Probability

- Deciding whether events are mutually exclusive
- Deciding whether two events are independent
- Working out the probability of two independent events both occurring
- Drawing a tree diagram to show two or more events
- Using tree diagrams to solve probability problems

Keywords

You should know

explanation 1a explanation 1b

1 This spinner is spun once.
What is the probability that the spinner will land on these colours?

a Yellow

b Blue

c Not blue

c Black

2 There are 20 tiles in a bag. The tiles are numbered from 1 to 20.
Alice takes a tile at random from the bag. Find these probabilities.

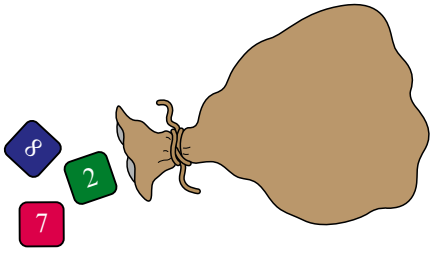
a P(a multiple of 4)

b P(a square number)

c P(a prime number)

d P(a factor of 20)

e P(an even number or a multiple of 5)



3 The two-way table shows which type of pizza some adults said was their favourite.

	Margherita	Salami	Ham	Total
Male	14	27	15	56
Female	11	10	23	44
Total	25	37	38	100

One of these adults is chosen at random. Find the probability of these events.

a An adult whose favourite pizza is margherita.

b A female whose favourite pizza was ham.

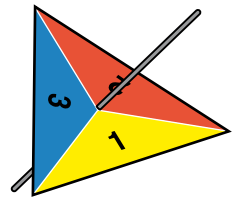
c A male.

One of the females is chosen at random. Find these probabilities.

d She chose ham pizza as her favourite.

e She did not choose margherita pizza as her favourite.

4 Frank spins this fair three-sided spinner twice.



a Write all the possible outcomes.

b What is the probability of getting two numbers the same?

c What is the probability of getting a total of 4?

d What is the probability of getting a total greater than 2?

5 The probability that it will rain one day is $\frac{2}{3}$.

What is the probability that it will not rain that day?

6 A football team play a match. The probability that the team will win is 0.54 and the probability that the team will draw is 0.2.
What is the probability that the team will lose the match?

7 Cassie cycles to school. The probability that she will arrive on time is $\frac{1}{4}$.

The probability that she will arrive late is $\frac{2}{3}$.

What is the probability that she will arrive early?

8 Alina has five cards with letters on them. The cards spell her name.

She takes a card at random.

a Work out the probability that this card is the letter N.

Alina keeps the first card, which was N. She takes another card.

b Explain why the probability that the second card is an A is not $\frac{2}{5}$.

c Work out the probability that the second card is an A.

9 A box contains 5 milk and 7 plain chocolates. Terri takes one chocolate at random and eats it. She then takes a second chocolate at random.

Assuming that the first chocolate was milk, find these probabilities.

a The second chocolate is milk.

b The second chocolate is plain.

If the second chocolate was milk, what is the probability that a third chocolate, taken at random, is this kind?

c milk

d plain

10 There are 6 green, 4 orange and 2 blue counters in a bowl.
Rory picks out counters at random.
They are *not* replaced.
The first one he picks is orange. Work out these probabilities.

a P(second counter is orange)

b P(second counter is green)

c P(second counter is blue)

explanation 2a explanation 2b

11 Tanya has 7 cards. Each card has a coloured shape on it.

Tanya takes a card at random. Work out these probabilities.

a P(blue)

b P(square)

c P(blue or square)

d Explain why adding the probability of picking a blue to the probability of picking a square will not give you the probability of picking a blue or a square.

12 A child is chosen at random from one of those shown below.

Which of the following pairs of events are mutually exclusive?
Give reasons for your decision in each case.

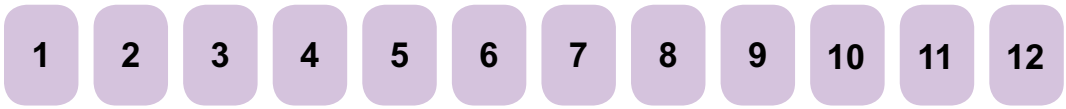
a 'The child is a girl' and 'The child is a boy'

b 'The child is a girl' and 'The child wears glasses'

c 'The child is a girl' and 'The child has blonde hair'

d 'The child is a boy' and 'The child wears glasses'

13 A card is picked at random from those shown below.



Which of the following pairs of events are mutually exclusive?
Give reasons for your decision in each case.
The first one has been done for you.

a 'The number is even' and 'The number is a multiple of 3'

These are not mutually exclusive. 6, for example, is both an even number and a multiple of 3.

b 'The number is a factor of 12' and 'The number is a multiple of 5'

c 'The number is less than 4' and 'The number is a multiple of 5'

d 'The number is prime' and 'The number is even'

14 One of the cards in question **13** is picked at random.
Work out these probabilities.

a P(factor of 12)

b P(multiple of 5)

c P(factor of 12 or multiple of 5)

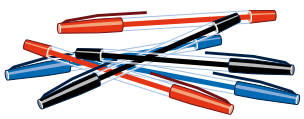
d P(prime)

e P(even)

f P(prime or even)

15 Jake has some pens in his pencil case. The pens are all red, black or blue.
He takes a pen at random from his pencil case.
The table gives the probability that the pen will be red or black.

