Year 11 Mathematics Advanced

Topic: Probability and Data (3 of 5)
Review Questions: Conditional probability
Term 3, 2026

How to use this review set

These are real past-paper questions, grouped by question pattern. The grey label on each question shows where it is from and its marks.

- The questions are grouped by the pattern that keeps coming up in exams, a few of each in a row, running from the plainer patterns into the harder ones near the end. Work through them and you will meet every type an exam can throw at you.
- This set **is your diagnostic**. Working through it shows you exactly which patterns are solid and which need work. Attempt every question properly in your own book, and go back to your notes to help you work through tough questions if needed.
- Every question you get wrong, need help with or struggle with goes in your **Mistakes Log**, which you should be working on daily to get you exam-ready.

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Conditional probability and independence

7. Reverse conditional and total probability (Bayes-style)
8. Conditional probability from a two-way table or Venn
9. Conditional probability from a tree or the formula
10. Independence and the multiplication rule

Multi-stage experiments and tree diagrams

1. Sample-space arrays, two-way tables and tree diagrams

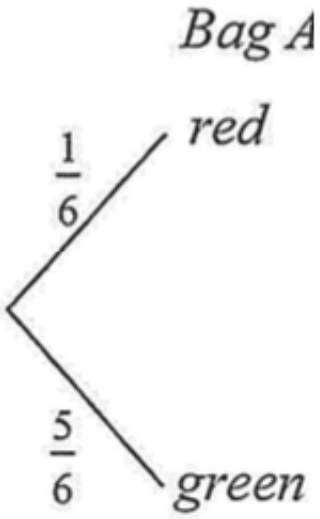
Q1 Hurlstone 2023 Trial Q35 · **1 mark**

Bag A contains 1 red ball and 5 green balls. Bag B contains 1 red ball and 3 green balls. Bag C contains 1 red ball and 2 green balls.

A ball is chosen at random from Bag A.

If this ball is red, no further balls are chosen, but if the ball from Bag A is green, then a ball is chosen at random from Bag B. If this ball is red, no further balls are chosen, but if this ball from Bag B is green, then a ball is chosen from Bag C.

Complete the probability tree diagram below.



Q2 Girraween 2022 Trial Q29 · **1 mark**

In a game a six-sided dice is rolled twice. The difference between the two results is recorded.

The following table is produced. Some of the results are missing. Complete the table.

The following table is produced. Some of the results are missing. Complete the table. [1]

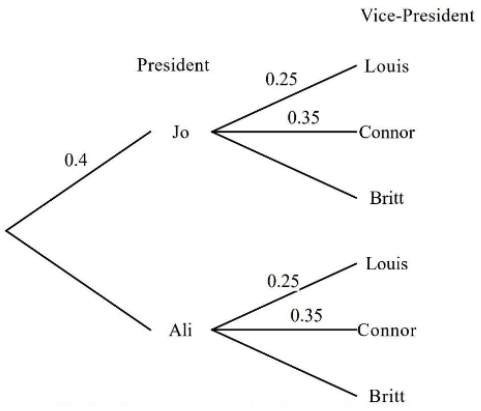
		Second roll					
		1	2	3	4	5	6
First roll	1	0	1	2	3		5
	2	1	0	1	2	3	
	3	2	1			2	3
	4		2	1	0	1	
	5	4	3	2	1	0	1
	6	5	4	3	2		0

A probability distribution table is drawn to summarise the results. Complete the table [2]

x	0	1	2	3	4	5
$P(X = x)$			$\frac{2}{9}$			$\frac{1}{18}$

Q3 St George Girls 2024 Trial Q1 · **1 mark**

The partially completed probability tree below shows the results of a survey of voting intentions of shareholders in an election for President and Vice-President of a large corporation.



Based on this survey, what is the probability that Jo is elected President, with either Britt or Louis as Vice-President?

(A) 0.04

(B) 0.26

(C) 0.30

(D) 0.50

Q4 2023 HSC Q2 · **1 mark**

A game involves throwing a die and spinning a spinner. The sum of the two numbers obtained is the score. The table of scores below is partially completed.





The sum of the two numbers obtained is the score.

The table of scores below is partially completed.

		SPINNER			
		1	2	3	4
DIE	1	2	3	4	
	2	3	4	5	
	3		5	6	
	4			7	
	5				
	6				

What is the probability of getting a score of 7 or more?

(A) $\frac{1}{6}$

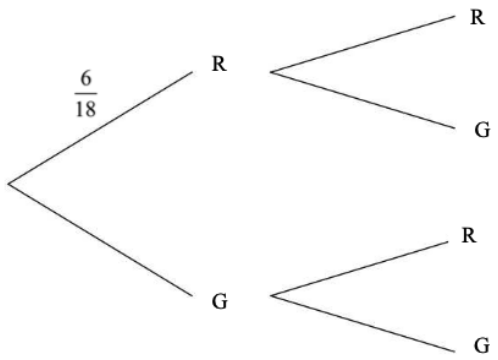
(B) $\frac{1}{4}$

(C) $\frac{5}{18}$

(D) $\frac{5}{12}$

Q5 Ascham 2020 Trial Q12 · **3 marks**

In a bag there are 6 red marbles (R) and 12 green marbles (G). Two marbles are selected at random without replacement. A partially completed probability tree is shown.



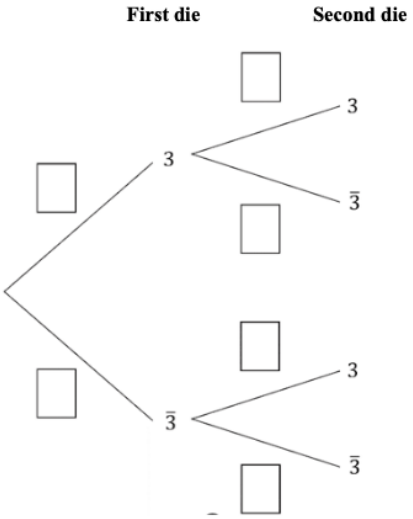
Complete the probability tree and calculate the probability of selecting two marbles of different colours.

Q6 Presbyterian 2023 Prelim Q27 · **3 marks**

Two dice are rolled. The first die is a standard die with numbers $1, 2, 3, 4, 5, 6$ while the second die is non-standard and has the numbers $3, 3, 3, 4, 4, 4$.

