



Junior Cert Maths

Free Notes

Frequency Distribution Tables



Frequency Distribution Tables

Data is often summarised using a frequency distribution

Value	1	2	3	4
Frequency	3	4	2	2

The top line is a list of the values and the second line is a list of the frequencies. A frequency being the number of times that a value occurred

The modal class is the class interval with the highest frequency. In the example above the modal class would be our interval with value 2 as it has the highest frequency of 4

A grouped frequency distribution displays the values in groups

Value	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	2	4	5	6	4	2	1

A mid - interval value is the middle point of an interval . Using mid –interval values we can change our grouped distribution if necessary to

Value	5	15	25	35	45	55	65
Frequency	2	4	5	6	4	2	1

Where 5 is the middle value of 0-10, 15 the middle value of 10-20.... etc

To get the mean of a distribution using mid-interval values we multiply each value by its frequency and divide our total number of frequencies

For our given example we have

$$\text{Mean} = \frac{5(2)+15(4)+25(5)+35(6)+45(4)+55(2)+65(1)}{2+4+5+6+4+2+1}$$

$$\text{Mean} = \frac{10+60+125+210+180+110+65}{24}$$

$$\text{Mean} = \frac{760}{24} = 31.67$$

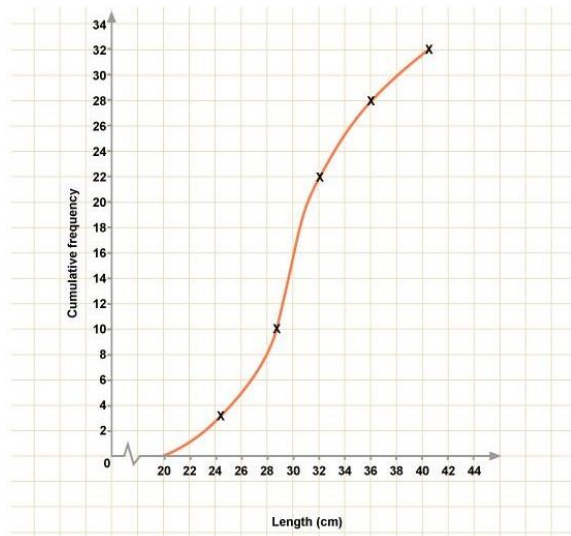
A cumulative frequency distribution table is similar to a normal frequency table except that we continuously add our frequencies

Length	21-24	25-28	29-32	33-36	37 -40
Frequency	3	7	12	6	4
Cumulative Frequency	3	10 (7+3)	22 (10+12)	28 (22+6)	32 (28+4)

The points are plotted at the upper class boundary. In this example the upper class boundaries are 24.5, 28.5, 32.5, 36.5 and 40.5

Cumulative frequency is always on the y-axis with our set of values always on the x -axis

The cumulative frequency graph below is called an ogive



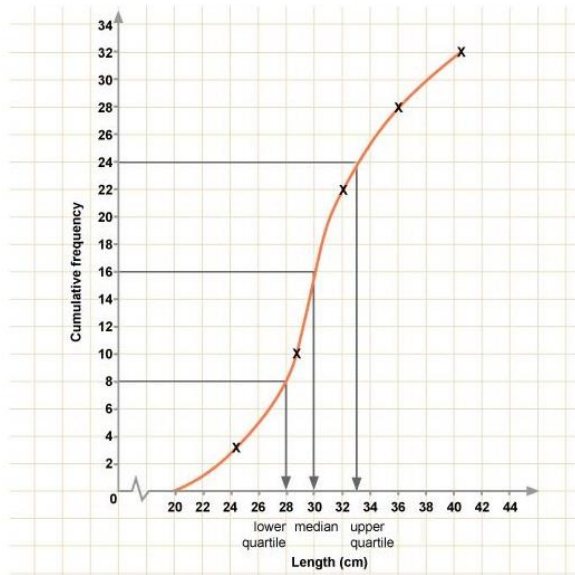
An ogive will usually make the S- Shape we see in the graph

