

# Statistical Diagrams 2



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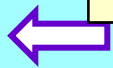
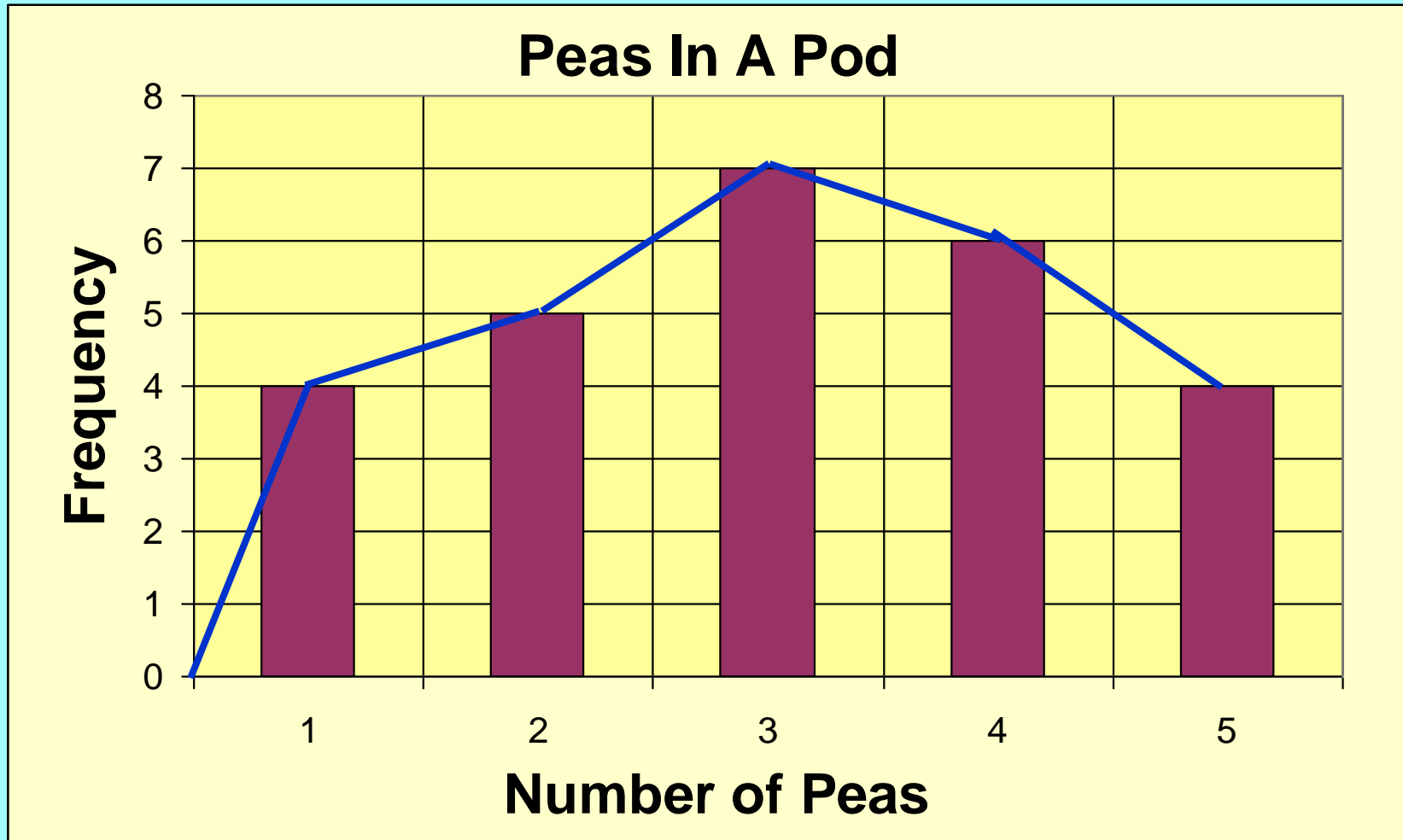
Questions

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## A Frequency Polygon

A frequency polygon is formed by joining the mid-points of the tops of the bars in a bar chart by straight lines.



## Example of a Frequency Polygon

The number of passengers on the 0656 train from Brighton to London was recorded for 36 days.