The number of threes is then recorded.

(a) Insert the correct probabilities into the six boxes on the probability tree below, to show the probability of whether or not a 3 is rolled.



(b) Calculate the probability of rolling at least one 3.

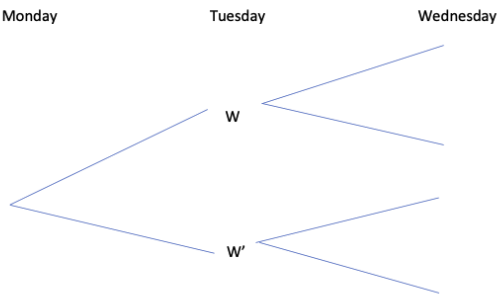
Q7 Fort St 2022 Trial Q22 · **4 marks**

The probability of Sirhind soccer team winning their next game is dependent on whether or not they win the previous game.

If they won the previous game, the probability of winning their next game is 0.8. If they did not win their previous game, then the probability of winning the next game is 0.4.

They won on Monday and then they played on Tuesday and Wednesday.

(a) Represent the above information using the tree diagram given below.



(b) Find the probability that the Sirhind soccer team do not win on Wednesday.

Q8 Blacktown Boys 2022 Prelim Q9 · **1 mark**

Shirley is a table tennis player. If she wins a game, the probability that she will win the next game is 0.8. If she loses a game, the probability that she will lose the next game is 0.4. Shirley has just won a game. The probability that she will win exactly one of her next two games is:

(A) 0.28

(B) 0.32

(C) 0.64

(D) 0.92

2. Selections without replacement

Q9 St George Girls 2022 Trial Q1 · **1 mark**

A jar contains 30 seashells. 19 of these are white and 11 are black.

Leslie is to select two shells from the jar at random.

What is the probability that Leslie selects two white shells?

(A) $\frac{19}{30} \times \frac{18}{29}$

(B) $\frac{19}{30} + \frac{18}{30}$

(C) $\frac{19}{30} + \frac{18}{29}$

(D) $\frac{19}{30} \times \frac{18}{30}$

Q10 Baulkham Hills 2021 Prelim Q2 · **1 mark**

A standard deck of 52 playing cards with four suits (spades, hearts, clubs and diamonds) are shuffled and two cards are drawn at random, one after the other without replacement. What is the probability that the cards are of different suits?

(A) $\frac{1}{12}$

(B) $\frac{39}{51}$

(C) $\frac{39}{52}$

(D) $\frac{1}{2028}$

Q11 Cherrybrook Tech 2022 Prelim Q5 · **1 mark**

A bag contains 4 green marbles and 6 blue marbles. Two marbles are selected at random without replacement.

What is the probability that at least one of the marbles selected is green?

(A) $\frac{2}{5}$

(B) $\frac{13}{15}$

(C) $\frac{2}{3}$

(D) $\frac{8}{15}$

Q12 Barker 2022 Trial Q18 · **2 marks**

A pencil case contains 7 blue pens and 3 red pens. Two pens are selected at random without replacement. What is the probability of selecting at least one red pen?

Q13 Sydney Tech 2021 Trial Q18 · **3 marks**

AstraZeneca and Pfizer are currently the two Covid-19 vaccines available in Australia. 50 unvaccinated Newtown residents were asked about their willingness to be vaccinated by either vaccine over the next 3 months.

- 26 residents said they were willing to be vaccinated by the Pfizer vaccine
- 22 residents said they were willing to be vaccinated by the AstraZeneca vaccine
- 12 residents said they were NOT willing to be vaccinated

(a) A random resident from the group was selected. By using a Venn diagram or otherwise, find the probability that they were willing to be vaccinated by either vaccine.

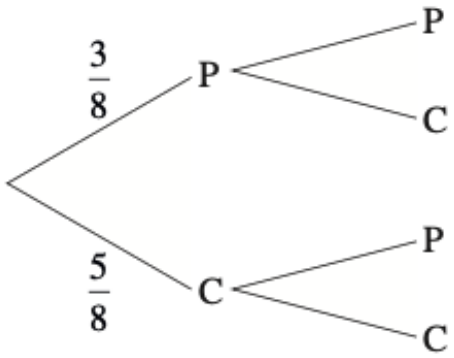
(b) Two residents were selected (without replacement). What is the probability that at least one of them was willing to be vaccinated?

Q14 2021 HSC Q6 · **1 mark**

There are 8 chocolates in a box. Three have peppermint centres (P) and five have caramel centres (C).

Kim randomly chooses a chocolate from the box and eats it. Sam then randomly chooses and eats one of the remaining chocolates.

A partially completed probability tree is shown.



What is the probability that Kim and Sam choose chocolates with different centres?

(A) $\frac{15}{64}$

(B) $\frac{15}{56}$

(C) $\frac{15}{32}$

(D) $\frac{15}{28}$

Q15 Merewether 2025 Trial Q19 · **4 marks**

A survey of all the Zoology students at a local university showed that $\frac{3}{8}$ of them had a pet cat, $\frac{3}{4}$ of them had a pet dog and $\frac{1}{4}$ had both a pet cat and a pet dog. 25 students had either a pet cat or a pet dog but not both types of pet.

(a) Show that a total of 40 Zoology students were surveyed.

(b) If two of the Zoology students are chosen at random, find in simplest fraction form the probability that neither of these students has a pet dog.

Q16 Penrith 2025 Trial Q18 · **6 marks**

A group of 40 adults were surveyed as to whether they paid a subscription fee to watch sport or television series online.

The following answers were given:

- 12 adults only pay for sport
- 6 adults pay for both
- 8 adults pay for neither

(a) By drawing a Venn diagram below find the probability that an adult surveyed pays for television shows.

(b) An adult is chosen at random. If it is known that they pay for television series, what is the probability that they also pay for sport?

(c) Two adults are chosen at random. What is the probability that they both pay the same types of subscription fees? Do not include the people that pay for neither.

3. 'At least one' in multi-stage experiments

Q17 Abbotsleigh 2024 Prelim Q15 · **2 marks**

The probability that Gemma gets a concert booking with her band on any given weekend is 0.65.

What is the probability that over two consecutive weekends she will get at least one concert booking?