$\frac{1}{4}$ of the total frequency represents the lower quartile

$\frac{1}{2}$ of the total frequency represents the median

$\frac{3}{4}$ of the total frequency represents the upper quartile

For the given example our total frequency is 32, So by drawing horizontal lines across from 8, 16 and 24 we can find our lower quartile, median and upper quartile



Median = 30

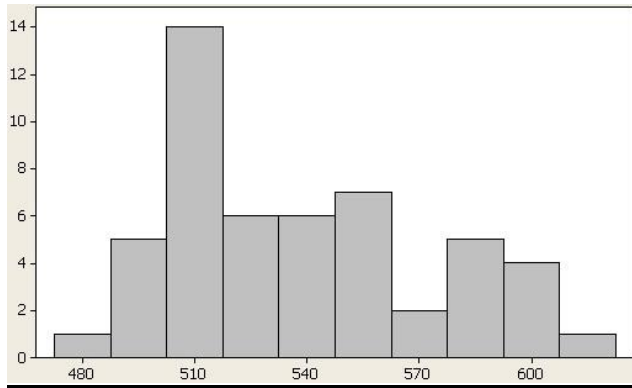
Lower quartile = 28

Upper quartile = 33

Our Interquartile range is our Upper quartile – Lower quartile

In our given example it is $33 - 28 = 5$

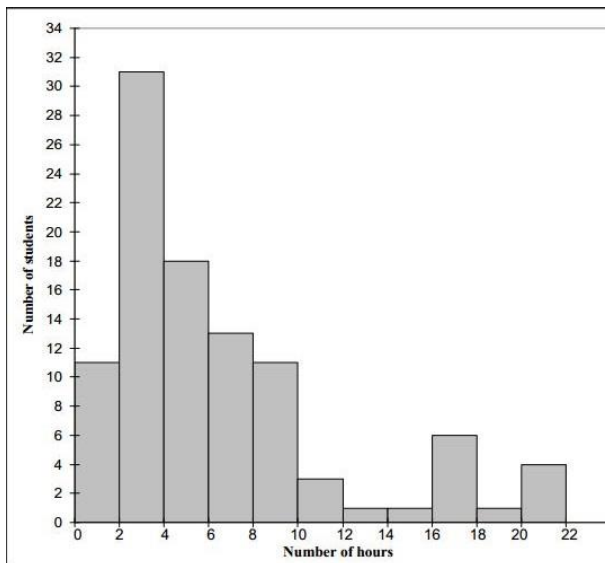
A Histogram can be used to display continuous data. The area of each rectangle represents the frequency.



When drawing a histogram be careful if there are intervals with different widths. Frequency is equal to the area of a rectangle, not its height

Questions

1. The phase 9 CensusAtSchool questionnaire contained the question
 “Approximately how long do you spend on social networking sites each week?”
 The histogram below illustrates the answers given by 100 students, randomly
 selected from those who completed the survey.



(i) Complete a frequency distribution table

No.of Hours	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22
No. of Students	11	31	18	13	11	3	1	1	6	1	4

(ii) What is the modal Interval?

The modal interval is the interval with the highest frequency

2-4 has the highest frequency with a value of 31

(iii) Taking mid-interval values, find the mean amount of time spent on social networking sites.

Taking mid-Interval values our frequency table becomes

No. of Hours	1	3	5	7	9	11	13	15	17	19	21
No. of Students	11	31	18	13	11	3	1	1	6	1	4

$$\begin{aligned}
 \text{Mean} &= \frac{1(11)+3(31)+5(18)+7(13)+9(11)+11(3)+13(1)+15(1)+17(6)+19(1)+21(4)}{100} \\
 &= \frac{11+93+90+91+99+33+13+15+102+19+84}{100} \\
 &= \frac{650}{100} = 6.5
 \end{aligned}$$

(iv) John is conducting a survey on computer usage by students at his school. His questionnaire asks the same question. He plans to carry out his survey by asking the question to twenty first-year boys on the Monday after the mid-term break. Give two reasons why the results from John's question might not be as representative as those in the histogram.

