12 - Exploring and applying probability

Probability = $\frac{\text{number of ways}}{\text{total number of possible outcomes}}$

$\frac{\text{Frequency of desired outcomes}}{\text{no.of trials}}$

Toss a die e.g.
P(6) - *probability of getting a six* = 1/6 *—> chance/total possible results*

- Probabilities add to 100%
- Probabilities add to 1 e.g. P(0.3) +P(0.7)

Venn Diagrams

U = or ⟶ both options, e.g. A U B'— A or not B

= and/but also ⟶ Same time e.g. A B — A but also B

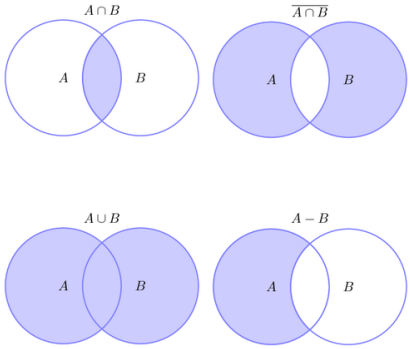
Mutually exclusive ⟶ not at the same time (cannot happen) - e.g. picking a letter that is S and a vowel - P(A and B)

Mutually exhaustive ⟶ one or more can occur e.g.P(A and B) — P(heart and king)

Exhaustive event ⟶ when all possible outcomes have been used up, only probability is 1

Independent event ⟶ does not affect the next event e.g. roll dice twice

Dependent event ⟶ is affected by another e



The more values = the more combinations

Expectation = long-run average you would get if a test was repeated many times

expectation = nP (no. trials x probability)

e.g. probability of heads with biased coin = 3/4
Coin thrown 200 times
Expectation = nP = 3/4 x 200 = 150

Rules:

A ∪ B = A union B = A or B

A ∩ B = A and B = A intersect B

A' = Complement A = everything that does not include A

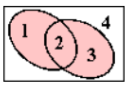
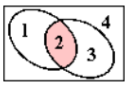
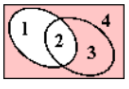
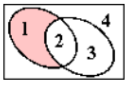
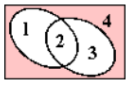
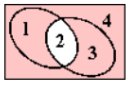
∅ = empty set

∈ = an element of A/B e.g. 1 in A

∉ = Not an element

Tree diagrams

- Multiply across branches to find combined probability of 2+ events

set notation	pronunciation	meaning	Venn diagram	answer
$A \cup B$	"A union B"	everything that is in either of the sets		{1, 2, 3}
$A \wedge B$ or $A \cap B$	"A intersect B"	only the things that are in both of the sets		{2}
A^c or $\sim A$	"A complement", or "not A"	everything in the universe outside of A		{3, 4}
$A - B$	"A minus B", or "A complement B"	everything in A except for anything in its overlap with B		{1}
$\sim(A \cup B)$	"not (A union B)"	everything outside A and B		{4}
$\sim(A \wedge B)$ or $\sim(A \cap B)$	"not (A intersect B)"	everything outside of the overlap of A and B		{1, 3, 4}