Helping Your Child with Probability

Probability · Year 7 to Year 10 · Australian Curriculum Mathematics

Probability is the mathematics of chance — how likely something is to happen. It appears in weather forecasts, sports predictions, insurance, medicine, and gambling. Your child learns to move from **experimental probability** (what actually happened in trials) to **theoretical probability** (what should happen based on equally likely outcomes), and eventually to combining probabilities of multiple events.

Year	What your child learns	What this looks like at home
Year 7	**Probability as a number, and from experiments** **probability** — a number from 0 to 1 showing how likely an event is: 0 = impossible | 0.5 = equally likely | 1 = certain **event** — an outcome or set of outcomes we are interested in **sample space** — the set of all possible outcomes: Rolling a die: {1, 2, 3, 4, 5, 6} **theoretical probability**: P(event) = favourable outcomes ÷ total equally likely outcomes **P(heads) = $\frac{1}{2}$ = 0.5 = 50%; P(6 on a die) = $\frac{1}{6}$ ≈ 0.167 = 16.7%** **experimental probability** — found by running trials: P(event) ≈ number of times event occurred ÷ total trials **relative frequency** — same thing: how often an event happened as a fraction **law of large numbers** — the more trials you run, the closer experimental probability gets to theoretical probability **e.g. flip a coin 10 times → might get 7 heads (70%)** **flip 1,000 times → will be very close to 50%** Your child designs and conducts probability experiments, records results in tables, and compares experimental to theoretical values.	**Coin flip: 'What is the probability of getting heads?'** ($\frac{1}{2}$) **Dice roll: 'What is the probability of rolling less than 3?'** (Outcomes: 1, 2 → P = $\frac{2}{6}$ = $\frac{1}{3}$) **Flip a coin 20 times. Record results for Heads. How close is it to 50%?** **'Why do casinos always win in the long run?'** (Law of large numbers — probability works against the gambler over time.)
Year 8	**Complementary events, and combining two events** **complementary event** — the opposite of the event: P(not A) = 1 − P(A); **P(not getting a 6) = 1 − $\frac{1}{6}$ = $\frac{5}{6}$** **combined events** — two or more events happening together **tree diagram** — a diagram showing all possible outcomes in branches: e.g. Flip a coin AND roll a die → 12 possible outcomes **two-way table** — a grid showing combined outcomes for two variables Your child finds probabilities of combined events: **P(heads AND a 4) = $\frac{1}{2}$ × $\frac{1}{6}$ = $\frac{1}{12}$** **(for independent events — one doesn't affect the other)**	**'What is the complementary event of rolling an even number on a die? What is its probability?'** (P(not rolling an even number) = $\frac{3}{6} = \frac{1}{2}$) **Tree diagram: 'If we flip two coins, draw all possible outcomes.'** (HH, HT, TH, TT — 4 outcomes) **'What is the probability of getting two heads?'** ($\frac{1}{4}$ = 25%)
Year 9	**Compound events, with and without replacement** **compound event** — an event made of 2 or more stages, like drawing several cards or marbles in a row **without replacement** — an item is NOT put back before the next draw, so the sample space shrinks and probabilities change: **Bag has 3 red, 2 blue marbles, two marbles drawn, without replacement find P(1st red, second red) = $\frac{3}{5} \times \frac{2}{4} = \frac{6}{20} = \frac{3}{10}$** Your child lists all outcomes for compound events using tree diagrams, tables or arrays, with and without replacement. P(A or B) = P(A) + P(B) − P(A and B) (for any events) Your child estimates probabilities of "and"/"or" events using data collected from repeated trials.	**Bag game: put 8 red, 3 blue marbles in a bag. Draw one WITHOUT looking, don't put it back, then draw again. Does the 2nd draw's probability change?** (Yes, as without replacement indicated.) **Card game: draw 2 cards from a shuffled deck WITHOUT replacing the first. What is P(both are hearts)?** (13/52 × 12/51 ≈ 0.059) ***Year 10 on next page***