1. He is asking first years who are less likely to be using social networking sites
2. He is asking right after the mid-term break, The usage of social networking sites generally increases during the mid-term

2. The salaries, in €, of the different employees working in a call centre are listed below.

22000 16500 38000 26500 15000 21000 15500 46000
 42000 9500 32000 27000 33000 36000 24000 37000
 65000 37000 24500 23500 28000 52000 33000 25000
 23000 16500 35000 25000 33000 20000 19500 16000

(i) Use this data to Complete a Grouped Frequency Table

Salary (€1000)	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of Employees	1	6	12	9	2	1	1

(ii) Using mid-interval values find the mean salary of the employees.

Our new table is

Salary (€1000)	5	15	25	35	45	55	65
No. of Employees	1	6	12	9	2	1	1

$$\begin{aligned}
 \text{Mean} &= \frac{5(1)+15(6)+25(12)+35(9)+45(2)+55(1)+65(1)}{32} \\
 &= \frac{5+90+300+315+90+55+65}{32} \\
 &= \frac{920}{32} = 28.75
 \end{aligned}$$

So our answer is 28750

(iii) Outline another method which could have been used to calculate the mean salary.

Instead of using mid-interval values all of our values could have been individually added together and divided by 32

(iv) Which method is more accurate?

Our second method is more accurate as we are the actual values rather than a mid-interval approximation

3. Third year students were asked how much pocket money they spent in a certain week.

Amount of Pocket Money	0-5	5-10	10-15	15-20	20-25
Number of Students	4	22	14	x	6

The results are shown in the frequency distribution table below.

Taking mid-interval values, it was found that the mean amount of pocket money spent in that week was €11.10. Find the value of x

$$\text{Mean} = 11.10 = \frac{2.5(4) + 7.5(22) + 12.5(14) + 17.5(x) + 22.5(6)}{4 + 22 + 14 + x + 6}$$

$$11.10 = \frac{10 + 165 + 175 + 17.5x + 135}{46 + x}$$

$$11.10(46 + x) = 485 + 17.5x$$

$$510.60 + 11.10x = 485 + 17.5x$$

$$510.60 - 485 = 17.5x - 11.10x$$

$$25.6 = 6.4x$$

$$x = 4$$

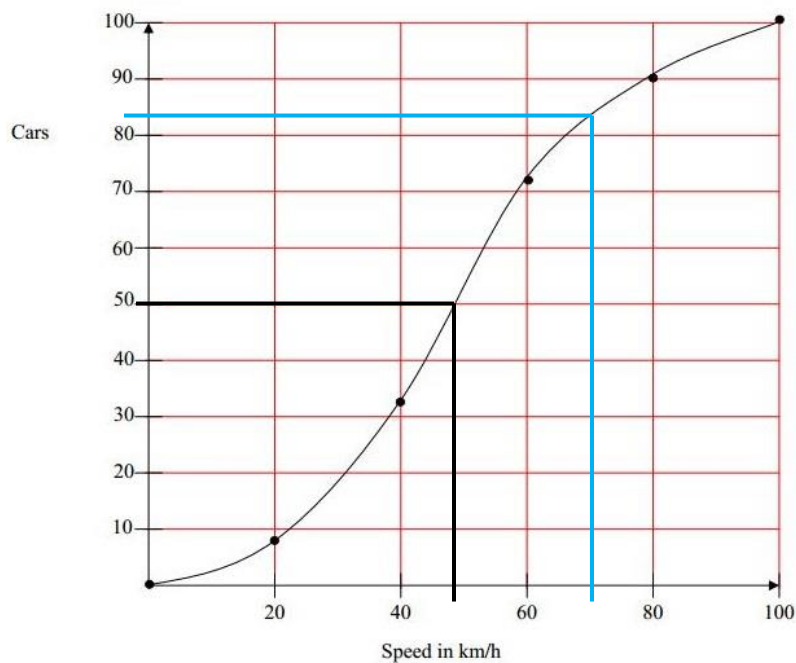
4. At a Garda checkpoint, the speed of 100 vehicles passing was recorded. The following were the results:

Speed in km/hr	0-20	20-40	40-60	60-80	80-100
No. of cars	8	24	40	18	10

(i) Construct the cumulative frequency table

Speed in km/hr	0-20	20-40	40-60	60-80	80-100
No. of cars	8	24	40	18	10
Cumulative frequency	8	32 (8+24)	72 (32+40)	90 (72+18)	100 (90+10)

(ii) On graph paper construct the ogive



(iii) Use your graph to estimate the median

Total Frequency = 100

$\frac{1}{2}$ of the total frequency = 50

Drawing a horizontal line across from 50 we find our median speed to be approximately 49

(iv) Use your graph to estimate the number of vehicles with a speed of at least 70 km/h.