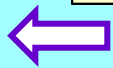
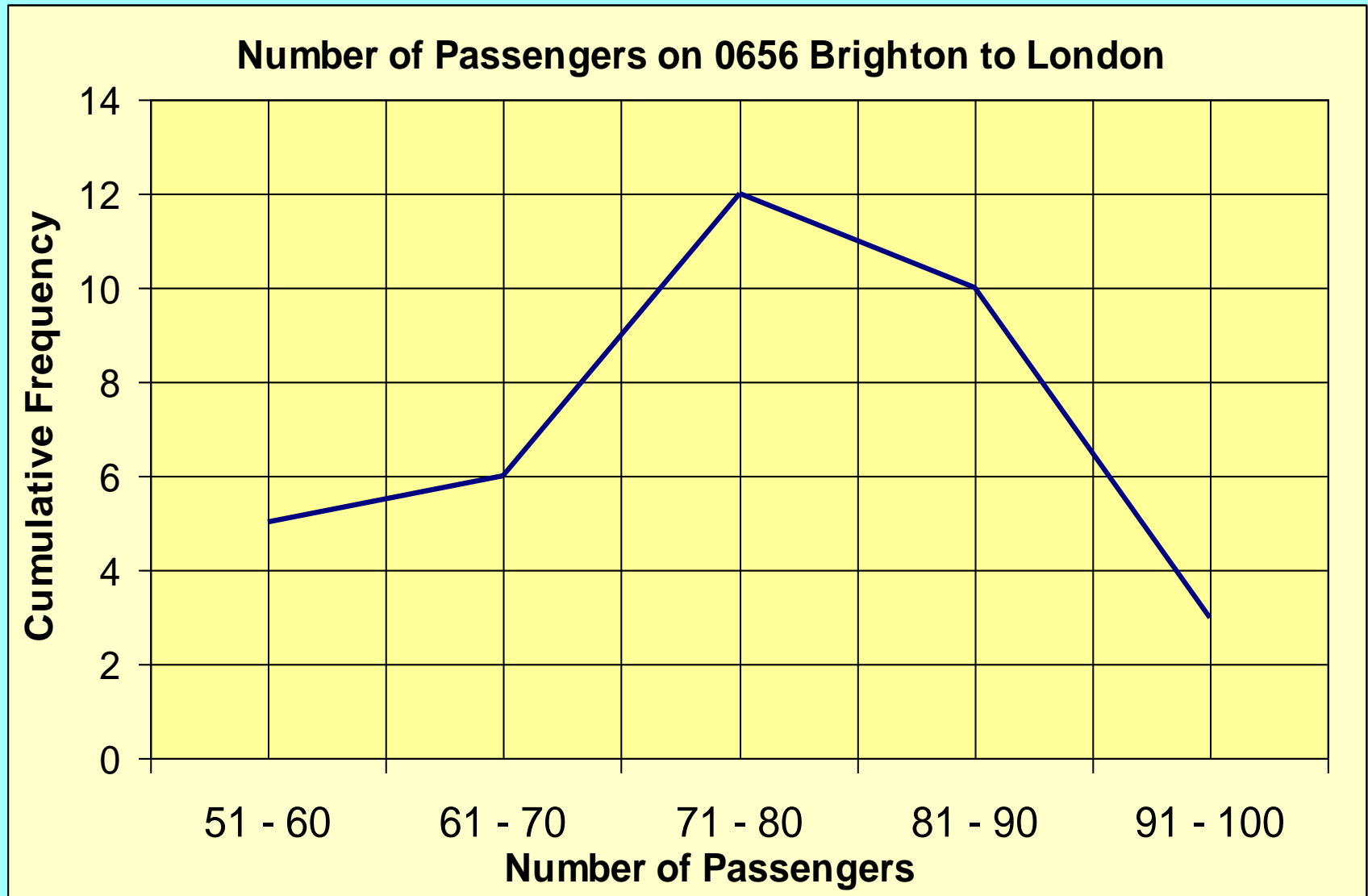
52 80 65 82 77 60 72 83 63  
78 84 75 53 73 70 86 55 88  
85 59 76 86 73 89 91 76 92  
66 93 84 62 79 90 73 68 71

This data can be put into a grouped frequency table.

Number of Passengers	Tally	Frequency
51 - 60		5
61 - 70		6
71 - 80		12
81 - 90		10
91 - 100		3

