Year 8 Knowledge Organiser - Probability

Objectives

Record describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees

Apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one

Enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams

Construct theoretical possibility spaces for combined experiments with equally likely outcomes and use these to calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions

Key Vocabulary

Probability – the chance that something will happen

Outcome – the result of an event that depends on probability

Event – the outcome of a probability

Chance – the likelihood of a particular outcome

Frequency tree – used to record and organise events

Enumerate – an ordered listing

Set – a collection of objects

Venn diagram – a diagram organising sets, enclosed within a universal set

Possibility space, sample space – a list of all possible outcomes of an experiment e.g. tossing a coin (heads, tails)

Equally likely outcomes - events that have the same theoretical probability (or likelihood) of occurring

Theoretical probability - determined on the basis of reasoning

Experimental probability - determined on the basis of the results of an experiment repeated many times

Bias – a built in error that makes all values wrong by a certain amount

Relative frequency - how often something happens divided by all outcomes

Construct sample space diagrams

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

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 to list the outcomes **S** =

In between the { } are a, the possible outcomes

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

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

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

This is the set notation that represents the question **P**

P (Even number and Tails) = 3/12

There are three even numbers with tails

There are twelve possible outcomes

In between the ( ) is the event asked for

Numerator: the event

Denominator: the total number of 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 (Girl walk to school) = 21/100

The event

The total in the set

The total number of items

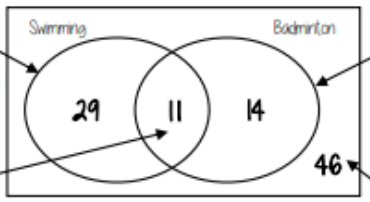
Product Rule

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

The intersection represents both Swimming **AND** badminton

The number outside represents those that did **neither** badminton or swimming 100 – 29 – 11 – 14

P (Just swimming) = 29/100

Identify and represent sets

The **universal set** has this symbol ξ – this means EVERYTHING in the Venn diagram is in this set

A set is a collection of things – you write sets inside curly brackets { }

ξ = {the numbers between 1 and 50 inclusive}

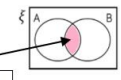
My sets can include every number between 1 and 50 including those numbers

A = {Square numbers}

A = {1, 4, 9, 16, 25, 36, 49}

All the numbers in set A are square number and between 1 and 50

Intersection of sets

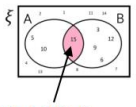


Elements in the intersection are in set A AND set B

The notation for this is $A \cap B$

ξ = {the numbers between 1 and 15 inclusive}

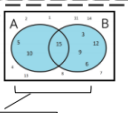
A = {Multiples of 5} B = {Multiples of 3}



The element in $A \cap B$ is 15

In this example there is only one number that is both a multiple of 3 and a multiple of 5 between 1 and 15

Union of sets



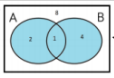
Elements in the union could be in set A OR set B

ξ = {the numbers between 1 and 15 inclusive}
A = {Multiples of 5} B = {Multiples of 3}

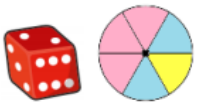
The elements in $A \cup B$ are 5, 10, 15, 3, 9, 6, 12

The notation for this is $A \cup B$

There are 7 elements that are either a multiple of 5 OR a multiple of 3 between 1 and 15



This Venn shows the **number of elements** in each set



Frequency trees

Multiply probabilities along the branches
Add probabilities down columns
Fractions are often used in place of decimals along branches - remember to multiply fractions by multiplying the numerators together, multiplying denominators then simplify