# YEAR 9 Type your text REASONING WITH NUMBER

@whisto_maths

# Sets and probability

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

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

- Identify and represent sets
- Interpret and create Venn diagrams
- Understand and use the intersection of sets
- Understand and use the union of sets
- Generate sample spaces for single events
- Calculate the probability of a single event
- Understand and use the probability scale

## Keywords

**Set**: collection of things
**Element**: each item in a set is called an element
**Intersection**: the overlapping part of a Venn diagram (AND ∩)
**Union**: two ellipses that join (OR ∪)
**Mutually Exclusive**: events that do not occur at the same time
**Probability**: likelihood of an event happening
**Bias**: a built-in error that makes all values wrong (unequal) by a certain amount, e.g. a weighted dice
**Fair**: there is zero bias, and all outcomes have an equal likelihood
**Random**: something happens by chance and is unable to be predicted

## Identify and represent sets

The **universal set** has this symbol $\xi$ – this means EVERYTHING in the Venn diagram is in this set

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

$\xi$ = {the numbers between 1 and 50 inclusive}

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

$A$ = {Square numbers}

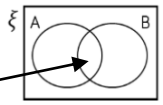
$A$ = {1, 4, 9, 16, 25, 36, 49}

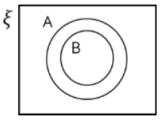
All the numbers in set $A$ are square number and between 1 and 50

## Interpret and create Venn diagrams


Mutually exclusive sets
The two sets have nothing in common
No overlap

Union of sets
The two sets have some elements in common – they are placed in the intersection

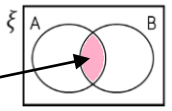



Subset
All of set B is also in Set A so the ellipse fits inside the set

The box
Around the outside of every Venn diagram will be a box. If an element is not part of any set it is placed outside an ellipse but inside the box

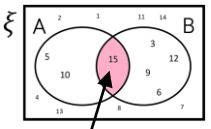
## Intersection of sets




Elements in the intersection are in set $A$ AND set B

The notation for this is $A \cap B$

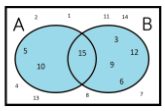
$\xi$ = {the numbers between 1 and 15 inclusive}
$A$ = {Multiples of 5} $B$ = {Multiples of 3}




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



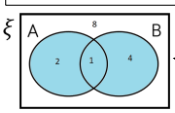

$\xi$ = {the numbers between 1 and 15 inclusive}
$A$ = {Multiples of 5} $B$ = {Multiples of 3}

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

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

## Sample space – for single events

A sample space for rolling a six-sided dice is S = {1, 2, 3, 4, 5, 6}

A sample space for this spinner is S = {Pink, Blue, Yellow}

You only need to write each element once in a sample space diagram

- A Sample space represents a possible outcome from an event
- They can be interpreted in a variety of ways because they do not tell you the probability

## Probability of a single event

Probability = number of times event happens / total number of possible outcomes

P(Blue) = 4/10 = 2/5

There are 4 blue sectors
There are 10 sectors overall

Probability notation
P ( event )

Probability can be a fraction, decimal or percentage value

$\frac{4}{10} = \frac{40}{100} = 0.40 = 40\%$

Probability is always a value between 0 and 1

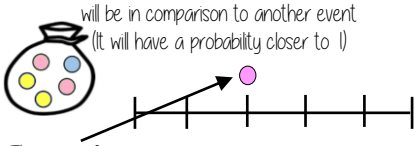
## The probability scale

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 $\frac{1}{5}$

## Sum of probabilities

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