← Objective : To know how to draw a frequency polygon. →

# Example of a Frequency Polygon



## Questions

1. Michelle did a survey of the cars passing her house. She recorded the results of 100 cars.

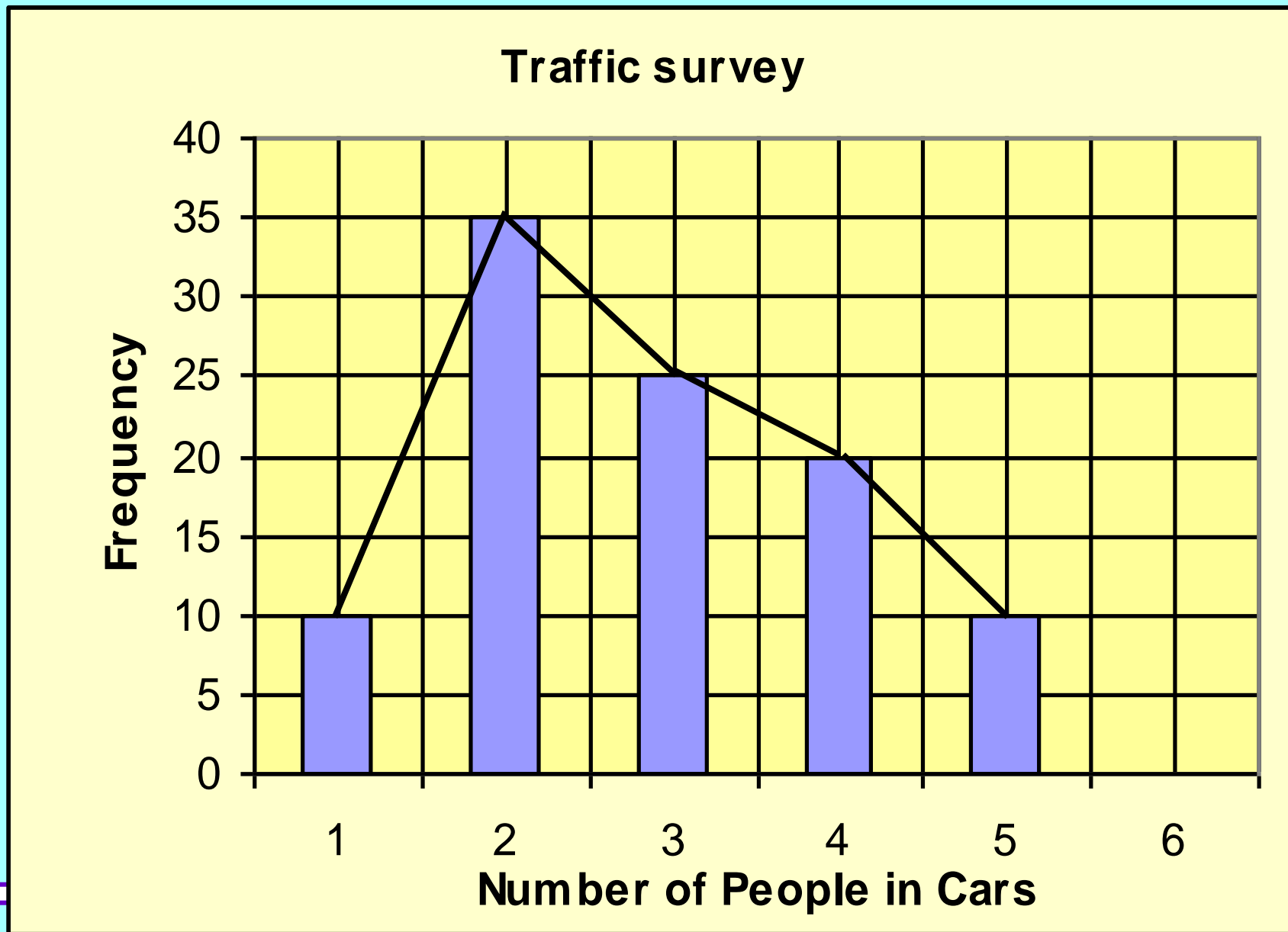
number of people	0	1	2	3	4	5	6
frequency	0	10	35	25	20	10	0

- a) Draw a bar chart to show this data.
- b) On the same graph draw a frequency polygon.

*Objective : To practise drawing frequency polygons.*



Answer



## Key Words

### Interquartile Range

Upper quartile - lower quartile

The distance on the horizontal scale between the lower and upper quartiles.

### Cumulative Frequency

The frequency is added up as you go along.

### Median

Exactly  $1/2$  way up the cumulative frequency axis and then across, then down and read off the other axis.

### Upper Quartile

Exactly  $3/4$  up the cumulative frequency axis and then across, then down and read off the other axis.

### Lower Quartile

Exactly  $1/4$  up the cumulative frequency axis and then across, then down and read off the other axis.

### Frequency

The frequency tells you how often a particular result was obtained.





# Cumulative Frequency

- Cumulative Frequency means adding up the frequency as you go along.
- When plotting the graph, plot the point using the highest value in each class.
- Cumulative Frequency is always plotted up the vertical axis.
- All values and ranges are read off the horizontal axis.

