

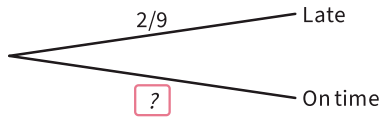
Fix it 1 Branches add to 1

Probability trees · ANSWERS

The branches from one point add to 1. A missing branch is 1 take away the others.

EXAMPLE

The bus is late with probability $\frac{2}{9}$.
Find the missing branch.



1. The two branches add to 1.

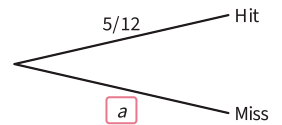
$$2. 1 - \frac{2}{9} = \frac{9}{9} - \frac{2}{9}$$

$$3. = \frac{7}{9}$$

YOUR TURN

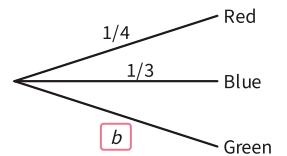
1 A free throw is a hit or a miss. Find a .

$$a = \frac{7}{12}$$



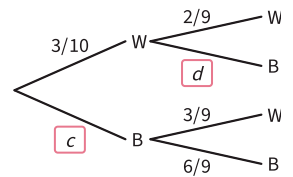
2 A spinner lands on red, blue or green. Find b .

$$b = \frac{5}{12}$$



3 White (W) and black (B) counters, taken without replacement. Find c and d .

$$c = \frac{7}{10}, d = \frac{7}{9}$$



Check: Add the branches from each point: they make 1.

The Maths Habit

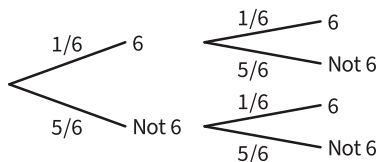
Fix it 2 Independent events

Probability trees · ANSWERS

Independent: the first result does not change the second. Every second set of branches is the same.

EXAMPLE

A fair dice is rolled twice. Fill in the second rolls.



1. The first roll does not change the second.

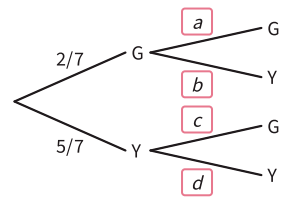
2. After a 6: $\frac{1}{6}$ and $\frac{5}{6}$.

3. After not a 6: $\frac{1}{6}$ and $\frac{5}{6}$ again.

YOUR TURN

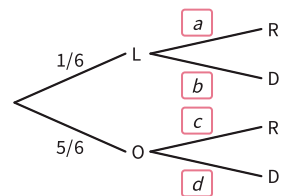
1 A spinner lands on green or yellow. It is spun twice. Find a , b , c and d .

$$a = \frac{2}{7}, b = \frac{5}{7}, c = \frac{2}{7}, d = \frac{5}{7}$$



2 The bus is late (L) or on time (O). It rains (R) with probability $\frac{3}{10}$ whatever the bus does. Find a , b , c and d .

$$a = \frac{3}{10}, b = \frac{7}{10}, c = \frac{3}{10}, d = \frac{7}{10}$$



3 A fair coin is flipped twice. Mo says that after a head, the second branches change because the coin has been flipped once already. Is he right?

No: independent, so the same

Check: Independent: the second sets of branches are all the same.

The Maths Habit

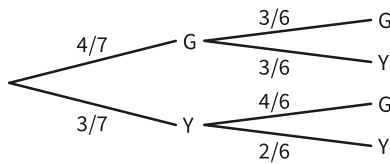
Fix it 3 Without replacement

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Without replacement: on the second branches, one fewer of the one taken first and one fewer in total.

EXAMPLE

A bag holds 4 green and 3 yellow counters. Two are taken without replacement.

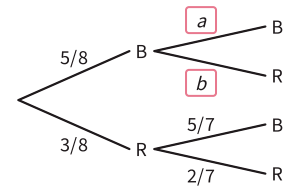


1. After a green: 3 green left, 6 in total.
2. After a yellow: 2 yellow left, 6 in total.
3. Every second branch is out of 6.

YOUR TURN

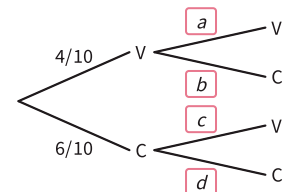
- 1 A pencil case holds 5 blue and 3 red pens. Two are taken without replacement. Find a and b .

$$a = \frac{4}{7}, b = \frac{3}{7}$$



- 2 Letter tiles: 4 vowels (V) and 6 consonants (C). Two are taken without replacement. Find a, b, c and d .

$$a = \frac{3}{9}, b = \frac{6}{9}, c = \frac{4}{9}, d = \frac{5}{9}$$



- 3 A squad has 7 Year 10s and 4 Year 11s. A captain is picked, then a vice captain from the rest. The captain is in Year 11. Find the probability the vice captain is in Year 11 too.

$$\frac{3}{10}$$

Check: Every second branch has the same denominator: one less than the first.

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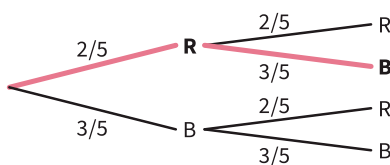
Fix it 4 Multiply along

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The probability of a path: multiply the fractions along its branches.

