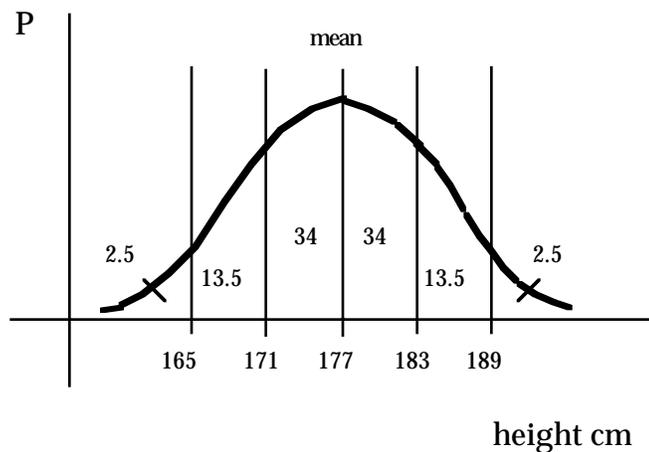# Normal Distribution 40

In many experiments, if a very large amount of data is collected, it is found that the data are distributed according to a distribution called the **Normal Distribution**. The equation for the normal distribution is given below.

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}}\, e^{\frac{-(x-\bar{x})^2}{2\sigma^2}}$$

An example is the height distribution for 17 year old boys. It is shown below. We say that the heights are distributed normally about the mean. In this case, the mean is 177 cm and the standard deviation is 6 cm.

height cm

This distribution is similar to the binomial distribution for a large N, if p is close to 0.5.

The normal distribution is continuous, not discrete. This means that measurements are not only integers.

It has the following properties;

The curve is determined by its mean and standard deviation.

It is symmetric about the mean.

The total area under the curve equals 1.

68% of the data are within one standard deviation of the mean.

95% of the data are within two standard deviations of the mean.

99.7% of the data are within three standard deviations of the mean.

The area between two measurements x_1 and x_2, gives the probability that the data is between x_1 and x_2.

Problems:

1) What two numbers determine a normal distribution?

2)a) Give an example of data which is distributed normally.

b) What is the mean and standard deviation for heights of 17 year old boys.

3) What percentage of the height data are within one standard deviation of the mean?

4) What percentage of the data are greater than the mean?

5) What percentage of boys have heights greater than 189 cm?

6) What percentage of boys have a height greater than 183 cm?

7) What percentage of boys have a height between 171 and 189 cm?

Answers: 1) the mean and the standard deviation, 2)a) the heights of 17 year old boys, b) 177 cm and 6 cm, 3) 68, 4) 50, 5) 2.5, 6) 16, 7) 81.5.