**Tallying**

Tallying is a useful way of counting or collecting data as shown below. The data can then be represented in a frequency distribution table or grouped frequency distribution table.

Table

Description automatically generated

Table

Description automatically generated

Graphical user interface, text, application, email

Description automatically generated

**Exercises**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ex 1 | **Raw data** | 1 | 3 | 4 | 1 | 2 | 1 | 6 | 7 |  |  |
|  | **Ordered data** |  |  |  |  |  |  |  |  |  |  |
|  | **Mode =** |  |  |  |  |  |  |  |  |  |  |
|  | **Median =** |  |  |  |  |  |  |  |  |  |  |
|  | **Mean =** |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Ex 2 | **Raw data** | 1 | 0 | 3 | 5 | 0 | 6 | 7 |  |  |  |
|  | **Ordered data** |  |  |  |  |  |  |  |  |  |  |
|  | **Mode =** |  |  |  |  |  |  |  |  |  |  |
|  | **Median =** |  |  |  |  |  |  |  |  |  |  |
|  | **Mean =** |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Ex 3 | **Raw data** | 8 | 0 | 3 | 3 | 1 | 7 | 4 | 1 | 4 | 4 |
|  | **Ordered data** |  |  |  |  |  |  |  |  |  |  |
|  | **Mode =** |  |  |  |  |  |  |  |  |  |  |
|  | **Median =** |  |  |  |  |  |  |  |  |  |  |
|  | **Mean =** |  |  |  |  |  |  |  |  |  |  |

Ex 4

Find the mean of the following: x, x+3, x+1, x-3, x-1

Ex 5

The mean of the numbers 1, x, 3, 6, 8 is 7, What is the number represented by x?

Ex 6

On a particular day the number of goals scored in 30 football matches was recorded as follows. Input the data in a frequency distribution table and calculate the mean/mode/median.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 3 | 4 | 3 | 2 | 1 | 6 | 5 | 1 | 2 | 3 | 2 | 1 | 2 | 4 | 3 | 1 | 4 | 6 | 2 | 5 | 2 | 4 | 6 | 2 | 1 | 6 | 2 | 1 | 5 |

**Solutions**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ex 1 | **Raw data** | 1 | 3 | 4 | 1 | 2 | 1 | 6 | 7 |  |  |
|  | **Ordered data** | 1 | 1 | 1 | 2 | 3 | 4 | 6 | 7 |  |  |
|  | **Mode =** | 1 |  |  |  |  |  |  |  |  |  |
|  | **Median =** | 2.5 |  |  |  |  |  |  |  |  |  |
|  | **Mean =** | 3.125 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Ex 2 | **Raw data** | 1 | 0 | 3 | 5 | 0 | 6 | 7 |  |  |  |
|  | **Ordered data** | 0 | 0 | 1 | 3 | 5 | 6 | 7 |  |  |  |
|  | **Mode =** | 0 |  |  |  |  |  |  |  |  |  |
|  | **Median =** | 3 |  |  |  |  |  |  |  |  |  |
|  | **Mean =** | 3.142857143 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Ex 3 | **Raw data** | 8 | 0 | 3 | 3 | 1 | 7 | 4 | 1 | 4 | 4 |
|  | **Ordered data** | 0 | 1 | 1 | 3 | 3 | 4 | 4 | 4 | 7 | 8 |
|  | **Mode =** | 4 |  |  |  |  |  |  |  |  |  |
|  | **Median =** | 3.5 |  |  |  |  |  |  |  |  |  |
|  | **Mean =** | 3.5 |  |  |  |  |  |  |  |  |  |

Ex 4

Find the mean of the following: x, x+3, x+1, x-3, x-1

Ex 5

Ex 6

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| x | 1 | 2 | 3 | 4 | 5 | 6 |  | Totals |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| f | 7 | 8 | 4 | 4 | 3 | 4 |  | 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| xf | 7 | 16 | 12 | 16 | 15 | 24 |  | 90 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mean = | 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mode = | 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Median = | 2.5 | (Note: 30/2 = so its 15th and 16th numbers divided by two) | | | | | | | | | | | | | | | | | | | | | | |