*Objective : To know how to draw cumulative frequency graphs.*



## Quartiles and Interquartile range and Median.

Lower quartile

Read off the graph at the 25% or 0.25 or  $\frac{1}{4}$  point

Upper quartile

Read off the graph at the 75% or 0.75 or  $\frac{3}{4}$  point

Interquartile range

Upper quartile - Lower quartile

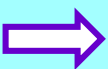
Median

Read off the graph at the 50% or 0.50 or  $\frac{1}{2}$  point

Remember at these points you must read off the graph



*Objective : To know how to calculate quartiles.*



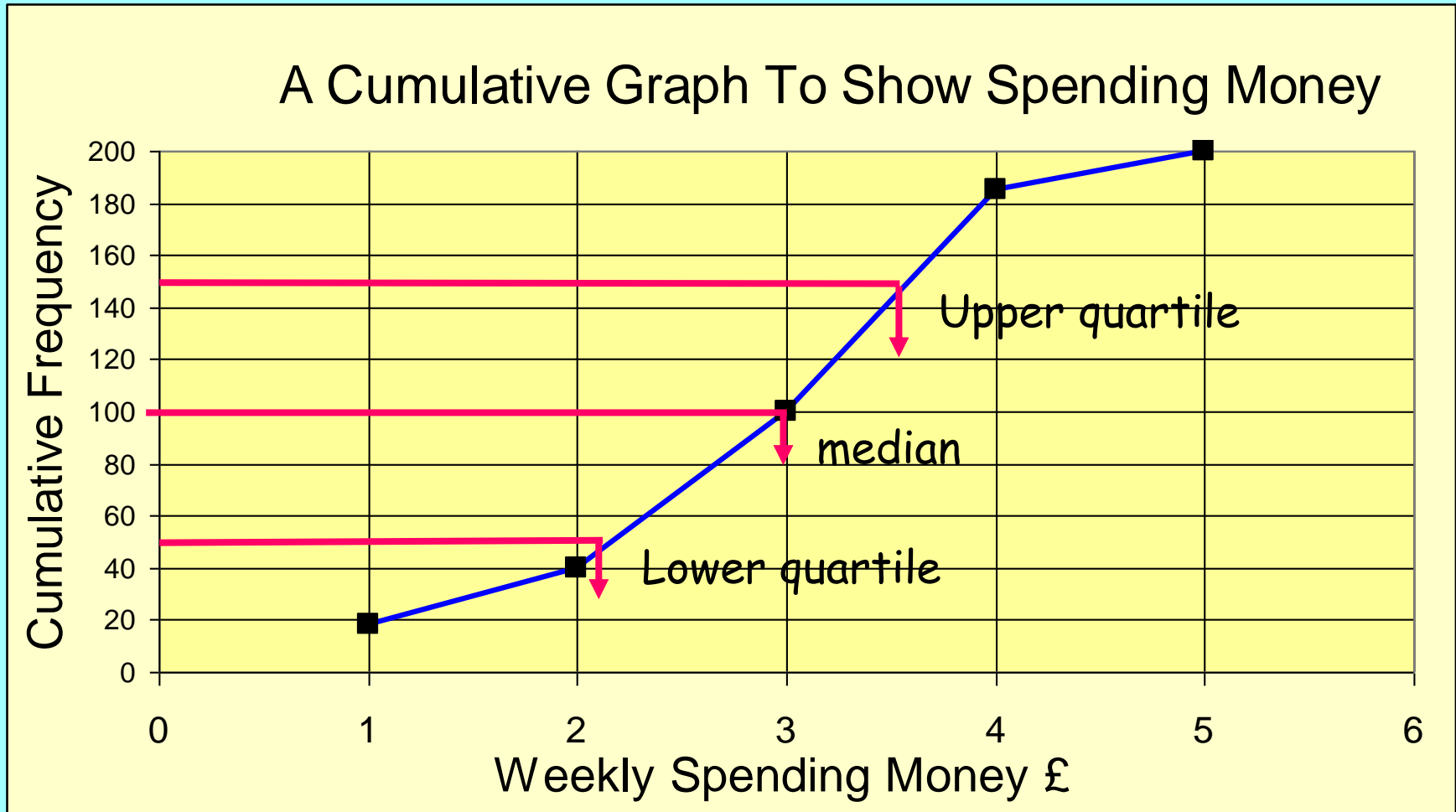
In a survey 200 teenagers were asked to state their weekly pocket money.

Money £	frequency	cumulative frequency
1	20	20
2	20	40
3	60	100
4	80	180
5	20	200



## Example

In a survey 200 teenagers were asked to state their weekly pocket money. The results were plotted as a cumulative frequency curve.



## Example

Upper quartile

$$75 \% \text{ of } 200 = 150$$

Using the graph, reading across from cumulative frequency of 150 the spending money at that point is £3.60.

In other words, 75% of students spend £3.60 or less each week.

Lower quartile

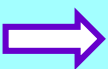
$$25 \% \text{ of } 200 = 50$$

Using the graph, reading across from cumulative frequency of 50 the spending money at that point is £2.20.

In other words, 25% of students spend £2.20 or less each week.



*Objective : To know how to calculate quartiles.*



## Example

Interquartile Range

$$£3.60 - £2.20 = £1.40$$

Median

$$50 \% \text{ of } 200 = 100$$

Using the graph, at a cumulative frequency of 100 the spending money is £3.00.

In other words, 50% of students spend £3.00 or less each week, and 50% of students also spend more than £3.00 each week.

(How many students spend EXACTLY £3.00 each week?)



*Objective : To know how to calculate quartiles.*





# Shape of the Cumulative Frequency Curve

The shape of the curve is like an S shape. The shape of the S indicates how spread out the data values are.

