

PROPORTION...

Probability

What do I need to be able to do?

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

- Add, Subtract and multiply fractions
- Find probabilities using likely outcomes
- Use probability that sums to 1
- Estimate probabilities
- Use Venn diagrams and frequency trees
- Use sample space diagrams
- Calculate probability for independent events
- Use tree diagrams

Keywords

- Event:** one or more outcomes from an experiment
- Outcome:** the result of an experiment
- Intersection:** elements (parts) that are common to both sets
- Union:** the combination of elements in two sets
- Expected Value:** the value/ outcome that a prediction would suggest you will get
- Universal Set:** the set that has all the elements
- Systematic:** ordering values or outcomes with a strategy and sequence
- Product:** the answer when two or more values are multiplied together.

Add, Subtract and multiply fractions

Addition and Subtraction

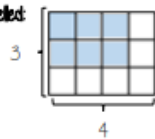
$$\frac{4}{5} - \frac{2}{3} = \frac{12}{15} - \frac{10}{15} = \frac{2}{15}$$

Use equivalent fractions to find a common multiple for both denominators

Multiplication

$$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$$

Modelled:



Parts shaded

Total number of parts in the diagram

Likelihood of a probability

Impossible 0 or 0% Even chance 0.5, 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)

Sum to 1

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

Experimental data

Theoretical probability

What we expect to happen

Experimental probability

What actually happens when we try it out

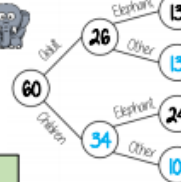
The more trials that are completed the closer experimental probability and theoretical probability become

The probability becomes more accurate with more trials
 Theoretical probability is proportional

Tables, Venn diagrams, Frequency trees

Frequency trees

60 people visited the zoo one Saturday morning. 26 of them were adults. 13 of the adult's favourite animal was an elephant. 24 of the children's favourite animal was an elephant.



Frequency trees and two-way tables can show the same information

The total columns on two-way tables show the possible denominators

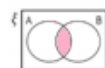
$$P(\text{Adult}) = \frac{26}{60}$$

$P(\text{Child with favourite animal as elephant}) = \frac{13}{37}$

Two-way table

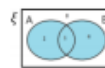
	Adult	Child	Total
Elephant	13	24	37
Other	13	10	23
Total	26	34	60

Venn diagram



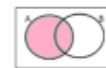
in set A AND set B

$$P(A \cap B)$$



in set A OR set B

$$P(A \cup B)$$



in set A

$$P(A)$$



NOT in set A

$$P(A')$$

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

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

Independent events

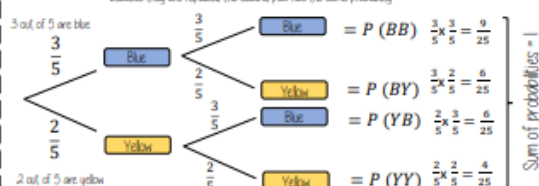
The outcome of two events happening. The outcome of the first event has no bearing on the outcome of the other

$$P(A \text{ and } B) = P(A) \times P(B)$$

Tree diagram for independent event

Isabel has a bag with 3 blue counters and 2 yellow. She picks a counter and replaces it before the second pick.

Because they are replaced the second pick has the same probability

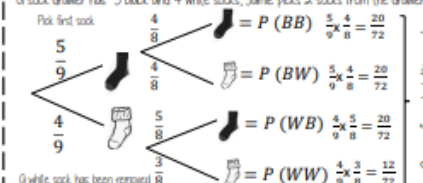


Dependent events

Tree diagram for dependent event

The outcome of the first event has an impact on the second event

A sock drawer has 5 black and 4 white socks. Jamie picks 2 socks from the drawer



NOTE: as 'socks' are removed from the drawer the number of items in that drawer is also reduced ∴ the denominator is also reduced for the second pick.