**Weighted Mean**

**Formula**

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**Example:** Calculating grades

Suppose a class has quizzes, homework and three exams. The scores are weighted as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Quiz | HW | Exam1 | Exam2 | Final |
| 10% | 10% | 20% | 20% | 40% |

Suppose your averages are as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Quiz | HW | Exam1 | Exam2 | Final |
| 80% | 89% | 79% | 84% | 87% |

How is your grade calculated?

Multiply percentages by respective weights (written as decimals)

0.1(80)+0.1(89)+0.2(79)+0.2(84)+0.4(87)

= 84.3% final grade

**Example:** Price Increase

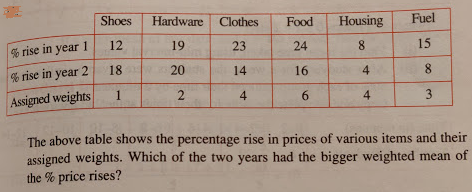
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type of Meat | Pork | Mutton | Beef | Poultry |
| % Price Increase | 2% | 8% | 3% | 5% |

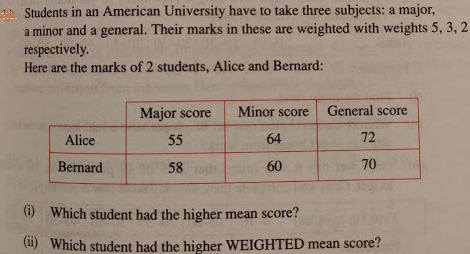
Mean Price Increase =

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type of Meat | Pork | Mutton | Beef | Poultry |
| % Price Increase | 2% | 8% | 3% | 5% |
| Weight | 3 | 1 | 4 | 2 |

Weighted Mean = %

**Exercises**





**Answers**

1

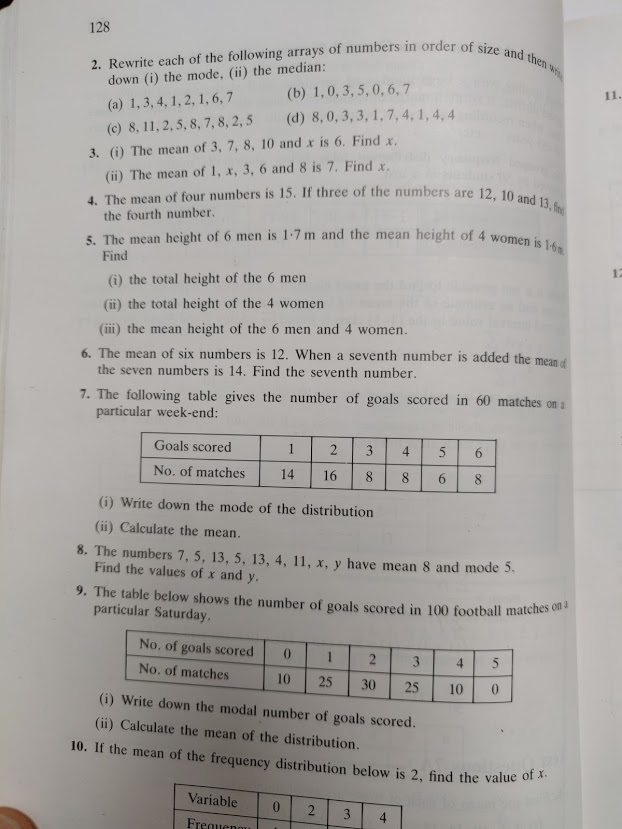
|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| % rise in Year 1 | 12 | 38 | 92 | 144 | 32 | 45 | 18.15 |
| % rise in Year 2 | 18 | 40 | 56 | 96 | 16 | 24 | 12.5 |
|  |  |  |  |  |  |  |  |
| Year 1 Weighted Mean | 18.15 |  |  |  |  |  |  |
| Year 2 Weighted Mean | 12.5 |  |  |  |  |  |  |

