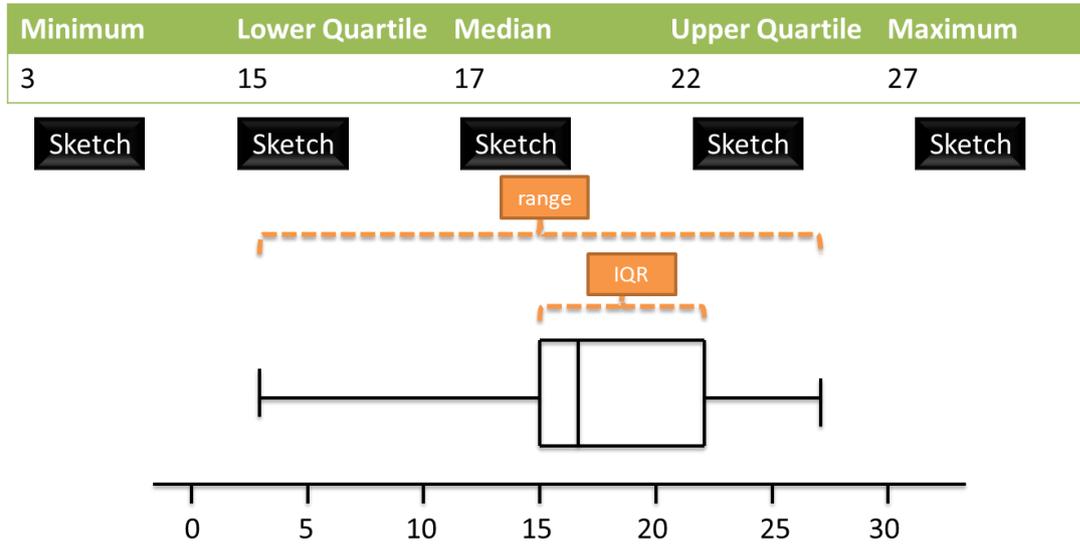


## Box Plots

Box Plots allow us to visually represent the distribution of the data.

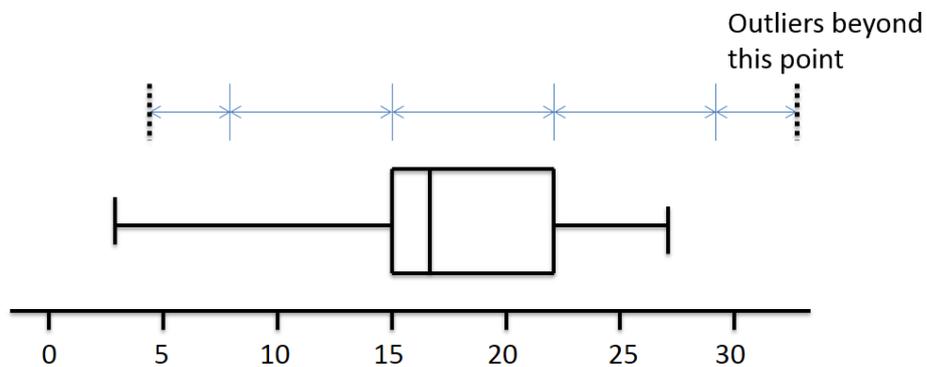


How is the IQR represented in this diagram?

How is the range represented in this diagram?

## Outliers

An outlier is an extreme value.



**One common definition of an outlier is when we're 1.5 IQRs beyond the lower and upper quartiles.**

## Examples

1. The diameters of 11 different Roman coins are measured in centimetres:

2.2 2.5 2.7 2.7 2.8 3.0 3.1 3.1 3.2 4.0 4.7

Determine the quartiles and hence any outliers.

2. [Textbook] The lengths, in cm, of 12 giant African land snails are given below:

17 18 18 19 20 20 20 20 21 23 24 32

Calculate the mean and standard deviation, given that  $\Sigma x = 252$  and  $\Sigma x^2 = 5468$ .  
An outlier is an observation which lies  $\pm 2$  standard deviations from the mean.  
Identify any outliers for this data.

## Test Your Understanding

The ages of 15 Lib Dem MPs are given:

11 18 20 27 30 31 32 32 35 36 37 58 63 78 104.5

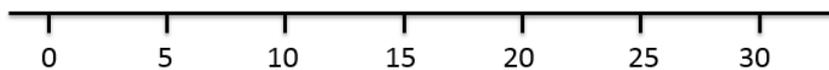
- If an outlier is considered to be 1.5 interquartile ranges below the lower quartile or above the upper quartile, determine any outliers.
- If instead an outlier is considered to be outside 2 standard deviations within the mean, determine any outliers. Note that  $\Sigma x = 612$  and  $\Sigma x^2 = 33606$



## Box Plot Example

Smallest values	Largest values	Lower Quartile	Median	Upper Quartile
0, 3	21, 27	8	10	14

Draw a box plot to represent the above data.