This time we draw a vertical blue line from 70 and find our corresponding value to be 82 vehicles

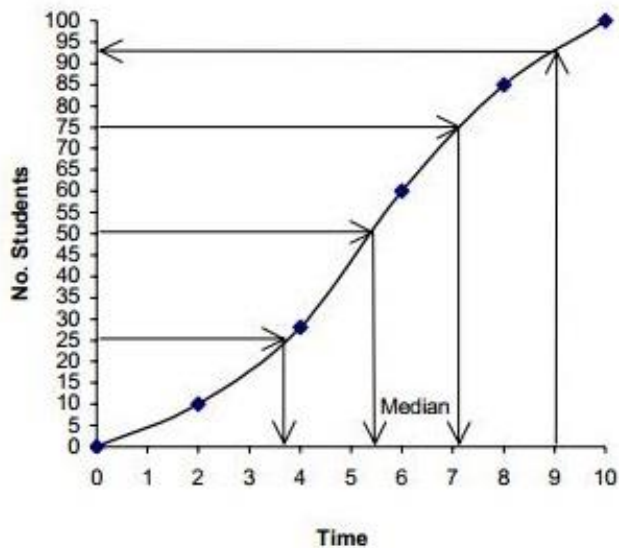
82 is the number of vehicles travelling under 100 km/h so

$100 - 82 = 18$ is the number of vehicles travelling at least 70 km/h

5. The cumulative frequency table shows the amount of time spent studying in a certain week by 100 Leaving Certificate students.

Time in hours	≤ 2	≤ 4	≤ 6	≤ 8	≤ 10
Number of Students	10	28	60	85	100

(i) On graph paper construct the ogive.



(ii) Use your graph to estimate the Median

Our Median is approximately 5.4

(iii) Use your graph to estimate the Inter-Quartile Range

Upper Quartile = 7

Lower Quartile = 3.6

Inter-Quartile Range = Upper Quartile - Lower Quartile

Inter-Quartile Range = $7 - 3.6 = 3.4$

(iv) Use your graph to estimate the number of students who spent 9 hours or more studying

Going up from 9 on our graph we get a value 93. This represents the number of students who spent 9 hours or less studying.

$100 - 93 = 7$

7 students spent 9 hours or more studying

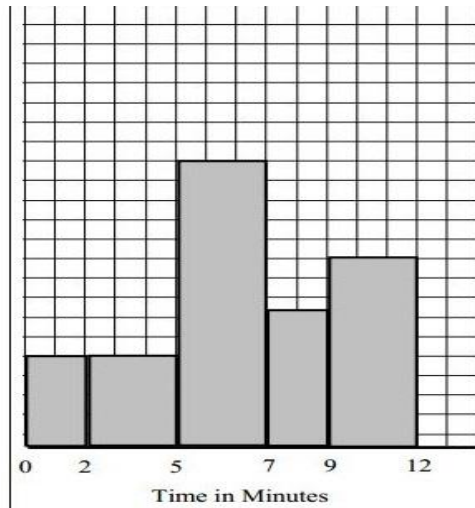
6. The cumulative frequency table below shows the times in minutes that 100 Olympic athletes completed the marathon after the winner crossed the line.

Time in Minutes	<2	<5	<7	<9	<12
Number of Athletes	10	25	55	70	100

- **Complete a Frequency distribution Table**

Time in Minutes	0-2	2-5	5-7	7-9	9-12
Number of Athletes	10	15 (25-10)	30 (55-25)	15 (70-55)	30 (100-70)

(ii) Draw a histogram to illustrate the data in the frequency table.



(iii) In which class interval does the 63rd athlete to finish lie?

By looking at our cumulative frequency distribution table we can $<7 = 55$ and $<9 = 70$

63 lies in between 55 and 70 so the 63rd athlete must finish in the interval 7-9

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