PROBABILITY

Probability

Probability is the chance that something will happen.

The idea of chance comes up every day.
For example…
- the chance of winning the lottery
- the likelihood that it'll snow on Christmas Day.

When you talk about probability, you might use words such as…
- likely
- unlikely
- evens / even chance
- fair
- impossible
- certain.

This probability line shows where each of the words comes on a scale from 'impossible' to 'certain'.
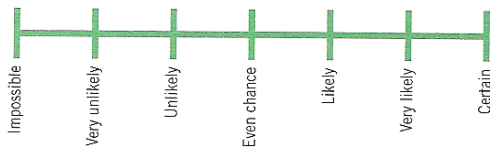
For example, a bag contains three green beads and one red bead. If a bead is taken out of the bag at random, the chance of it being green is likely and the chance of it being red is unlikely.

An event is something that happens. Every event has a set of possible outcomes. In probability, events are considered that have one or more possible outcomes.

For example, the possible outcomes when a fair die is thrown are 1, 2, 3, 4, 5, 6.
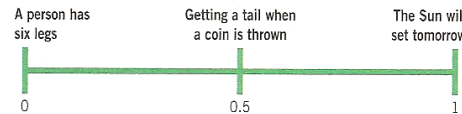
Expressing Probabilities

The probability that an event can happen lies between 0 and 1.

The probability scale…
- starts at 0 for something that's impossible
- finishes at 1 for something that's certain.

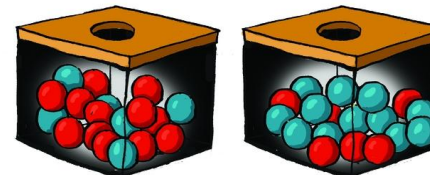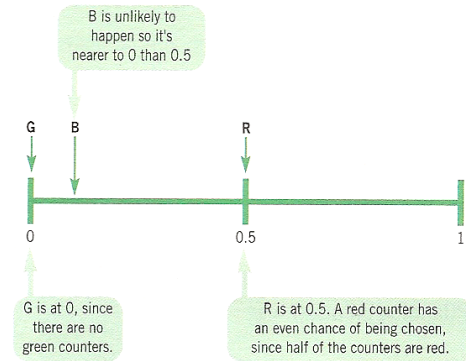Probabilities can be written as…
- fractions
- decimals
- percentages

Example
A bag contains five red counters, one blue counter and four yellow counters.
A counter is chosen at random.
On a probability scale…
a) mark with an R the probability of choosing a red counter
b) mark with a B the probability of choosing a blue counter
c) mark with a G the probability of choosing a green counter.

B is unlikely to happen so it's nearer to 0 than 0.5

G is at 0, since there are no green counters.

R is at 0.5. A red counter has an even chance of being chosen, since half of the counters are red.

Calculating Probabilities

Probabilities can be calculated by...
- doing experiments
- using theory
- collecting data.

If you know what all the possible outcomes of an event are, you can calculate the probability of something happening:

Probability of an outcome	$=$	$\dfrac{\text{Number of ways an outcome can happen}}{\text{Total number of outcomes}}$

P(outcome) is the shortened way of writing the probability of an outcome.

The total of the probabilities for all possible outcomes of an event is 1.

Example

The letters that spell out the word 'trigonometry' are placed in a contain A letter is taken out at random.
What is the probability of taking out..

a) a letter T?
$$P(T) = \tfrac{2}{12} = \tfrac{1}{6}$$

b) a vowel?
$$P(\text{vowel}) = \tfrac{4}{12} = \tfrac{1}{3}$$

c) a letter A?
$$P(A) = 0$$
Since there's no letter A, the probability is zero.

Probability of an Event Not Happening

Mutually exclusive events are events that can't happen at the same time.

If two outcomes of an event are mutually exclusive, then:

P (outcome will happen)	$=$	1	$-$	P (outcome won't happen)

or

P (outcome will not happen)	$=$	1	$-$	P (outcome will happen)

Example

The probability that Sasoon is late is 0.31. What is the probability that he isn't late?

$$P(\text{not late}) = 1 - P(\text{late})$$
$$= 1 - 0.31$$
$$= 0.69$$

The probability that it rains on a particular day in August is $\tfrac{3}{11}$. What is the probability that it does not rain in August?

$$P(\text{not rain}) = 1 - P(\text{rains})$$
$$= 1 - \tfrac{3}{11}$$
$$= \tfrac{8}{11}$$