Test Your Understanding

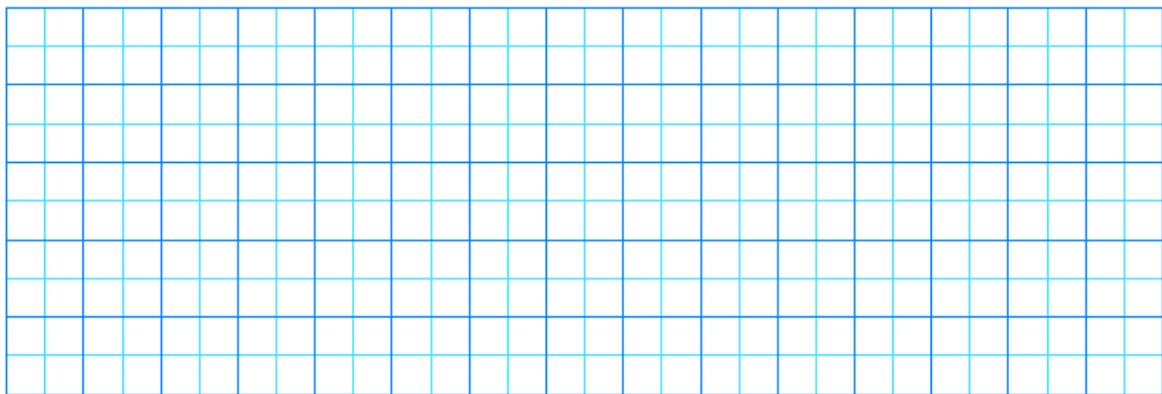
**[Jan 2011 Q3]** Over a long period of time a small company recorded the amount it received in sales per month. The results are summarised below.

	Amount received in sales (£1000s)
Two lowest values	3, 4
Lower quartile	7
Median	12
Upper quartile	14
Two highest values	20, 25

An outlier is an observation that falls either  $1.5 \times$  interquartile range above the upper quartile or  $1.5 \times$  interquartile range below the lower quartile.

(a) On the graph paper below, draw a box plot to represent these data, indicating clearly any outliers. (5)

(c) The company claims that for 75% of the months, the amount received per month is greater than £10 000. Comment on this claim, giving a reason for your answer. (2)

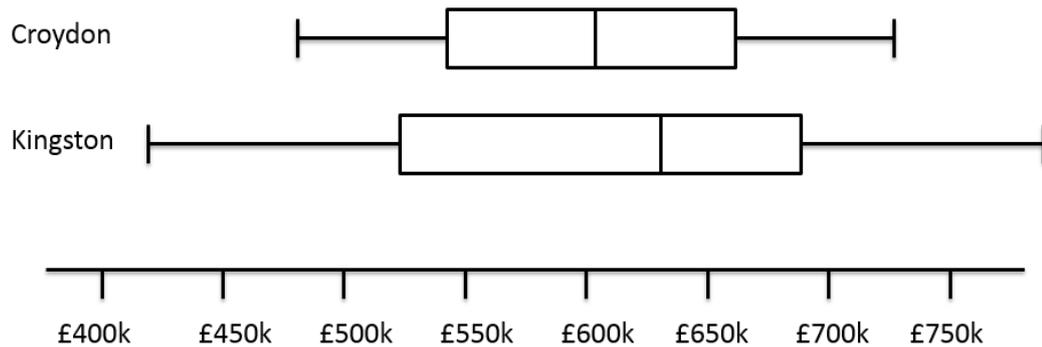


## Comparing Box Plots

It is important to be able to compare the data that is shown in 2 or more box plots. You should consider the median and quartiles as well as the spread of the data. Always relate the comparison back to the specific situation being analysed.

Examples

1. **Box Plot comparing house prices of Croydon and Kingston-upon-Thames:**



“Compare the prices of houses in Croydon with those in Kingston”. (2 marks)

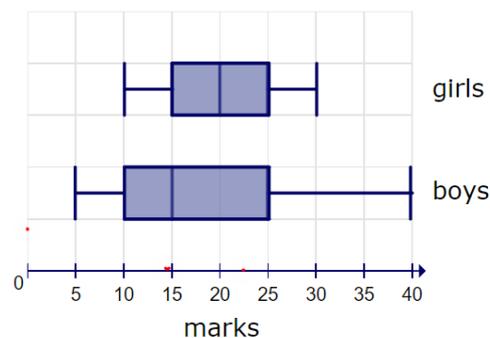
- 2.

Consider these box plots comparing marks in a maths competition for boys and girls.

Who had the greater median?

boys

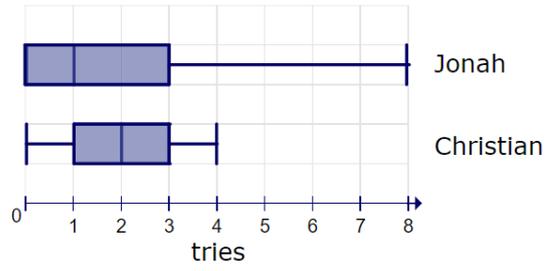
girls



3.

A coach for a rugby club needs to choose between two different wingers for the next game.

The box plots show the number of tries scored by each winger over the last 10 matches.



Which winger should the coach pick?

Jonah

Christian

Ex 3A/3B Pg  
42-43, 45