Q18 Kings 2022 Trial Q15 · **3 marks**

James and Kyle are both goal kickers for their respective teams.

The probability that James kicks a goal is $\frac{2}{7}$ and the probability that Kyle kicks a goal is $\frac{5}{8}$.

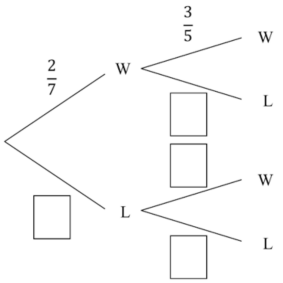
What is the probability that, on their next 3 attempts at goal, at least one of them kicks a goal?

Q19 Hills Grammar 2025 Trial Q11 · **3 marks**

Cody wins the first set against Sofia in two out of every seven tennis matches they play.

If he wins the first set, he wins the second set three out of every five times, but if he loses the first set, he wins the second set one out of every five times.

(a) Complete the probability tree below and find the probability that Cody loses both sets.



The probability that Cody loses both sets is _____

(b) Suppose Cody and Sofia play 70 matches in a year. In how many of those matches would Cody expect to win at least one set?

Q20 Glenwood 2025 Trial Q30 · **4 marks**

In a science experiment, a robot arm attempts to successfully pick up a small object. The probability that the robot arm successfully picks up the object on any single attempt is $\frac{1}{4}$.

(a) What is the probability that the robot arm successfully picks up the object on the third attempt only, after failing the first two attempts?

(b) What is the probability that the robot arm is unsuccessful in the first four attempts?

(c) Determine the minimum number of attempts required so that the probability of at least one successful pick-up exceeds 0.95.

Q21 Cherrybrook Tech 2020 Trial Q29 · **5 marks**

It is known at the beginning of winter in a large population, 15% of the people in the population will be infected with a particular virus.

(a) Two people are selected at random, find the probability that both of them have the virus.

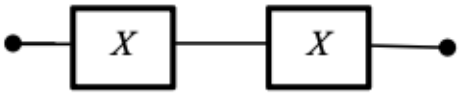
(b) Four people are selected at random, find the probability that at least one of them has the virus. Give your answer to 3 decimal places.

(c) What is the smallest number of people a drug company would need to test to have a greater than 95% chance that at least one of the tested people had the virus?

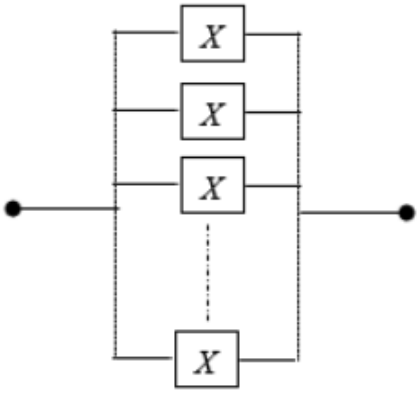
Q22 Hurlstone 2020 Trial Q28 · **5 marks**

An alarm system is made up of a number of identical components. The probability that component X fails is 0.05.

(a) (i) The alarm system below is wired in series, i.e. the system works only when both components operate properly. Find the probability that the system does not fail. (Give your answer correct to three decimal places.)



(ii) Another alarm system below is wired in parallel, i.e. only one component needs to work for the circuit to work. What is the minimum number of components needed so that the probability of the system working is greater than 99.999%? Clearly justify your working.



(b) If a coin is tossed n times, where $n > 1$, find the probability of obtaining at least one head and at least one tail.

Q23 Barker 2024 Prelim Q18 · **2 marks**

Each week Percy and Kura take part in a raffle at their respective workplaces. The probability that Percy wins a prize in his raffle is $\frac{1}{9}$. The probability that Kura wins a prize in his raffle is $\frac{1}{16}$.

What is the probability that, during the next three weeks, at least one of them wins a prize?

Q24 2024 HSC Q18 · **3 marks**

In a game, the probability that a particular player scores a goal at each attempt is 0.15.

(a) What is the probability that this player does NOT score a goal in the first two attempts?

(b) Determine the least number of attempts that this player must make so that the probability of scoring at least one goal is greater than 0.8.

Q25 Hurlstone 2024 Prelim Q32 · **4 marks**

A tenpin bowler has a 28% chance of scoring a strike in bowling each time they bowl.

(a) The bowler bowls twice. By using a tree diagram or otherwise, calculate the probability that the bowler does not get a strike in both bowls.

(b) What is the minimum number of bowls required for the bowler to have a 90% chance of bowling at least one strike?

4. Exactly k of n in repeated trials

Q26 Sydney Girls 2020 Trial Q5 · **1 mark**

The chance of a fisherman catching a fish of legal length is 3 in 5. If three fish are caught at random, what is the probability that exactly one is of legal length?

(A) $\frac{36}{125}$

(B) $\frac{12}{125}$

(C) $\frac{7}{125}$

(D) $\frac{9}{125}$

Q27 Caringbah 2024 Trial Q7 · **1 mark**

Alicia and Steven are participating in a fitness program. The probability that Alicia will complete the program is 0.8, and the probability that Steven will complete the program is 0.7.

What is the probability that only one of them will successfully complete the program?

(A) 0.14

(B) 0.24

(C) 0.38

(D) 0.56

Q28 Barker 2021 Prelim Q12 · **2 marks**

During a particular month, the probability of it raining on a given day is $\frac{1}{3}$. Over a three-day long weekend, what is the probability that it will rain on exactly two days?

Q29 Gosford 2022 Trial Q24 · **3 marks**

Greg lives in Gosford and is starting a new job in Sydney. He needs to catch a train to get to work and will be late if the trains do not run to schedule. The probability that, on any given day, his train will run to schedule is 0.96.

(i) What is the probability that Greg's train is late on the first day?

(ii) What is the probability that Greg arrives late on exactly one of the first three days of his new job?

Q30 Sydney Grammar 2025 Trial Q17 · **3 marks**

A team has a $\frac{1}{3}$ chance of winning any given game. If they played 3 games, find the probability of them winning:

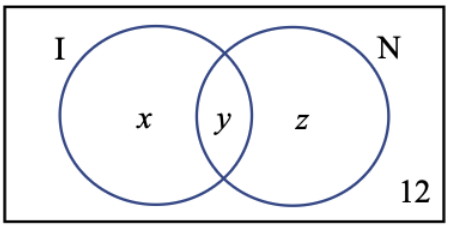
(a) at least one game.