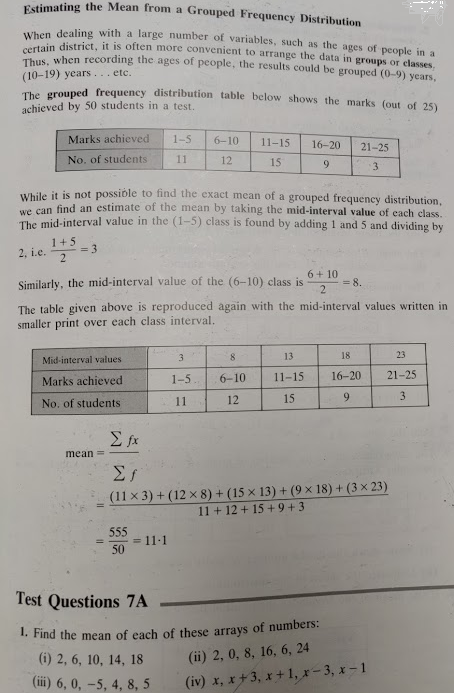
Answer = Year 1 has bigger weighted mean.

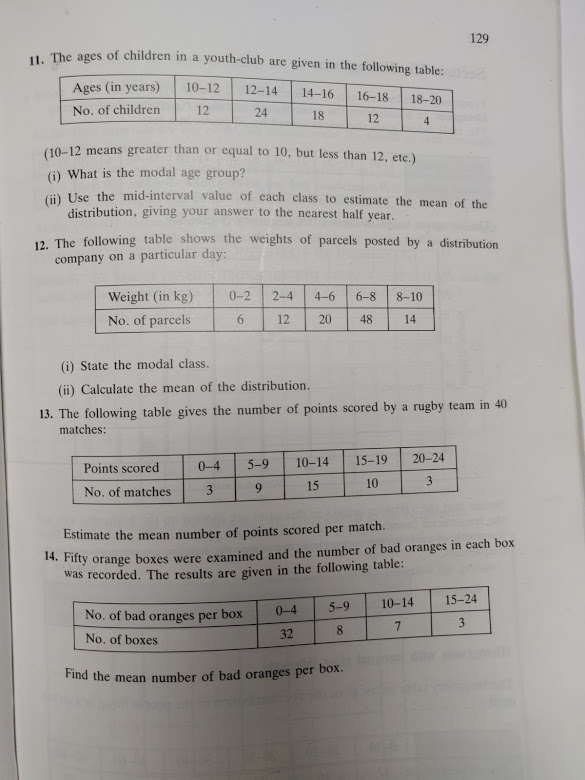
2

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Weights | 5 | 3 | 2 |  |  |  |  |  |  |
|  | Major | Minor | General |  |  |  |  |  | **Sums** |
| Alice | 55 | 64 | 72 |  | 275 | 192 | 144 | => | **611** |
| Bernard | 58 | 60 | 70 |  | 290 | 180 | 140 | => | **610** |
|  |  |  |  |  |  |  |  |  |  |
| Mean Scores | |  |  |  |  |  |  |  |  |
| Alice | 63.67 |  |  |  |  |  |  |  |  |
| Bernard | 62.67 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| Weighted Mean Scores | | |  |  |  |  |  |  |  |
| Alice | 61.1 |  |  |  |  |  |  |  |  |
| Bernard | 61 |  |  |  |  |  |  |  |  |

1. Alice has highest mean score
2. Alice has highest weighted mean score.







A Cumulative Frequency Graph is a graph plotted from a cumulative frequency table. A cumulative frequency graph is also called an **ogive** or cumulative frequency curve..  
  