EXAMPLE

A spinner is spun twice. Find $P(\text{red then blue})$.

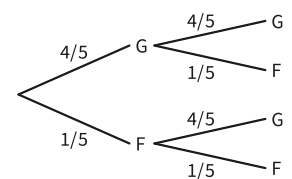


1. Follow red, then blue.
2. $\frac{2}{5} \times \frac{3}{5}$
3. $= \frac{6}{25}$

YOUR TURN

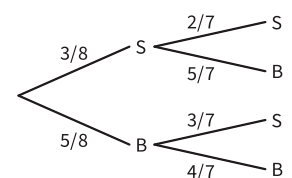
- 1 Two seeds are planted. Each grows (G) or fails (F). Find $P(\text{both grow})$.

$$\frac{16}{25}$$



- 2 A ring holds 3 silver (S) and 5 brass (B) keys. Two are taken without replacement. Find $P(\text{two brass})$.

$$\frac{5}{14}$$



- 3 A train is on time with probability $\frac{9}{10}$ each day, whatever happened the day before. Find the probability it is on time three days running.

$$\frac{729}{1000}$$

Check: Your answer is smaller than every fraction on the path.

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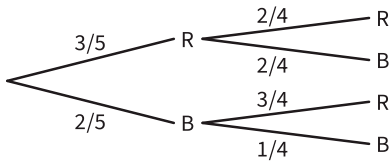
Fix it 5 Which paths?

Probability trees · ANSWERS

Write down every path that fits the question. One of each can happen in either order.

EXAMPLE

3 red and 2 blue counters.
Two are taken without replacement.
Which paths give one of each colour?

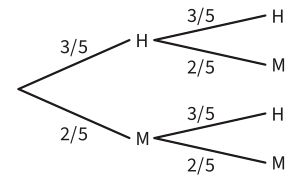


- The paths: RR, RB, BR, BB.
- One of each: red then blue, or blue then red.
- RB and BR.

YOUR TURN

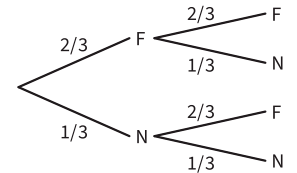
- Two free throws: hit (H) or miss (M).
Which paths give two the same?

HH and MM



- Two plants: each flowers (F) or not (N).
Which paths give at least one flowering?

FF, FN and NF



- Three plants, each flowers (F) or not (N). Which paths give exactly two flowering?

FFN, FNF and NFF

Check: Read each path aloud. Does it match the words? Is there one in the other order?

The Maths Habit

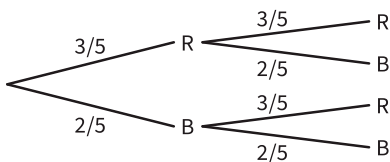
Fix it 6 Add the paths

Probability trees · ANSWERS

More than one path fits: find each path, then add them.

EXAMPLE

A spinner is spun twice.
Find P(one of each).

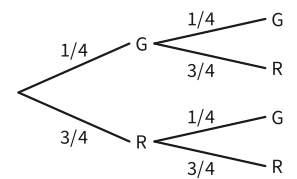


- RB: $\frac{3}{5} \times \frac{2}{5} = \frac{6}{25}$
- BR: $\frac{2}{5} \times \frac{3}{5} = \frac{6}{25}$
- $\frac{6}{25} + \frac{6}{25} = \frac{12}{25}$

YOUR TURN

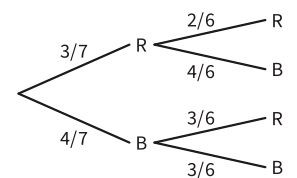
- Two traffic lights: green (G) or red (R).
Find P(both the same).

$\frac{5}{8}$



- Red (R) and blue (B) counters, two taken without replacement.
Find P(different colours).

$\frac{4}{7}$



- Ali's alarm fails with probability $\frac{1}{8}$. His bus is late with probability $\frac{1}{5}$.
The two are independent. Find the probability that exactly one of these happens.

$\frac{11}{40}$

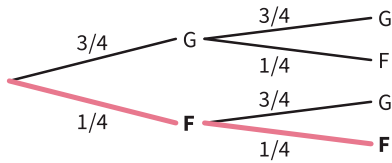
Check: Add every path on the tree: they make 1.

The Maths Habit

$P(\text{at least one}) = 1 - P(\text{none})$. Find the one path with none, then take it from 1.

EXAMPLE

A seed grows with probability $\frac{3}{4}$.
Two are planted. Find $P(\text{at least one grows})$.



1. None: neither grows, FF.

$$2. \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$$

$$3. 1 - \frac{1}{16} = \frac{15}{16}$$

YOUR TURN

- 1 A spinner lands on blue with probability $\frac{2}{5}$. It is spun twice.
Find $P(\text{at least one blue})$.

$$\frac{16}{25}$$

- 2 A box holds 6 plain and 3 striped tiles. Two are taken without replacement. Find $P(\text{at least one striped})$.

$$\frac{7}{12}$$

- 3 A train is late with probability $\frac{1}{5}$ each day, whatever happened the day before. Find the probability it is late at least once in three days.

$$\frac{61}{125}$$

Check: The long way gives the same: add every path with at least one.

The Maths Habit