(b) exactly one game.

Q31 Knox 2021 Trial Q12 · **5 marks**

Eighty people were asked if they had holidayed interstate (I) or within NSW (N) in the past five years. The results showed that,

- 12 people had not holidayed at all.
- 42 people had holidayed interstate (I).
- 36 people had holidayed within NSW (N).



(i) Copy the Venn diagram above onto your answer sheet and complete it by finding values for x, y and z.

(ii) One of the surveyed people is selected at random. Find the probability that the person selected has holidayed both interstate and within NSW.

(iii) A randomly selected person is known to have travelled. Find the probability that this person holidayed within NSW.

(iv) Two people are chosen, in turn, at random. Find the probability that exactly one of those chosen holidayed interstate.

5. Repeated trials and eventually winning a game

Q32 St George Girls 2022 Trial Q19 · **4 marks**

Ash and Naomi complete a series of games. The series finishes when one player has won two games.

In any game, the probability that Ash wins is $\frac{3}{5}$ and the probability that Naomi wins is $\frac{2}{5}$.

(a) Draw a probability tree showing the possible outcomes, in a series of three games. (2 marks)

(b) What is the probability that Naomi wins the series? (1 mark)

(c) What is the probability that Naomi wins at least one game? (1 mark)

Q33 Blacktown Boys 2025 Trial Q29 · **2 marks**

Tom and Ricky play against each other in a chess match. The champion will be the first person to win two games. Tom's probability of winning each game is 0.7 and Ricky's probability of winning each game is 0.3.

What is the probability that Tom wins the match?

Q34 Presbyterian 2021 Trial Q32 · **7 marks**

In lockdown, Grant has invented a game for one person. He throws two ordinary coloured dice, one orange and one green. He notes the result.

Grant wins if the number on the green die is greater than the number on the orange die.

Grant loses if the number on the green die is smaller than the number on the orange die.

If neither of these events occur, Grant continues to throw the dice until it does.

(a) Show that the probability that Grant wins on the first roll of the dice is $\frac{5}{12}$. (1 mark)

(b) What is the probability that a second throw is needed? (2 marks)

(c) Calculate the probability that Grant wins on his first, second or third throw. Leave your answer in unsimplified form. (2 marks)

(d) What is the probability that Grant wins the game? (2 marks)

Q35 Normanhurst Boys 2024 Trial Q17 · **3 marks**

There are 4 red and 3 black discs in a bag. Ms Kim and Ms Lee are playing a game in which they take turns drawing a disc from the bag and then replacing it.

To win the game, Ms Kim must draw a red disc and for Ms Lee to win, she must draw a black disc. They continue taking turns until there is a winner. Ms Kim draws a disc first.

(a) Find the probability that Ms Kim wins on her first draw.

(b) Find the probability that Ms Kim wins in three or less of her turns.

Q36 Sydney Girls 2023 Trial Q36 · **4 marks**

Donald is playing a game with two ordinary dice such that he wins if the sum of the two numbers on the dice is 6. If the sum is 5 then he loses. If the sum is anything else it is a draw and the player plays again until he wins or loses.

(i) Find the probability that Donald wins on the first throw. (1 mark)

(ii) What is the probability that Donald wins on the first, second or third throw? (1 mark)

(iii) Calculate the probability that Donald eventually wins the game. (2 marks)

Q37 North Sydney Girls 2023 Trial Q33 · **4 marks**

Lucas and Sophia play a game where they each take turns at throwing two ordinary six-sided dice.

The winner is the first person to throw a double. For example, a double is obtained when the upwards-facing number on both dice shows the number 'two'.

Lucas throws first.

(a) Show that the probability Sophia wins the game on her first or second throw is given by

$$\frac{5}{36} + \frac{5^3}{6^4}.$$

(2 marks)

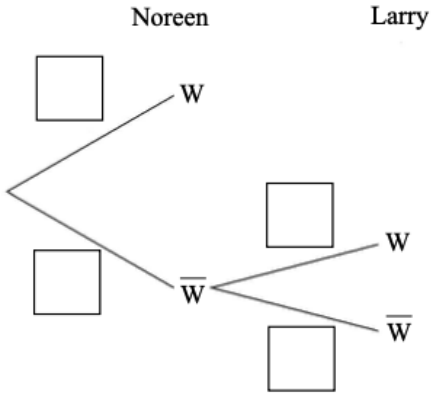
(b) Calculate the probability that Sophia wins the game. (2 marks)

Q38 Shore 2024 Trial Q20 · **5 marks**

Noreen and Larry are playing a game. They take turns throwing two dice. The game is won by the first player to throw a double six or double one. Noreen starts the game.

(a) Find the probability that Noreen wins on her first throw. (1 mark)

(b) Complete the tree diagram. (1 mark)



(c) Calculate the probability that Noreen wins the game on her first or her second throw. (1 mark)

(d) Find the probability that Noreen wins eventually. (2 marks)

Q39 Fort St 2020 Trial Q13 · **5 marks**

Alice and Raoul take turns throwing darts at a dartboard. The winner is whoever hits the bullseye first. Alice has a $\frac{1}{30}$ chance of hitting the bullseye, while Raoul has a $\frac{1}{40}$ chance of hitting the bullseye. Alice throws the first dart.

(a) Draw a tree diagram for the first four throws of the games (two throws for Alice and two for Raoul). (1 mark)

(b) What is the probability that Alice wins on her first or second throw? (1 mark)

(c) What is the probability that Alice will eventually win the game? (3 marks)

Q40 Hornsby Girls 2022 Trial Q31 · **5 marks**

Matt and Ingrid are playing a game. The dice they play with is four-sided and is marked with the numbers $1, 2, 3, 4$. They take turns throwing two dice. The game is won by the first player to throw a double four. Matt starts the game.

(a) Show that the probability that Ingrid wins the game on her first throw is $\dfrac{15}{256}$. (1 mark)

(b) What is the probability that Matt wins the game on the first or on the second throw? (2 marks)

(c) Find the probability that Matt eventually wins the game. (2 marks)

6. The product rule and multi-stage selections

Q41 Presbyterian 2023 Prelim Q32 · **1 mark**

Jane plays a game using a standard 6-sided die. In each game the die is rolled three times. Each time, before the die is rolled, Jane guesses the number that will be rolled.