**Example 1**  
Draw a cumulative frequency graph for the frequency table below.

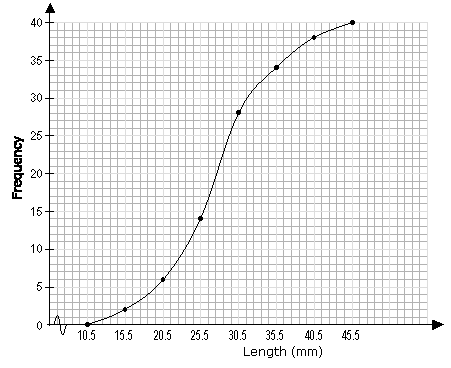
|  |  |
| --- | --- |
| **Length (*x* mm)** | **Frequency** |
| 11 – 15 | 2 |
| 16 – 20 | 4 |
| 21 – 25 | 8 |
| 25 – 30 | 14 |
| 31 – 35 | 6 |
| 36 – 40 | 4 |
| 41 – 45 | 2 |

**Solution**

We need to add a class with 0 frequency before the first class and then find the upper boundary for each class interval.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Length**  **(*x* mm)** | **Frequency** | **Upper Class Boundary** | **Length**  **(*x* mm)** | **Cumulative**  **Frequency** |
| 6 – 10 | 0 | 10.5 | *x* ≤ 10.5 | 0 |
| 11 – 15 | 2 | 15.5 | *x* ≤ 15.5 | 2 |
| 16 – 20 | 4 | 20.5 | *x* ≤ 20.5 | 6 |
| 21 – 25 | 8 | 25.5 | *x* ≤ 25.5 | 14 |
| 25 – 30 | 14 | 30.5 | *x* ≤ 30.5 | 28 |
| 31 – 35 | 6 | 35.5 | *x* ≤ 35.5 | 34 |
| 36 – 40 | 4 | 40.5 | *x* ≤ 40.5 | 38 |
| 41 – 45 | 2 | 45.5 | *x* ≤ 45.5 | 40 |

And then plot the cumulative frequency against the upper class boundary of each interval and join the points with a smooth curve.

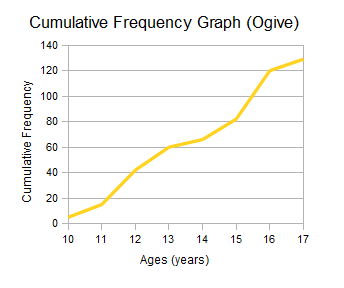


**Example 2**

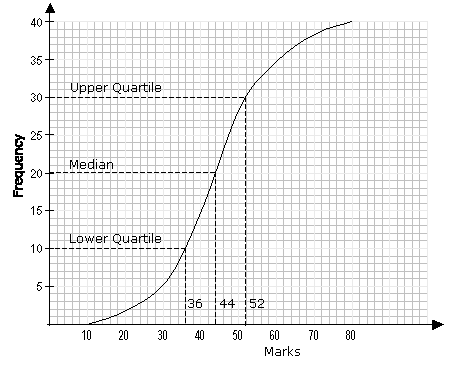
|  |  |
| --- | --- |
| **Age (years)** | **Frequency** |
| **10** | **5** |
| **11** | **10** |
| **12** | **27** |
| **13** | **18** |
| **14** | **6** |
| **15** | **16** |
| **16** | **38** |
| **17** | **9** |

:

|  |  |  |
| --- | --- | --- |
| **Age (years)** | **Frequency** | **Cumulative Frequency** |
| **10** | **5** | **5** |
| **11** | **10** | **5+10 = 15** |
| **12** | **27** | **15+27 = 42** |
| **13** | **18** | **42+18 = 60** |
| **14** | **6** | **60+6 = 66** |
| **15** | **16** | **66+16 = 82** |
| **16** | **38** | **82+38 = 120** |
| **17** | **9** | **120+9 = 129** |

****

**Exam Results Example** - Cumulative Frequency Curve (Ogive)



**Percentile**

A percentile is a certain percentage of a set of data.

