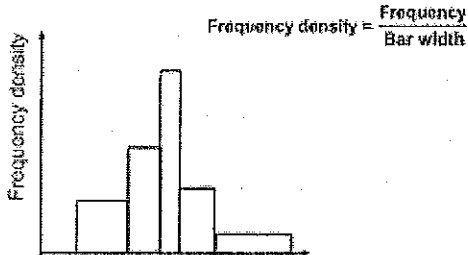
Line Graph



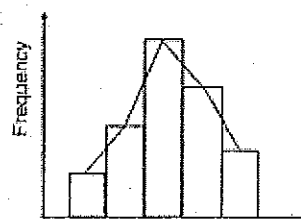
Box and whisker diagram



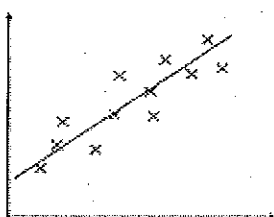
Histogram, vertical axis is frequency density



Frequency diagram
Equal bar widths, vertical axis is frequency



Scatter diagram



Stem and leaf diagram

2	4 5	Key
3	1 1 4	2 4 represents 24
4	0 6 7 8 9	
5	0 2 3 3	
6	1	