What is the probability that Jane will guess all three numbers correctly?

Q42 Riverview 2022 Trial Q14 · **3 marks**

The ratio of boys to girls at Rivendale High School is $3 : 5$. The ratio of boys to girls in South Park High School is $2 : 3$. A student is chosen at random from Rivendale High School and then another student is chosen from South Park High School.

Find the probability that:

(a) two boys are chosen. (2 marks)

(b) at least one girl is chosen. (1 mark)

Q43 Barker 2021 Trial Q6 · **1 mark**

4 red socks and 4 blue socks are in a drawer. If 2 socks are selected at random at the same time, what is the probability that both are the same colour?

(A) $\frac{1}{2}$

(B) $\frac{3}{7}$

(C) $\frac{4}{7}$

(D) $\frac{3}{14}$

Q44 Hornsby Girls 2023 Trial Q15 · **3 marks**

Three standard six-sided dice are thrown once.

(a) What is the probability that all three dice show six? (1 mark)

(b) What is the probability that exactly two of the dice show six? (1 mark)

(c) What is the probability of rolling three different numbers? (1 mark)

Q45 Presbyterian 2021 Trial Q14 · **4 marks**

Forty two students study at least one of either Physics or Chemistry. Of these 42 students, 27 study Physics and 33 study Chemistry.

(a) How many students study both Physics and Chemistry? (1 mark)

(b) Find the probability that a student studies Physics given that they study Chemistry. (1 mark)

(c) What is the probability that 2 randomly chosen students both study only Physics? (2 marks)

Q46 Baulkham Hills 2023 Prelim Q23 · **3 marks**

In archery, Sally hits the target in 3 out of every 4 attempts, while Timothy hits it in 1 out of every 3 attempts.

(a) If Sally and Timothy shoot one arrow each, find the probability that:

(i) both arrows hit the target. (1 mark)

(ii) at least one arrow hits the target. (1 mark)

(b) In a particular archery competition, the winner is the first person to hit the target. If they take turns to shoot and Timothy shoots first, what is the probability that Timothy wins with his second arrow? (1 mark)

Q47 Shore 2023 Prelim Q18 · **5 marks**

Four cards, numbered 3, 4, 5 and 6 are used in a game.

The four cards are placed face down and each player pays \$1 to take a turn to draw two cards, one at a time without replacement. The two cards make a 2-digit number, with the first card drawn being the first digit of their number.

If the cards form a number over 60, the player wins \$3 back (i.e. an additional \$2). Otherwise they receive nothing back.

The four cards are then shuffled and replaced for the next turn.

(a) Use a diagram to show all the 2-digit numbers that could be drawn. (2 marks)

(b) What is the probability that a player will win on their first turn? (1 mark)

(c) Calculate the probability that a player who brings \$2 to play will have exactly \$3 left after two turns. (2 marks)

Q48 Sydney Grammar 2021 Trial Q31 · **7 marks**

Tom invented a dice game to play on his own. He throws a pair of six-sided dice repeatedly until the difference between the dice is 2 or 3.

If the difference is 2, Tom wins and the game ends. If the difference is 3, Tom loses and the game ends. If the difference is any other number, he continues to throw until the difference is a 2 or 3.

(a) Show that the probability that Tom wins on his first throw of the dice is $\frac{2}{9}$. (2 marks)

(b) Calculate the probability that the game continues to a second throw. (1 mark)

(c) What is the probability that Tom wins in one of the first three throws? Leave your answer in unsimplified form. (2 marks)

(d) Calculate the probability that Tom wins the game. (2 marks)

Conditional probability and independence

7. Reverse conditional and total probability (Bayes-style)

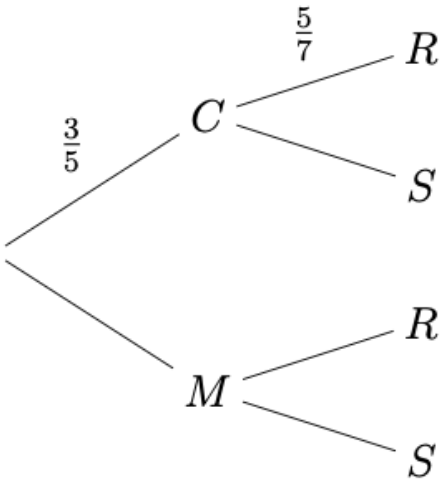
Q49 Normanhurst Boys 2020 Trial Q20 · **3 marks**

A factory produces chocolate chip cookies and oatmeal cookies in both regular and sugar free variants. Each day, $\frac{3}{5}$ of the cookies produced are chocolate chip and the rest are oatmeal. According to demand, $\frac{5}{7}$ of the chocolate chip cookies are regular and the rest of the chocolate chip cookies are sugar free, while $\frac{2}{3}$ of the oatmeal cookies are sugar free and the rest of the oatmeal cookies are regular.

(a) Using the information supplied, label all remaining branches of the following probability tree with the correct probabilities.

The symbols given in the tree are:

- C represents the chocolate chip cookie.
- M represents the oatmeal cookie.
- S represents a sugar free cookie.
- R represents a regular cookie.



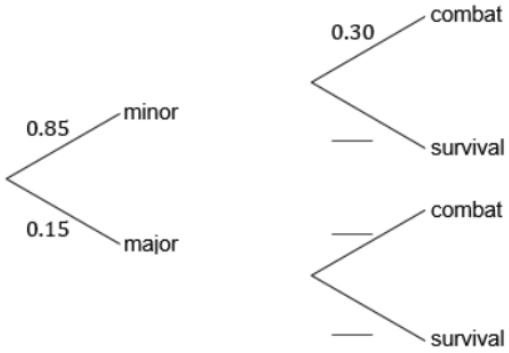
(b) A cookie is selected at random. Given that a sugar free cookie is selected, find the probability that the cookie was chocolate-chip.

Q50 Sydney Boys 2022 Trial Q31 · **3 marks**

In an online game there are various 'power-ups' that players can discover while progressing through the game. The power-ups come in two sizes, major and minor, and they all belong to one of two categories, either combat or survival.