**Median**

The median corresponds to the 50th percentile i.e. 50% of the total frequency.  
  
  
  
From the graph, 20 on the vertical axis corresponds to 44 on the horizontal axis. The median mark is 44.

**Upper Quartile**

The upper quartile corresponds to the 75th percentile i.e. 75% of the total frequency.  
  


From the graph, 30 on the vertical axis corresponds to 52 on the horizontal axis. The upper quartile is 52.

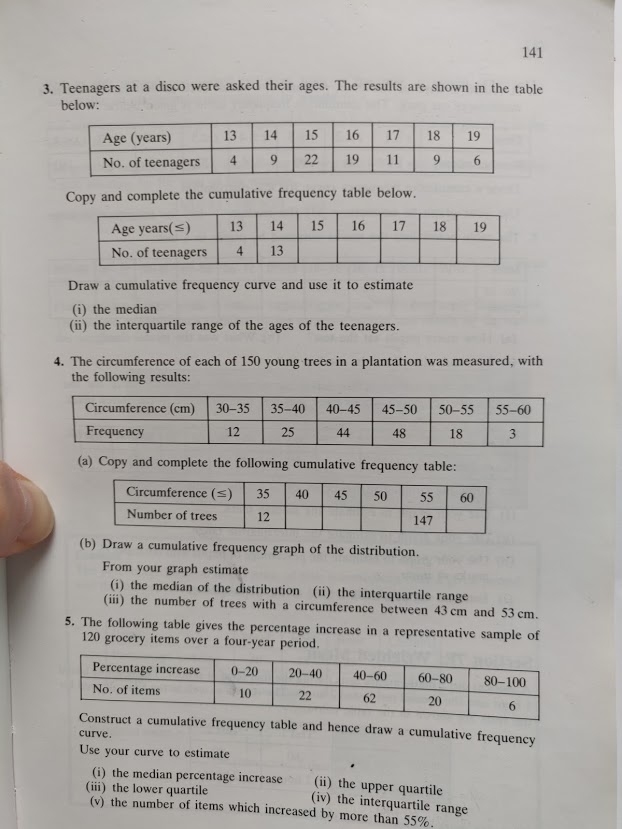
**Lower Quartile**

The lower quartile corresponds to the 25th percentile i.e. 25% of the total frequency.  
  


From the graph, 10 on the vertical axis corresponds to 36 on the horizontal axis. The lower quartile is 36.

**Inter Quartile Range**

Upper - Lower Quartile = 52 - 36 = 16



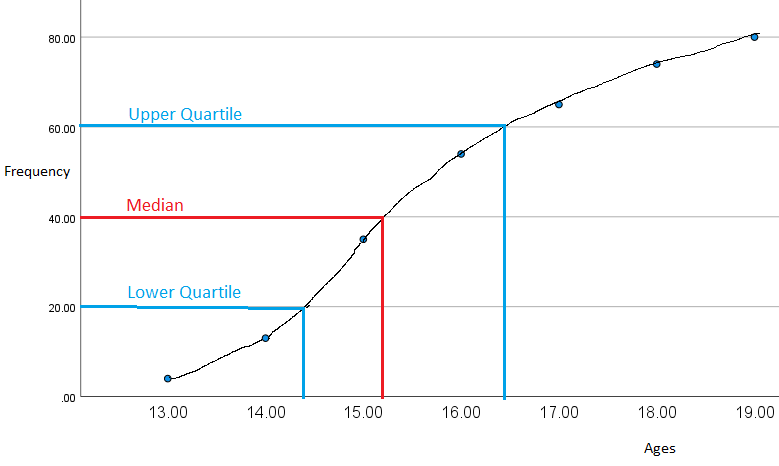
Ogive – Cumulative Frequency Curve

**Question 3**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Age (x) | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| No. of Teenagers (f) | 4 | 9 | 22 | 19 | 11 | 9 | 6 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Age | ≤13 | ≤14 | ≤15 | ≤16 | ≤17 | ≤18 | ≤19 |
| No. of Teenagers | 4 | 13 | 35 | 54 | 65 | 74 | 80 |