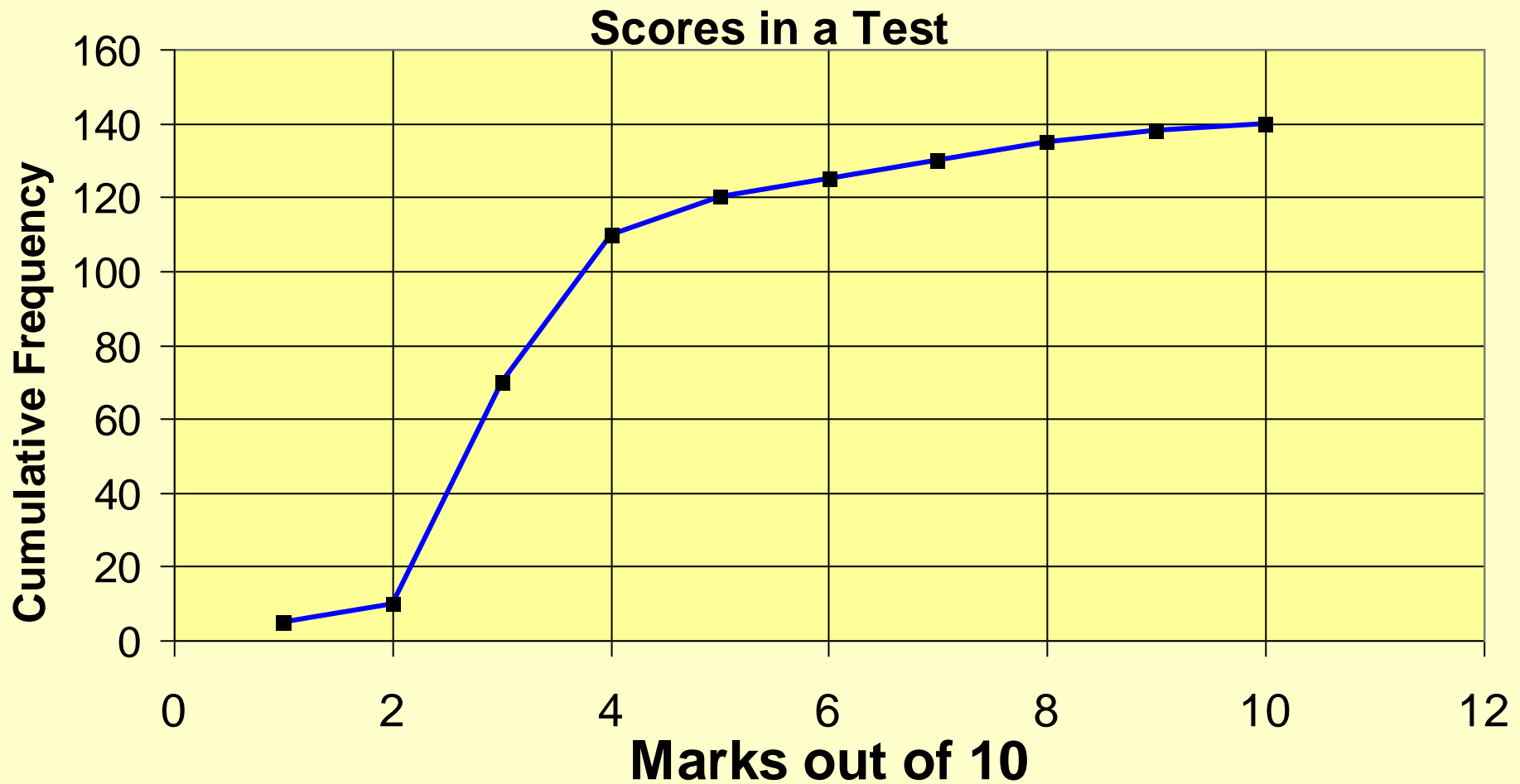
A tight S curve close to the median indicates a tight distribution and a small interquartile range.

A tight distribution represents very consistent results. Eg. Lifetimes of batteries or light bulbs all very close to the median represent a more reliable product compared to another product where the lifetimes show a wide variation.

 Objective : To know how the shape affects the distribution. 

## Shape of the Cumulative Frequency Curve

*A longer more flowing S curve farther away from the median indicates a widely spread set of data and a larger interquartile range.*





## Questions

1. The length of girls' hair is measured in cms.

length	frequency	cumulative frequency
10	0	0
20	2	2
30	4	6
40	10	16
50	17	
60	11	
70	3	
80	3	

a) Copy the table above and fill it in and draw the cumulative frequency curve for the results.

b) Find the median.

c) Find the interquartile range.



## Questions

2. The length of snakes are measured in cms.

length	frequency	cumulative frequency
10	0	0
20	4	4
30	5	9
40	20	29
50	17	
60	12	
70	5	
80	3	

a) Copy the table above and fill it in and draw the cumulative frequency curve for the results.

b) Find the median.

c) Find the interquartile range.



## Questions

3. The marks in a French test are recorded.

marks	frequency	cumulative frequency
5	1	1
10	2	3
15	4	7
20	8	
25	16	
30	19	
35	10	

a) Copy the table above and fill it in and draw the cumulative frequency curve for the results.

b) Find the median.

c) Find the interquartile range.



## Questions

4. The marks in a German test are recorded.

marks	frequency	cumulative frequency
5	2	2
10	5	7
15	11	18
20	16	
25	10	
30	8	
35	8	

a) Copy the table above and fill it in and draw the cumulative frequency curve for the results.

b) Find the median.

c) Find the interquartile range.



## Questions

5. The marks in a Mathematics test are recorded.

marks	frequency	cumulative frequency
5	2	2
10	5	7
15	15	22
20	24	
25	35	
30	7	
35	9	

a) Copy the table above and fill it in and draw the cumulative frequency curve for the results.

b) Find the median.

c) Find the interquartile range.



## Answers

1.

length	frequency	cumulative frequency
10	0	0
20	2	2
30	4	6
40	10	16
50	17	33
60	11	44
70	3	47
80	3	50