It is known that 85% of the power-ups in the game are minor and the rest are major. Of the major power-ups it is known that 60% are combat power-ups, while of the minor power-ups it is known that 30% are combat power-ups.

(a) Using the given information, complete the tree diagram below.



(b) Power-ups that are discovered in the game occur at random.

(i) Find the probability that when a power-up is discovered it will be a combat power-up.

(ii) Given that a power-up is a combat power-up, find the probability that it is a major power-up.

Q51 Sydney Boys 2020 Trial Q28 · **4 marks**

The probability that a certain girl wakes up late in the morning is 0.6. When she wakes up late, the probability that she is late to work is 0.85. When she wakes up on time, the probability that she is late to work is 0.4.

(a) What is the probability that she is late to work on any morning?

(b) Upon seeing the girl arriving late, her boss asks her if she overslept. What is the probability that the truthful answer is 'yes'?

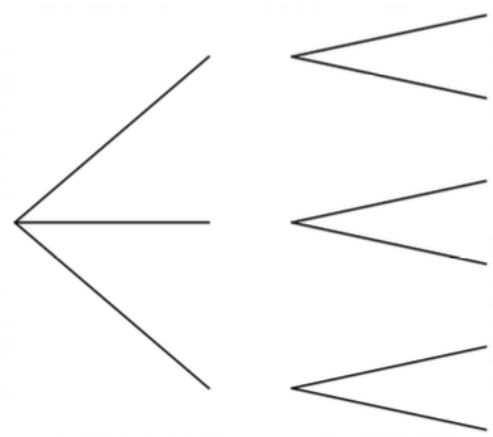
Q52 Baulkham Hills 2024 Trial Q18 · **5 marks**

During the winter, Andrew attends weekly business meetings in Queenstown and always travels to these meetings by car.

The probability of being dry, raining or snowing during his travel to these meetings is $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{6}$, respectively.

The respective probabilities of Andrew arriving on time when it is dry, raining or snowing are $\frac{4}{5}$, $\frac{2}{5}$ and $\frac{1}{10}$.

(a) Complete the probability tree diagram below, showing all outcomes.



(b) Determine the probability that Andrew will arrive late to his next winter business meeting.

(c) Andrew arrived late for his meeting last week. Find the probability that it was raining on that day.

Q53 Gosford 2024 Prelim Q20 · **2 marks**

In a bag there are 3 six-sided dice. Two of the dice have faces marked $1, 2, 3, 4, 5, 6$. The other is a special die with faces marked $1, 5, 5, 5, 5, 6$.

One die is randomly selected and tossed.

(a) What is the probability that the die shows a 5?

(b) Given that the die shows a 5, what is the probability that it is the special die?

Q54 Normanhurst Boys 2025 Trial Q17 · **4 marks**

Joe plays soccer, a sport where a team can win, lose or draw.

Joe is prone to injury, and misses 20% of his team's games.

When Joe plays, his team has a 77% chance of winning and a 10% chance of losing.

When Joe does not play, his team has a 53% chance of winning and a 25% chance of losing.

(a) Calculate the probability that Joe's team loses any given game.

(b) Given that Joe's team does not lose in a particular match, what is the probability that Joe played in that match?

Q55 Penrith 2022 Trial Q32 · **6 marks**

If Mr Ferrarin wakes up late, the probability that he exercises is $\frac{1}{3}$, and if he wakes up on time the probability that he exercises is $\frac{4}{5}$.

(a) In a particular week, Mr Ferrarin wakes up on time on Thursday morning and late on Friday morning.

Find the probability that Mr Ferrarin exercised on at least one of these days.

(b) The probability that Mr Ferrarin wakes up on time on a Monday is $\frac{1}{4}$.

(i) Find the probability that Mr Ferrarin exercises on any given Monday.

(ii) Hence, or otherwise, find the probability that Mr Ferrarin woke up on time on a Monday, given that he exercised that day.

Q56 Hurlstone 2023 Prelim Q14 · **6 marks**

(a) Three employees, Alice, Ben and Chloe, work for the same company. They respectively handle 48%, 30% and 22% of the company's orders. It has been found that they make mistakes in 10%, 5% and 2% of their orders respectively.

(i) Use a tree diagram to display this information.

(ii) Calculate the probability that an order handled by the company has a mistake.

(b) A website claims to be 98% accurate at detecting plagiarism.

That is, it will return the correct result for a paper, "Plagiarised" or "Not Plagiarised," 98% of the time.

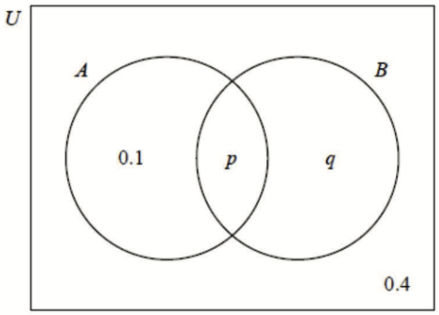
It is known that 5% of submitted papers at a school are plagiarised.

If a teacher checks a randomly selected paper using the website and gets the result "Plagiarised," what is the probability that it is a plagiarised paper?

8. Conditional probability from a two-way table or Venn

Q57 Trinity Grammar 2020 Trial Q6 · **1 mark**

The Venn diagram below shows the probabilities of A and B. If $P(A) = 0.25$, what is the value of $P(B)$?



(A) 0.15

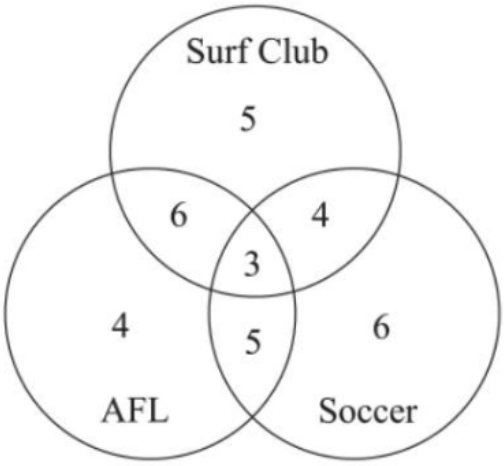
(B) 0.35

(C) 0.50

(D) 0.60

Q58 Kings 2022 Trial Q7 · **1 mark**

In a classroom, students were asked what sports club they are members of and the results are shown in the Venn diagram below.



