# REPRESENTATIONS...

# Probability

## What do I need to be able to do?

By the end of this unit you should be able to:
- Find single event probability
- Find relative frequency
- Find expected outcomes
- Find independent events
- Use diagrams to work out probabilities

## Keywords

**Probability:** the chance that something will happen
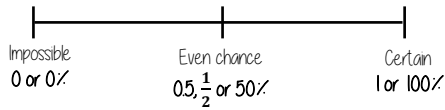**Relative Frequency:** how often something happens divided by the outcomes
**Independent:** an event that is not effected by any other events.
**Chance:** the likelihood of a particular outcome.
**Event:** the outcome of a probability – a set of possible outcomes.
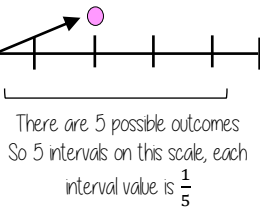**Biased:** a built in error that makes all values wrong by a certain amount.

## The probability scale  (R)

Impossible
0 or 0%

Even chance
0.5, $\frac{1}{2}$ or 50%

Certain
1 or 100%

The more likely an event the further up the probability it will be in comparison to another event
(It will have a probability closer to 1)

There are 2 pink and 2 yellow balls, so they have the same probability

There are 5 possible outcomes
So 5 intervals on this scale, each interval value is $\frac{1}{5}$

## Single event probability  (R)

Probability is always a value between 0 and 1

The probability of getting a blue ball is $\frac{1}{5}$
∴The probability of **NOT** getting a blue ball is $\frac{4}{5}$

The sum of the probabilities is 1

The table shows the probability of selecting a type of chocolate

| Dark | Milk | White |
|------|------|-------|
| 0.15 | 0.35 | |

P(white chocolate) = 1 − 0.15 − 0.35
= 0.5

## Relative Frequency

$$\frac{\text{Frequency of event}}{\text{Total number of outcomes}}$$

Remember to calculate or identify the overall number of outcomes!

| Colour | Frequency | Relative Frequency |
|--------|-----------|--------------------|
| Green | 6 | 0.3 |
| Yellow | 12 | 0.6 |
| Blue | 2 | 0.1 |
| | 20 | |

Relative frequency can be used to find expected outcomes

e.g. Use the relative probability to find the expected outcome for green if there are 100 selections.

Relative frequency x Number of times
$$0.3 \times 100 = 30$$

## Expected outcomes

Expected outcomes are estimations. It is a long term average rather than a prediction.

| Dark | Milk | White |
|------|------|-------|
| 0.15 | 0.35 | 0.5 |

The sum of the probabilities is 1

An experiment is carried out **400** times.
Show that dark chocolate is expected to be selected **60** times

$$0.15 \times 400 = 60$$

## Independent events

The rolling of one dice has no impact on the rolling of the other. The individual probabilities should be calculated separately.

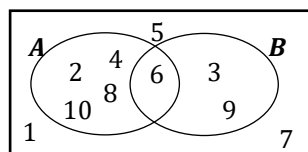**Probability of event 1 × Probability of event 2**

$$P(5) = \frac{1}{6} \qquad P(R) = \frac{1}{4}$$

Find the probability of getting a 5 and a red

$$P(5 \text{ and } R) = \frac{1}{6} \times \frac{1}{4} = \frac{1}{24}$$

## Using diagrams  (R)

Recap Venn diagrams, Sample space diagrams and Two-way tables

A: 2, 4, 10, 8
6
B: 3, 9
5
1
7

| | Car | Bus | Walk | Total |
|-------|-----|-----|------|-------|
| Boys | 15 | 24 | 14 | 53 |
| Girls | 6 | 20 | 21 | 47 |
| Total | 21 | 44 | 35 | 100 |

The possible outcomes from tossing a coin

The possible outcomes from rolling a dice

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|----|----|----|----|----|----|
| H | 1,H | 2,H | 3,H | 4,H | 5,H | 6,H |
| T | 1,T | 2,T | 3,T | 4,T | 5,T | 6,T |