	Year 10	**Conditional probability and independence** **conditional probability** — the probability of A given that B has already happened: $P(A \mid B) = P(A \text{ and } B) \div P(B)$ **independent events** — one event does not affect the probability of the other: $P(A \text{ and } B) = P(A) \times P(B)$ **dependent events** — the outcome of one event affects the next: Drawing cards WITHOUT replacement — fewer cards remain **e.g. P(2nd card is Ace | 1st was Ace) = $\frac{3}{51}$ (one ace gone)** **Venn diagrams** — used to show overlapping events and calculate combined probabilities	**'If a family has two children, and the first is a girl, what is the probability the second is also a girl?'** ($\frac{1}{2}$ — events are independent) **'Draw cards without replacement.** P(1st is King) = $\frac{4}{52}$.. **If that happens, P(2nd is King) = ?'** ($\frac{3}{51}$ — one king gone) **Medical testing: discuss false positives. 'If a test is 99% accurate, is a positive result definitely correct?'**

★ Probability at a glance — scale and common events

0	**$\frac{1}{4}$ (0.25)**	**$\frac{1}{2}$ (0.5)**	**$\frac{3}{4}$ (0.75)**	**1**
Impossible (never happens)	*Unlikely (less than 50%)*	*Even chance (50/50)*	*Likely (more than 50%)*	*Certain (always happens)*

Examples: *P(impossible) = 0 | P(rolling a 7 on a standard die) = 0 | P(rolling 1–6 on a standard die) = 1 | P(rolling an even number) = $\frac{3}{6}$ = 0.5 | P(rolling a number > 4) = $\frac{2}{6} = \frac{1}{3} \approx$ 0.333*

Tree diagram — flipping two coins: *First flip → H or T. Second flip → H or T for each. Outcomes: HH, HT, TH, TT (4 equally likely). P(at least one head) = $\frac{3}{4}$ | P(two tails) = $\frac{1}{4}$ | P(exactly one head) = $\frac{2}{4} = \frac{1}{2}$.*

Helping at Home — Probability

Worked examples and questions to ask · Year 7 to Year 10

How it works — worked examples

Year 7 — Theoretical probability

A bag has 3 red, 2 blue, and 5 green marbles. Find the probability of picking (a) red (b) not green.

Total marbles	3 + 2 + 5 = 10 marbles
(a) P(red)	3 red out of 10 total → P(red) = $\frac{3}{10}$ = 0.3 = 30%
P(green)	5 out of 10 → P(green) = $\frac{5}{10} = \frac{1}{2}$
(b) P(not green)	**1 − P(green) = 1 − $\frac{1}{2} = \frac{1}{2}$ = 50%**

Year 8 — Combined events

A spinner has Red, Blue, Green (equal sections). A coin is flipped. What is P(Red AND Tails)?

List outcomes	R-H, R-T, B-H, B-T, G-H, G-T (6 equally likely outcomes)
Favourable	Only R-T (Red AND Tails) = 1 outcome
Probability	P(Red AND Tails) = $\frac{1}{6}$ ≈ 0.167
Multiply method	**P(Red) × P(Tails) = $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$ (independent events → multiply)**

Year 9 — Compound events, without replacement

A bag has 5 red and 3 blue counters. Two are drawn WITHOUT replacement. What is P(both red)?

1st draw	Bag has 5 red, 3 blue counters (8 total). P(1st is red) = $\frac{5}{8}$
Without replacement	The counter is NOT put back — only 7 counters are left for the 2nd draw.
2nd draw	Given the 1st was red: 4 red, 3 blue remain. P(2nd is red) = $\frac{4}{7}$
Multiply	P(both red) = $\frac{5}{8} \times \frac{4}{7} = \frac{20}{56}$ ≈ 0.357

Year 10 — Conditional probability

In a class of 30: 18 play sport, 12 play music, 5 do both. A student is chosen. Given they play sport, what is the probability they also play music?

