

# Lessons and Probability

@whisto\_maths

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

By the end of this unit you should be able to:

- Construct a sample space diagram
- Systematically list outcomes
- Find the probability from two-way tables
- Find the probability from Venn diagrams

## Keywords

**Outcomes:** the result of an event that depends on probability

**Probability:** the chance that something will happen

**Set:** a collection of objects

**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

**Union:** Notation 'U' meaning the set made by comparing the elements of two sets

## Construct sample space diagrams



Sample space diagrams provide a systematic way to display outcomes from events

The possible outcomes from tossing a coin

The possible outcomes from rolling a dice

	1	2	3	4	5	6
H	1H	2H	3H	4H	5H	6H
T	1T	2T	3T	4T	5T	6T

This is the set notation to list the outcomes  $S =$

$$S = \{1H, 2H, 3H, 4H, 5H, 6H, 1T, 2T, 3T, 4T, 5T, 6T\}$$

In between the  $\{ \}$  are  $a_i$  the possible outcomes

## Probability from sample space

The possible outcomes from rolling a dice

The possible outcomes from tossing a coin

	1	2	3	4	5	6
H	1H	2H	3H	4H	5H	6H
T	1T	2T	3T	4T	5T	6T

This is the set notation that represents the question P

What is the probability that an outcome has an even number and a tails?

$$P(\text{Even number and Tails}) = \frac{3}{12}$$

In between the  $( )$  is the event asked for

There are three even numbers with tails

Numerator: the event

Denominator: the total number of outcomes

There are twelve possible outcomes

## Probability from two-way tables

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

$$P(\text{Girl walk to school}) = \frac{21}{100}$$

The event

The total in the set

The total number of items

## Product Rule

The number of items in event a

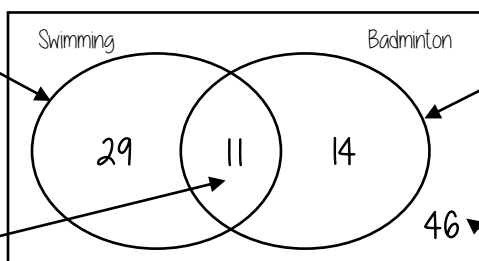
x

The number of items in event b

## Probability from Venn diagrams

100 students were questioned if they played badminton or went to swimming club  
40 went swimming, 25 went to badminton and 11 went to both

This whole curve includes everyone that went swimming  
Because 11 did both we calculate just swimming by  $40 - 11$



This whole curve includes everyone that went to badminton  
Because 11 did both we calculate just badminton by  $25 - 11$

$$P(\text{Just swimming}) = \frac{29}{100}$$

The intersection represents both  
Swimming AND badminton

The number outside represents those that did neither badminton or swimming

$$100 - 29 - 11 - 14$$