A student who is a member of a soccer club is chosen at random. What is the probability that they are also a member of the surf club?

(A) $\frac{2}{9}$

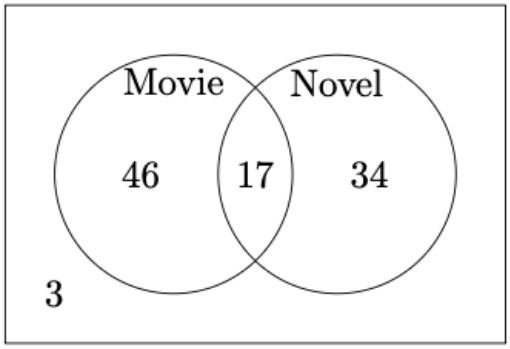
(B) $\frac{4}{11}$

(C) $\frac{7}{18}$

(D) $\frac{2}{5}$

Q59 Normanhurst Boys 2020 Trial Q10 · **1 mark**

A magazine surveyed 100 readers about whether they had read a certain novel or watched its movie adaptation. The data collected is represented in the Venn diagram below.



A reader was selected at random. If the reader selected has watched the movie, what is the probability that they had also read the novel?

(A) $\frac{17}{100}$

(B) $\frac{17}{63}$

(C) $\frac{17}{46}$

(D) $\frac{17}{51}$

Q60 Hurlstone 2021 Prelim Q22 · 1 mark

The results of a survey of P-plate drivers are shown in the two-way table below.

	Male (M)	**Female (F)**	**Totals**
Lost license for speeding (S)	13	5	18
Not lost license for speeding ($\bar{S}$)	51	50	101
Totals	64	55	119

What is $P(S \mid M)$ as a fraction?

(A) $\dfrac{18}{101}$

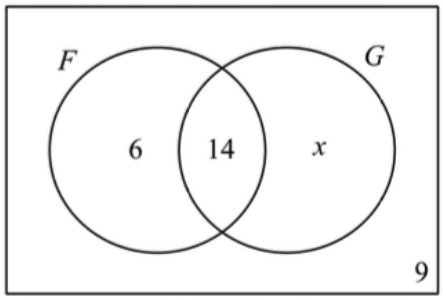
(B) $\dfrac{13}{64}$

(C) $\dfrac{64}{119}$

(D) $\dfrac{13}{18}$

Q61 Killara 2022 Prelim Q7 · 1 mark

The Venn diagram shows the number of scores in two sets F and G.



If $P(\bar{G}) = \dfrac{1}{2}$, what is the value of x?

(A) $x = 1$

(B) $x = 8$

(C) $x = 11$

(D) $x = 29$

Q62 Hurlstone 2024 Trial Q33 · **2 marks**

A group of 60 students has the following enrolment details:

- 26 students study Mathematics Advanced.
- 29 students study Biology.
- 14 students study both subjects.

(a) Draw a Venn diagram to represent this situation.

(b) Find the probability that a student studies Biology given that they study Mathematics Advanced.

Q63 Normanhurst Boys 2022 Trial Q27 · **2 marks**

A sports magazine surveyed 120 soccer fans and asked them whether they supported Manchester United or Tottenham. 74 fans supported Manchester United, 55 supported Tottenham and 8 supported neither team.

(a) Represent this data in a Venn diagram.

(b) A fan is selected at random. If the fan selected is a Manchester United fan, what is the probability that they are also a Tottenham fan?

Q64 Danebank 2020 Trial Q17 · **3 marks**

200 people took part in a new lie detector test with the following results.

	Test Positive	Test Negative
Person lying	96	24
Person not lying	8	72

(a) Find the probability that a person who was lying tested positive. (1 mark)

(b) Find the probability that the test was inaccurate. (2 marks)

Q65 Cranbrook 2023 Trial Q19 · **3 marks**

A group of students were surveyed on the type of pets they own. The results are summarised in the following incomplete two-way table.

	Cat	**No Cat**
Dog	A	32
No Dog	45	35

Given that a student owns a dog, the probability that they also own a cat is 60%.

Find the probability that a student chosen at random owns both a cat and a dog.

9. Conditional probability from a tree or the formula

Q66 Sydney Girls 2021 Prelim Q2 · **1 mark**

Find $P(X \mid Y)$ if $P(X \cap Y) = 0.2$, $P(X) = 0.3$ and $P(Y) = 0.4$.

Q67 St George Girls 2022 Trial Q5 · **1 mark**

A computer technician notes that 40% of computers fail because of their hard drive, 25% because of the monitor, 20% because of a disk drive, and 15% because of the microprocessor.

If the problem is not in the monitor, what is the probability that it is in the hard drive?

(A) 0.333

(B) 0.400

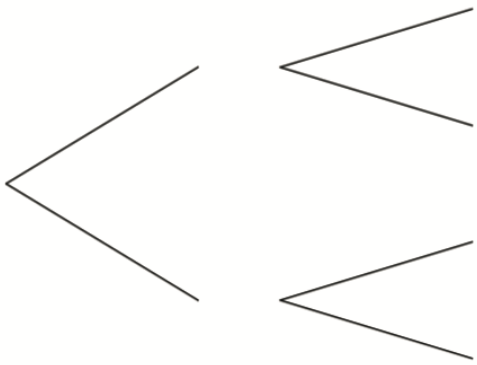
(C) 0.417

(D) 0.533

Q68 Killara 2020 Trial Q17 · **4 marks**

200 tickets are sold in a raffle at Koolara High School. First prize is \$150 and second prize is \$50. The prize-winning tickets are drawn consecutively without replacement where the first ticket wins first prize.

(a) Complete the probability tree diagram for a student who buys five tickets, showing the sample space clearly.



(b) Find the probability that the student wins at least one prize.

(c) What is the probability that the student wins the second prize given that they did not win the first prize?

Q69 SCEGGS 2022 Prelim Q24 · **3 marks**

It is known that for dependent events A and B, $P(A) = 0.22$, $P(B) = 0.54$ and $P(A \cup B) = 0.72$.

Find $P(A \mid B)$ to 3 decimal places.