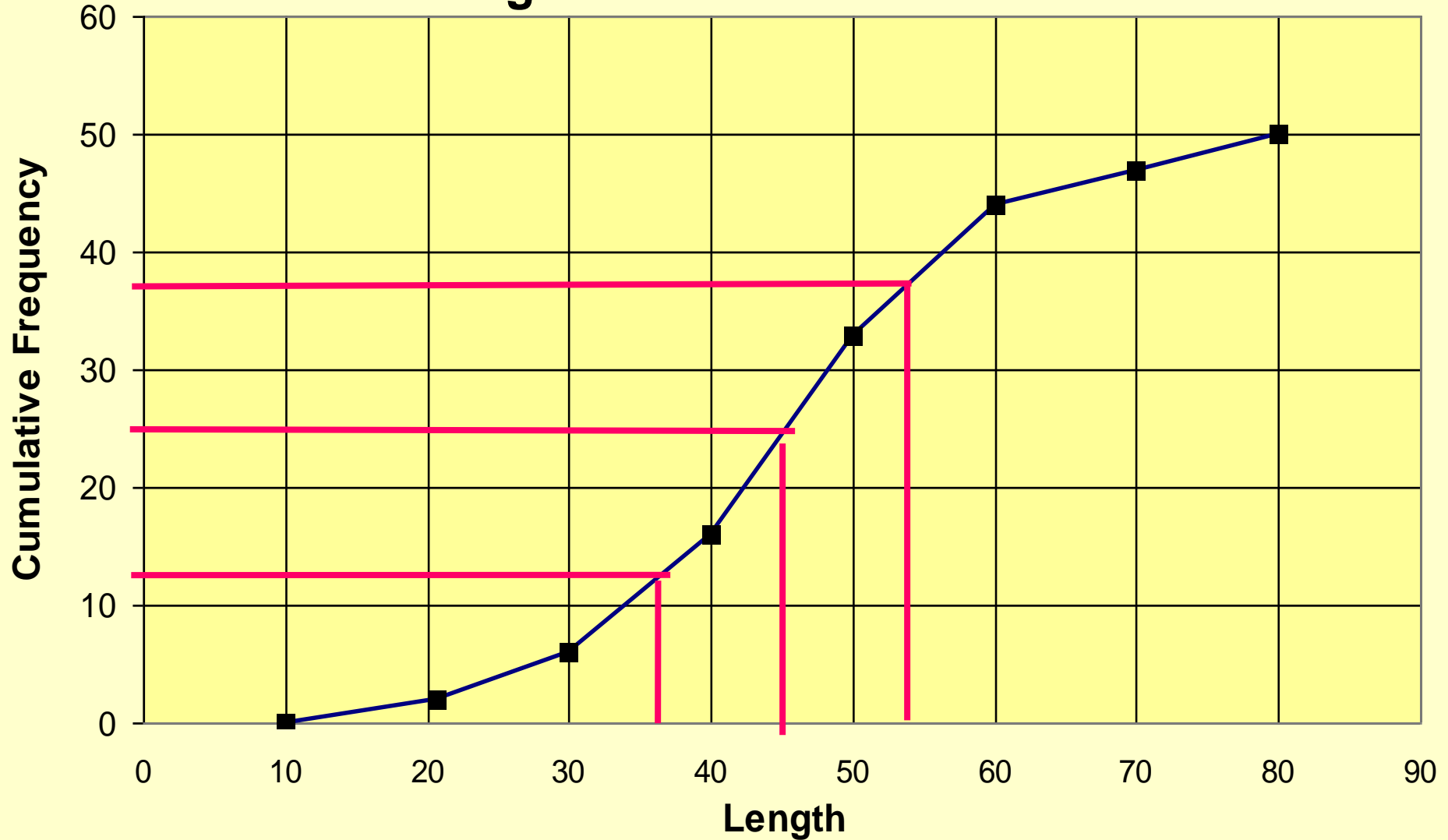
b) median = 45

c) Interquartile range =  $53 - 36 = 17$



# 1. Answers

## Length of Girls Hair in cms



## Answers

2.

length	frequency	cumulative frequency
10	0	0
20	4	4
30	5	9
40	20	29
50	17	46
60	12	58
70	5	63
80	3	66

b) median = 43 approx

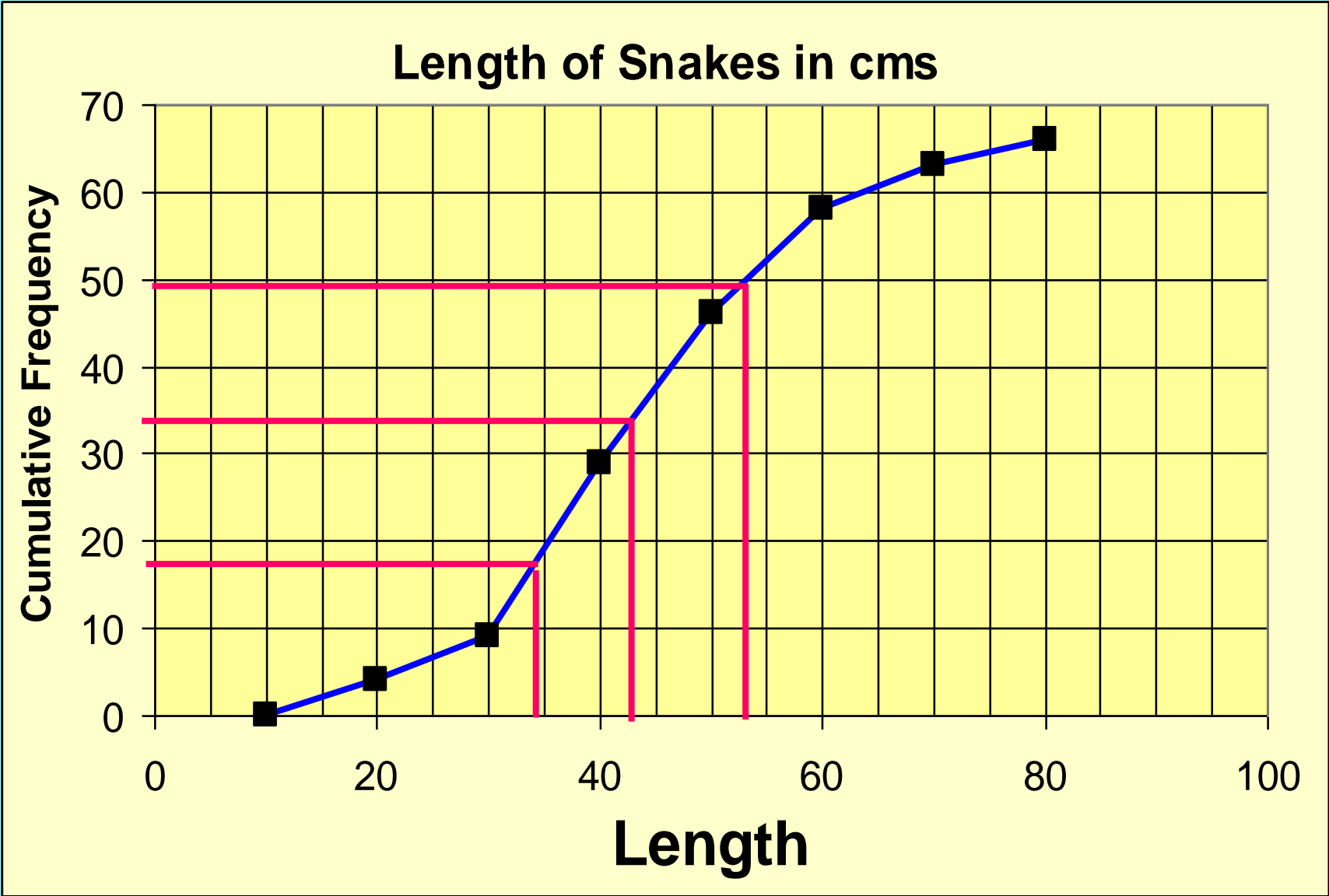
c) Interquartile range =  $53 - 34.5 = 18.5$  approx





