

Complementary and Mutually Exclusive Events

Starter

1. **(Review of last lesson)** A group of students spun the same five sided spinner and recorded the number of 1s they got. Here are their results:

Student	1	2	3	4	5	6
Number of trials	30	65	20	35	50	40
Number of 1s spun	4	10	7	5	9	32

Work out the best estimate for the probability of spinning a 1.

2. The probability of winning a match is $\frac{5}{7}$. What is the probability of not winning the match?

Notes

Complementary events

Two events are **complementary** if they are the only two possible outcomes. **Complementary events** are usually **connected by the word 'not'**.

Probability of an event not happening = $1 - \text{probability of the event happening}$

Probability of an event happening = $1 - \text{probability of the event not happening}$

The sum of the probabilities is 1.

- E.g. 1** The probability of Jack getting a hole in one at crazy golf is $\frac{2}{5}$. What is the probability of him not getting a hole in one?

Working:

$$\begin{aligned}
 P(\text{not getting a hole-in-one}) &= 1 - P(\text{getting a hole-in-one}) \\
 &= 1 - \frac{2}{5} \\
 &= \frac{3}{5}
 \end{aligned}$$

- E.g. 2** The probability of Lia arriving on time for work is 0.92. What is the probability she will arrive late?

Sum of the probabilities

The sum of the probabilities of an event is 1.

- E.g. 3** The probability of a football team winning a match is $\frac{3}{8}$, while the probability of it losing is 0.2. Find the probability of the team drawing the match.

Mutually exclusive events

Two **events** (or **outcomes**) are **mutually exclusive** if they cannot occur at the same time.

For example:

Flipping a coin — the two outcomes ‘head’ and ‘tail’ are mutually exclusive i.e. they cannot happen at the same time.

Rolling a dice — the event ‘rolling an even number’ is mutually exclusive to ‘rolling an odd number’.
— the event ‘rolling a 2’ is mutually exclusive to ‘rolling a 6’.
— but the event ‘rolling a 3’ is **not** mutually exclusive to ‘rolling an odd number’.

If event A and event B are mutually exclusive, then $P(A \text{ or } B) = P(A) + P(B)$

E.g. 4 In a game there are four types of card. These are the probabilities of getting each card:

$$P(\text{Luck card}) = \frac{1}{8}$$

$$P(\text{Doom card}) = \frac{1}{4}$$

$$P(\text{Wealth card}) = \frac{1}{2}$$

$$P(\text{Lose money card}) = ?$$

- (a) What is the probability of getting a Lose money card?
- (b) Find the probability of getting a Doom or a Wealth card.
- (b) What is the probability of not getting a Luck card?

Video: [Probability of not happening](#)
Video: [Mutually exclusive events](#)

[Solutions to Starter and E.g.s](#)

Exercise

CIMT 7B p149 Ex 21.4 Qu 1-10

CIMT 7B p155 Ex 21.6 Qu 1-10

CIMT 8A p168 Ex 10.1 Qu 1-10

Summary

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Two events are **complementary** if they are the only two possible outcomes. **Complementary events** are usually **connected by the word ‘not’**.

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