Basic Probability

Scale

impossible — equally likely / unlikely — certain

0 — 0.5 — 1

unlikely — likely

Three ways probabilities can be expressed

	Fractions	Percentages	Decimals
eg	$\frac{1}{2}$	50%	0.5
	$\frac{1}{4}$	25%	0.25

You must not use ratios such as 50:50

A die (or dice) if fair can give a 1, 2, 3, 4, 5, 6 as the outcome of a roll

Prob(1) or $P(1) = \frac{1}{6}$

$P(2) = \frac{1}{6}$

$P(3) = \frac{1}{6}$

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

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

$P(6) = \frac{1}{6}$ +

1

Mutually Exclusive events are events which cannot both happen at the same time

The 'OR' Rule

If two events A and B are mutually exclusive then probability of A or B happening written as $P(A \cup B)$ is given by

$$P(A \cup B) = P(A) + P(B)$$

Ex $P(5 \cup 6) = P(5) + P(6)$

$$= \frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$$

because rolling a 5 or a 6 are mutually exclusive events.

Not all events are mutually exclusive

Ex Let A be the event get an even number

Let B be the event get number > 3

Then $P(A) = \frac{3}{6}$ $P(B) = \frac{3}{6}$

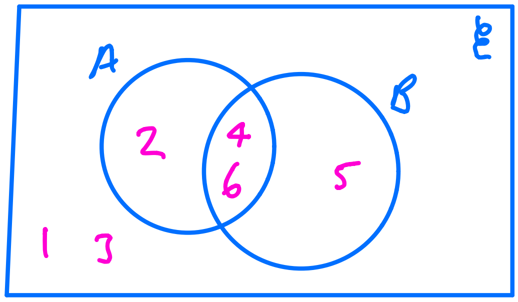
But $P(A \cup B) = \frac{4}{6}$ not $\frac{6}{6}$

$\{2, 4, 6, 5\}$

These probabilities for A and B could not simply be added because A and B are not mutually exclusive 4 and 6 are in both A and B

Venn Diagrams

Let A be even number
B be number > 3



$P(A \cup B) = \frac{4}{6}$ = Prob of A or B or both

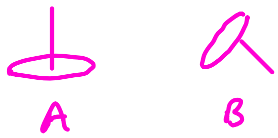
$P(A \cap B) = \frac{2}{6}$ = Prob of A <u>and</u> B happening

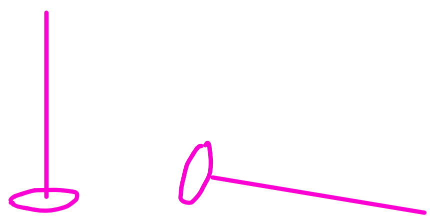
$A \cup B$ is pronounced A union B

$A \cap B$ is pronounced A intersect B

Experimental Probability

Drawing Pin





what is the probability of outcomes A and B

There is no theoretical answer.

If we experimented and got 57 times

and 43 times we could suggest

$P(\;) = 57\%$ and $P(\;) = 43\%$

More repetitions would make our probabilities more reliable.