2.5) Tree diagrams

Worked example

A bag contains 7 green beads and 3 yellow beads.
A bead is taken from the bag at random, the colour is recorded and it is not replaced.
A second bead is then taken from the bag and its colour recorded.
Given that both balls are the same colour, find the probability that they are both green.

Your turn

A bag contains 6 green beads and 4 yellow beads.
A bead is taken from the bag at random, the colour is recorded and it is not replaced.
A second bead is then taken from the bag and its colour recorded.
Given that both balls are the same colour, find the probability that they are both yellow.

$\frac{2}{7}$

Worked example

There are two bags.
Bag A contains 5 red balls and 5 blue balls
Bag B contains 3 red balls and 6 blue balls.
One ball is taken from bag A and placed in bag B. Then one ball is taken from bag B.
Find the probability that:

a) A blue ball is taken from bag B.
b) Given that a blue ball is taken from bag B, the ball taken from bag A was also blue.

Your turn

There are two bags.
Bag A contains 5 red balls and 5 blue balls
Bag B contains 3 red balls and 6 blue balls.
One ball is taken from bag A and placed in bag B. Then one ball is taken from bag B.
Find the probability that:

a) A red ball is taken from bag B.
b) Given that a red ball is taken from bag B, the ball taken from bag A was also red.

a) $\frac{7}{20}$
b) $\frac{4}{7}$

Worked example

On a randomly chosen day the probability that a person travels to work by bus, train or motorbike is $\frac{2}{5}$, $\frac{1}{4}$ and $\frac{7}{20}$ respectively.
The probability of being late when using these methods of travel is $\frac{1}{3}$, $\frac{2}{7}$ and $\frac{3}{8}$ respectively.
Given that the person is late, find the probability that they did not travel by bus.

Your turn

On a randomly chosen day the probability that a person travels to school by car, bicycle or on foot is $\frac{1}{2}$, $\frac{1}{6}$ and $\frac{1}{3}$ respectively.
The probability of being late when using these methods of travel is $\frac{1}{5}$, $\frac{2}{5}$ and $\frac{1}{10}$ respectively.
Given that the person is late, find the probability that they did not travel on foot.

$\frac{5}{6}$

Worked example

A bag contains 9 blue balls and 3 red balls.
A ball is selected at random from the bag and its colour is recorded.
The ball is not replaced.
A second ball is selected at random and its colour is recorded.
Find the probability that:

a) The second ball selected is blue
b) Both balls selected are blue, given that the second ball selected is blue.

Your turn

A bag contains 9 blue balls and 3 red balls.
A ball is selected at random from the bag and its colour is recorded.
The ball is not replaced.
A second ball is selected at random and its colour is recorded.
Find the probability that:

a) The second ball selected is red
b) Both balls selected are red, given that the second ball selected is red.

a) $\frac{1}{4}$
b) $\frac{2}{11}$

Worked example	Your turn
In bag A there are 2 white and 5 red counters. In bag B there are 7 white counters and 3 red counters. A person takes at random one counter from A and one counter from B. Find the probability that the counters are the same colour	In bag A there are 5 white and 2 red counters. In bag B there are 3 white counters and 7 red counters. A person takes at random one counter from A and one counter from B. Find the probability that the counters are the same colour $\frac{29}{70}$

Worked example	Your turn
In bag A there are 2 white and 5 red counters. In bag B there are 7 white counters and 3 red counters. A person takes at random one counter from A and one counter from B. Find the probability that the counters are different colours	In bag A there are 5 white and 2 red counters. In bag B there are 3 white counters and 7 red counters. A person takes at random one counter from A and one counter from B. Find the probability that the counters are different colours $\frac{41}{70}$

Worked example	Your turn
A person plays a game of tennis and then a game of golf. They can only win or lose each game. The probability of winning tennis is 0.3 The probability of winning golf is 0.7 The results of each game are independent of each other. Calculate the probability that the person wins at least one game	A person plays a game of tennis and then a game of golf. They can only win or lose each game. The probability of winning tennis is 0.6 The probability of winning golf is 0.35 The results of each game are independent of each other. Calculate the probability that the person wins at least one game $\frac{37}{50} = 0.74$

Worked example

The table shows 100 students, who each study one language.
Two students are chosen at random.

	French	German
Female	26	30
Male	10	34

Calculate the probability that the two chosen students study the same language.

Your turn

The table shows 50 students, who each study one language.
Two students are chosen at random.

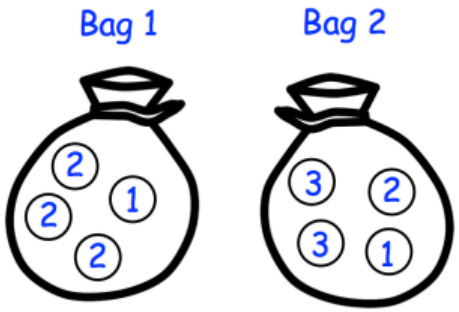
	Japanese	Spanish
Female	13	15
Male	5	17

Calculate the probability that the two chosen students study the same language.

$$\frac{64}{245}$$

Worked example

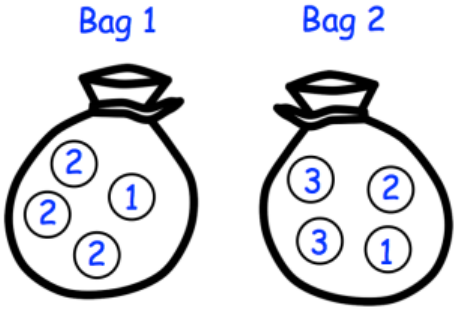
There are two bags with numbered discs as shown.



A person chooses a disc at random from bag 1.
If it is labelled 2, he puts the disc in bag 2.
If it is labelled 1, he does not put the disc in bag 2.
He then chooses a disc at random from bag 2.
He then adds the numbers of the two discs he selected to give his score.
Find the probability that his score is 5.

Your turn

There are two bags with numbered discs as shown.



A person chooses a disc at random from bag 1.
If it is labelled 1, he puts the disc in bag 2.
If it is labelled 2, he does not put the disc in bag 2.
He then chooses a disc at random from bag 2.
He then adds the numbers of the two discs he selected to give his score.
Find the probability that his score is 4.

$$\frac{23}{80}$$