Q70 Sydney Grammar 2023 Trial Q29 · **5 marks**

A bowl of fruit contains 18 apples of which 11 are red and 7 are green. Matthew takes one apple at random and eats it. Evelyn then takes an apple at random and eats it.

(a) By drawing a probability tree diagram, or otherwise, find the probability that Matthew and Evelyn eat apples of the same colour.

(b) Given that Matthew and Evelyn eat apples of the same colour, find the probability that they are red.

Q71 St George Girls 2024 Trial Q30 · 3 marks

When Lucio plays for his soccer team, they have an 85% chance of winning. When he does not play, their chance of winning is 40%. The chance that Lucio plays any particular game is 90%.

(a) Find the probability that Lucio plays and his team wins.

(b) Find the probability that Lucio played, given that his team won.

10. Independence and the multiplication rule

Q72 Cherrybrook Tech 2020 Trial Q3 · 1 mark

Two events, A and B, are independent, and $P(A)$ and $P(B)$ are both non-zero.

Which of the following expressions gives the probability that event A occurs and then event B also occurs?

(A) $P(B \mid A)$

(B) $P(A \mid B)$

(C) $P(A \cup B)$

(D) $P(A)\,P(B)$

Q73 North Sydney Boys 2024 Trial Q8 · 1 mark

Let X and Y be independent events where $P(X) = 0.2$ and $P(Y) = 0.52$.

What is the value of $P(\overline{X} \cap \overline{Y})$?

(A) 0.616

(B) 0.72

(C) 0.384

(D) 0.28

Q74 Ravenswood 2021 Trial Q10 · **4 marks**

In a school, 30 students take chemistry only, 20 take physics only, 10 take both chemistry and physics, and 60 take neither subject.

(a) Find the probability that a student takes physics. (2 marks)

(b) Find the probability that a student takes physics given that the student takes chemistry. (1 mark)

(c) Are the events taking chemistry and taking physics independent? Justify your answer. (1 mark)

Q75 Cherrybrook Tech 2022 Prelim Q10 · **1 mark**

There are two events A and B. In which case are the events A and B independent?

(A) $P(A \mid B) = 0.5$ and $P(A) = 0.4$ and $P(B) = 0.5$

(B) $P(A) = 0.9$ and $P(B) = 0.4$ and $P(A \cap B) = 0.36$

(C) $P(A \mid B) = \dfrac{3}{4}$ and $P(A) = \dfrac{3}{5}$ and $P(B) = \dfrac{7}{10}$

(D) $P(A) = \dfrac{1}{5}$ and $P(B) = \dfrac{1}{3}$ and $P(A \cap B) = \dfrac{1}{5}$

Q76 Shore 2023 Trial Q24 · **3 marks**

600 students at a primary school were asked whether they preferred Rugby, Soccer or AFL. The results are given in the following table.

	Rugby	**Soccer**	**AFL**
Female	52	130	88
Male	104	155	71

A student is chosen at random.

(a) Find the probability that the student prefers Rugby. (1 mark)

(b) Determine whether the events "the student is Female" and "the student prefers Rugby" are independent, justifying your answer with mathematical reasoning. (2 marks)

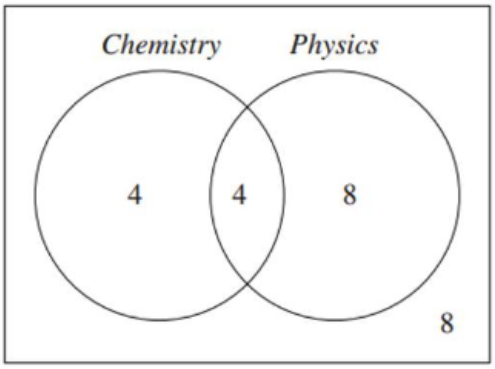
Q77 Riverview 2023 Trial Q27 · **4 marks**

A teacher surveyed his class of 24 students about the subjects that they have chosen to study in the following year.

The results indicate that:

- 8 students chose to study neither Physics nor Chemistry
- 8 students chose to study Chemistry
- 12 students chose to study Physics.

A Venn diagram showing this information has been drawn below.



(a) A student choosing to study Chemistry is event 1. A student choosing to study Physics is event 2. If a student is chosen at random, determine whether these events are independent of each other. (2 marks)

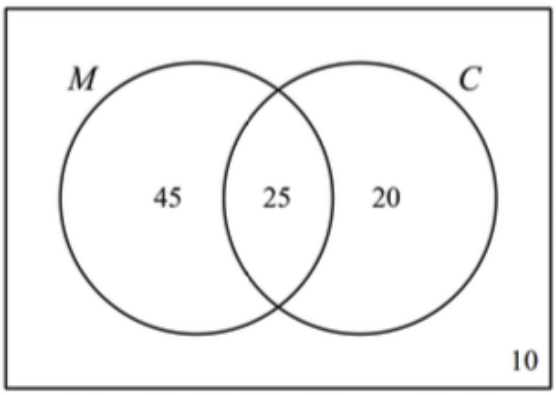
(b) The entire year group is given the same survey. The results indicate that:

- the probability that a student chose to study Chemistry is $\frac{1}{3}$
- the probability that a student chose to study Physics is $\frac{2}{5}$
- given that a student chose to study Chemistry, the probability that they chose to study Physics is $\frac{3}{7}$.

Calculate the probability that a student picked at random has chosen to study Chemistry or Physics. (2 marks)

Q78 Killara 2022 Prelim Q27 · **5 marks**

In a group of 100 students, some study Mathematics (M), some study Chemistry (C). Some study both Mathematics and Chemistry, while some study neither.



(a) How many students are in the set $\overline{M} \cup C$? (1 mark)

(b) Explain why the events M and C are not mutually exclusive. (1 mark)

(c) If a student is chosen at random from this group, what is $P(C \mid M)$? (1 mark)

(d) Determine whether the events M and C are independent. (2 marks)

Q79 Fort St 2025 Trial Q25 · **4 marks**

Events A and B are such that $P(A) = \dfrac{3k}{4}$, $P(B) = k$ and $P(\overline{A} \cap B) = k^2$ where $0 < k < 1$.

(a) Find the expression of $P(A \cap B)$ in terms of k. (1 mark)

(b) Given that the two events are independent, find the value of k. (3 marks)