2.

Answers



## Answers

3.

marks	frequency	cumulative frequency
5	1	1
10	2	3
15	4	7
20	8	15
25	16	31
30	19	50
35	10	60

b) median = 24.5 approx

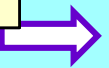
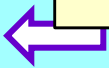
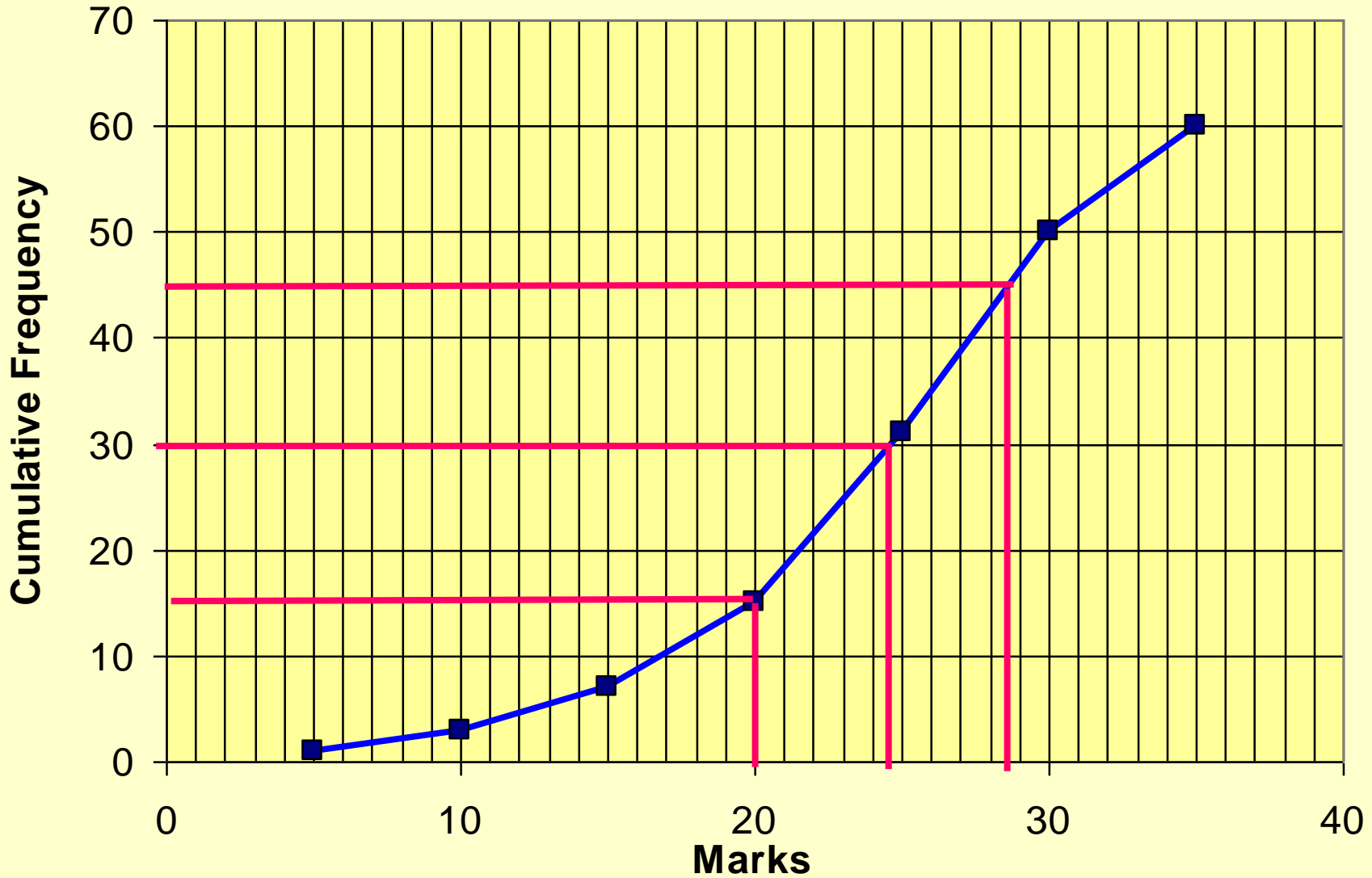
c) Interquartile range = 28.5 - 20 = 8.5 approx