Given	We know the student plays sport (18 students)
Both sport AND music	5 students do both
Conditional formula	P(music | sport) = P(music AND sport) / P(sport)
Calculate	**= $(\frac{5}{30})$ / $(\frac{18}{30})$ = $\frac{5}{18}$ ≈ 0.278 = 27.8%**

Questions to ask your child

You don't need to solve these. Ask them and let your child explain their thinking!

7 Year 7

→ A standard die is rolled. What is the probability of rolling an odd number?
→ A deck has 52 cards. What is P(picking a heart)?
→ You flip a coin 100 times and get 43 heads. What is the experimental probability of heads?
→ You roll a die 60 times. About how many times would you expect to roll a 3?

8 Year 8

→ If P(rain tomorrow) = 0.7, what is P(no rain tomorrow)?
→ Draw a tree diagram for rolling a die and flipping a coin together.
→ How many outcomes are in the sample space?
→ What is P(an even number AND heads)?

9 Year 9

→ What is P(a number less than 3 OR tails)?
→ A bag has 3 red and 2 blue marbles. One is drawn and NOT put back. Does this change the probability of the next draw? Why?
→ Draw a tree diagram for picking 2 letters from A, B, C without replacing the first one. How many outcomes are there?
→ You record the weather for 20 days: 12 sunny, 8 rainy. How could you use this data to estimate P(sunny tomorrow)?

10 Year 10

→ Two cards are drawn without replacement. What is P(both are aces)? $(\frac{4}{52} \times \frac{3}{51})$
→ Are drawing two cards independent or dependent events? Why?
→ In a medical test, 1 in 100 people has a disease. The test is 95% accurate. If you test positive, are you definitely sick? Discuss.
→ What does P(A | B) mean in everyday language? Give an example from real life.

🏠 Things to try at home

Year 7: Make a bag of coloured counters (e.g. 5 red, 3 blue, 2 yellow). Ask: 'Without looking, what is the probability of drawing red?'	**Year 7:** Flip a coin 50 times and record results. Graph the running percentage of heads. Watch it move closer to 50%.
Year 8: Weather app: if there's a 30% chance of rain, ask 'What is the chance it does NOT rain?' Check that the two chances add up to 100%.	**Year 8:** Flip a coin and roll a die together. List all the outcomes (Heads-1, Heads-2, Tails-1...). How many outcomes are there in total?
Year 9: Roll two dice together 20 times. Record the sum each time. Which sum comes up most? (Should be 7 — it has the most combinations.)	**Year 9:** Write 5 friends' names on paper. Draw 2 names WITHOUT putting the first one back. List all the possible pairs you could draw. How many are there?
Year 10: Look up the probability of winning a lottery. Calculate: if you played every week for 50 years, how many weeks would that be? Is a win expected?	**Year 10:** Read a news story like '1 in 5 people have condition X.' Ask: does knowing more about a person (e.g. their age or habits) change that chance? That's conditional probability.

💬 Key words to learn together

probability: a number from 0 to 1 showing how likely an event is: 0 = impossible, 1 = certain	**event:** an outcome or set of outcomes we are interested in
theoretical probability: P(event) = favourable outcomes ÷ total equally likely outcomes	**experimental probability:** found from trials: times event happened ÷ total trials
complementary event: the opposite of the event: P(not A) = 1 − P(A)	**sample space:** the set of all possible outcomes (e.g. rolling a die: {1,2,3,4,5,6})
relative frequency: how often something happened as a fraction of total trials	**law of large numbers:** more trials → experimental probability gets closer to theoretical
independent events: one event does not affect the other: P(A and B) = P(A) × P(B)	**dependent events:** one event affects the probability of the other (e.g. drawing without replacement)
conditional probability: P(A | B) — probability of A given that B has already happened	**tree diagram:** a branching diagram showing all possible outcomes of combined events
two-way table: a grid showing combined outcomes for two variables	**Venn diagram:** overlapping circles showing the relationship between two (or more) events

Australian Curriculum v9 | Mathematics | Probability strand • Year 7–10 • Your child's learning matters — and so does your support!