**Cumulative Frequency Curve (Ogive)**



1. **Median** (middle value) = 15.2 years old
2. **Interquartile Range**

**Mean** *(arithmetic average)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| x | 52 | 126 | 330 | 304 | 187 | 162 | 114 |  | sum of fx = | 1275 |
| f | 4 | 9 | 22 | 19 | 11 | 9 | 6 |  | sum of f = | 80 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | Mean = | 15.9375 |

**Mode** *(most common value or the value with the biggest frequency)*

Mode = 15 years

**Range** *(highest x value – lowest x value)*

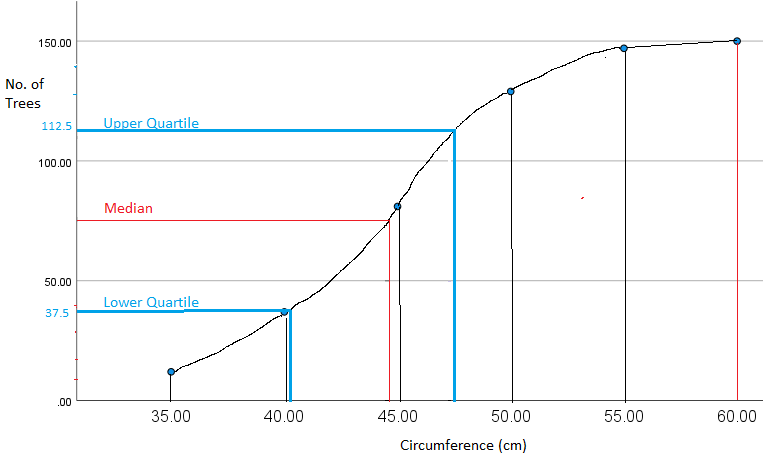
19 – 13 = 6

Range = 6 years

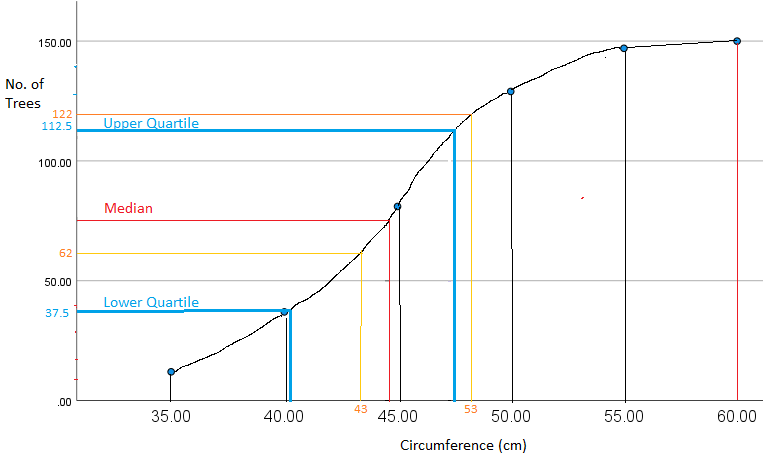
**Question 4**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Circumference (cm) | 30\_35 | 35\_40 | 40\_45 | 45\_50 | 50\_55 | 55\_60 |
| Frequency | 12 | 25 | 44 | 48 | 18 | 3 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Circumference (cm) | ≤35 | ≤40 | ≤45 | ≤50 | ≤55 | ≤60 |
| Frequency | 12 | 37 | 81 | 129 | 147 | 150 |



1. **Median** (middle value of 75) = 44 cm
2. **Interquartile Range**

1. 122 – 62 = 60 trees ****