3.

Answers

**Test Scores**



## Answers

4.

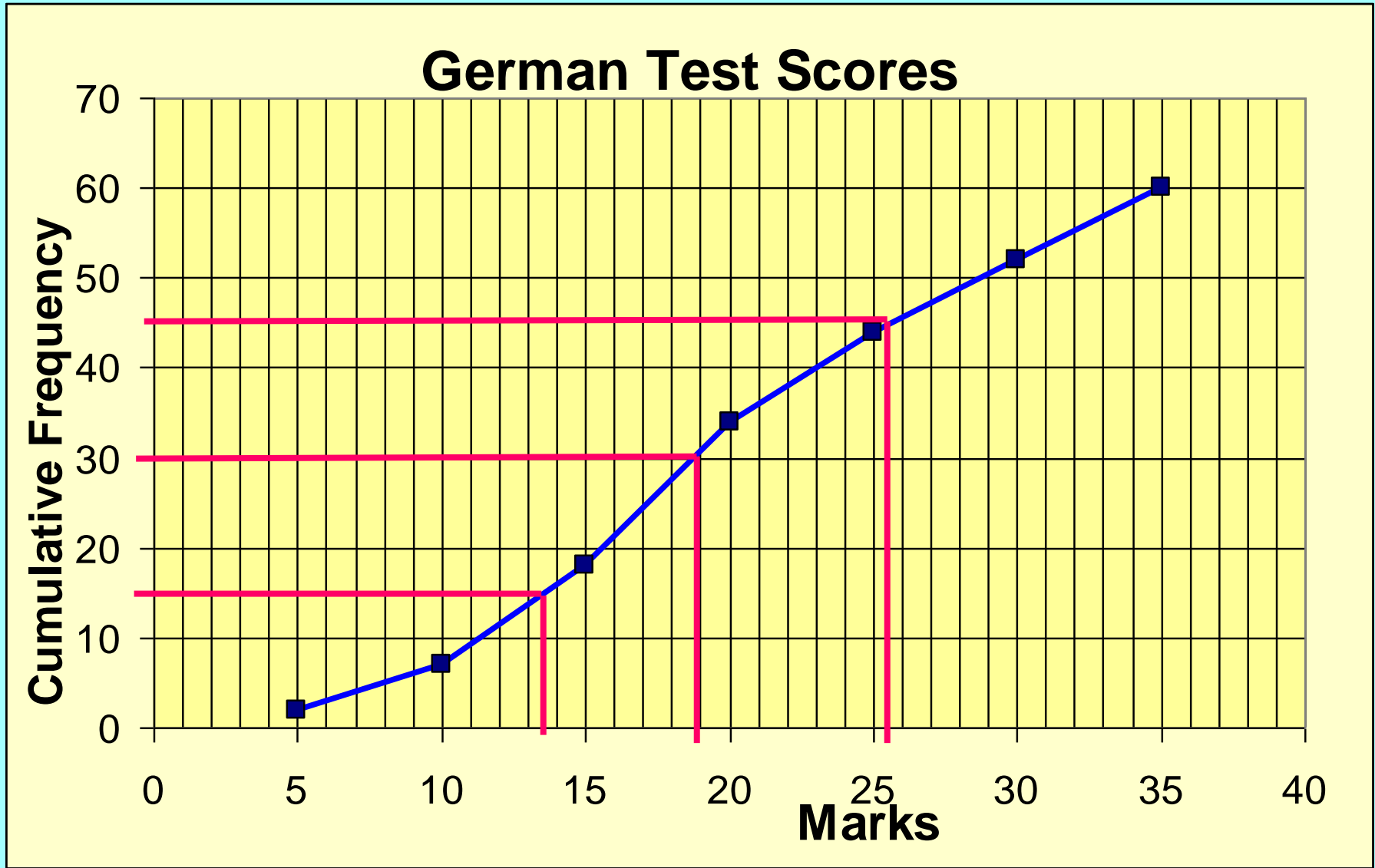
marks	frequency	cumulative frequency
5	2	2
10	5	7
15	11	18
20	16	34
25	10	44
30	8	52
35	8	60

b) median = 19 approx

c) Interquartile range =  $25.5 - 13.5 = 12$  approx



# 4. Answers



## Answers

5.

marks	frequency	cumulative frequency
5	2	2
10	5	7
15	15	22
20	24	46
25	35	81
30	7	88
35	9	97

b) median = 20.5

c) Interquartile range =  $24 - 15.5 = 8.5$



## 5. Answers