Pen colour	Red	Black	Blue
Probability	0.25	0.6	



What is the probability that the pen is blue?

16 Jalinda has a box of three types of chocolate.

The chocolates are milk, plain or white.

The probability of choosing each type of chocolate is shown in the table.

Chocolate	Milk	Plain	White
Probability	$2x$	x	$5x$

Jalinda takes a chocolate at random from the box.
Work out the probability that the chocolate will be plain.

17 A bag contains some red, blue, yellow and green counters.

The table shows the probabilities of taking at random a red, yellow or green counter.

Colour	Red	Yellow	Green	Blue
Probability	$\frac{1}{3}$	$\frac{2}{5}$	$\frac{1}{10}$	

Work out these probabilities.

a P(blue)

b P(green or yellow)

c P(red or yellow)

explanation 3

18 A fair six-sided dice is rolled and a fair coin is spun.

a Draw a sample space diagram to show all the possible outcomes.

b Write down the probability that the dice score will be less than 3 and the coin will land tails up.

c Write down the probability that the dice score will be less than 3.

d Write down the probability that the coin will land tails up.

e Use your answer to parts **c** and **d** to work out the probability that the dice score will be less than 3 and the coin will land tails up.
Check that the answer you get is the same as your answer to part **b**.

19 Lisa has some blue and some red tiles. Each tile has a number on it.
Lisa takes one blue tile and one red tile.

a Draw a sample space diagram to show all the possible outcomes.

b Use your diagram to write the probability that Lisa takes a blue tile that is a factor of 6 and a red tile that is an even number.

c Write down the probability that the blue tile is a factor of 6.

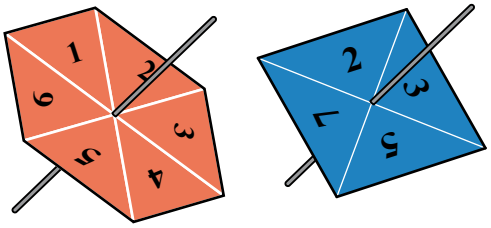
d Write down the probability that the red tile is an even number.

e Use your answers to parts **c** and **d** to work out the probability that the blue tile is a factor of 6 and the red tile is an even number.
Check that the answer you get is the same as your answer to part **b**.

20 Peter has two spinners.

Both spinners are spun together.

Work out the probability that the red spinner will land on an even number and the blue spinner will land on an odd number.



21 Class A is made up of 12 girls and 10 boys.

Class B is made up of 15 girls and 10 boys.

One pupil is chosen at random from class A and another is chosen from class B.

a Work out the probability that a boy is chosen from both classes.

b Work out the probability that a girl is chosen from class A and a boy is chosen from class B.

22 The probability that Clare arrives on time for the cinema is 0.3.

The probability that Ali arrives on time for the cinema is 0.7.

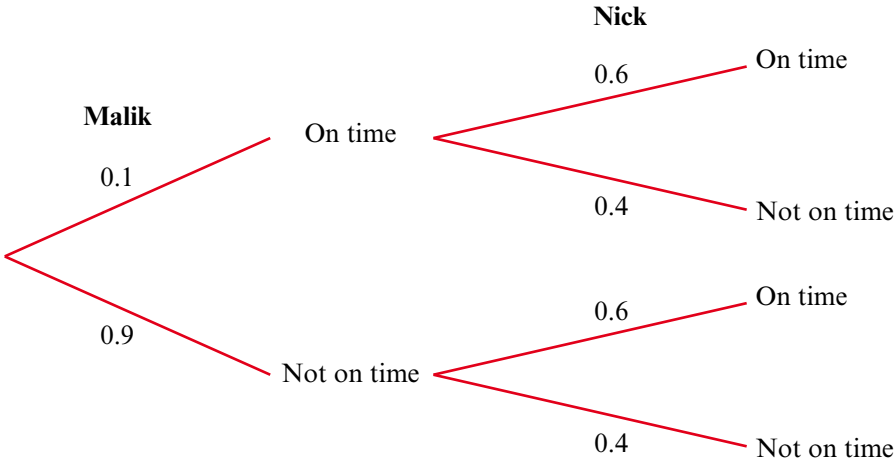
These are independent events.

a Work out the probability that both Clare and Ali arrive on time.

b Work out the probability that Clare arrives on time and Ali arrives late.

explanation 4a | explanation 4b | online

23 The probability that Malik will get to school on time is 0.1 and the probability that Nick will get to school on time is 0.6.
This information has been used to draw the tree diagram.

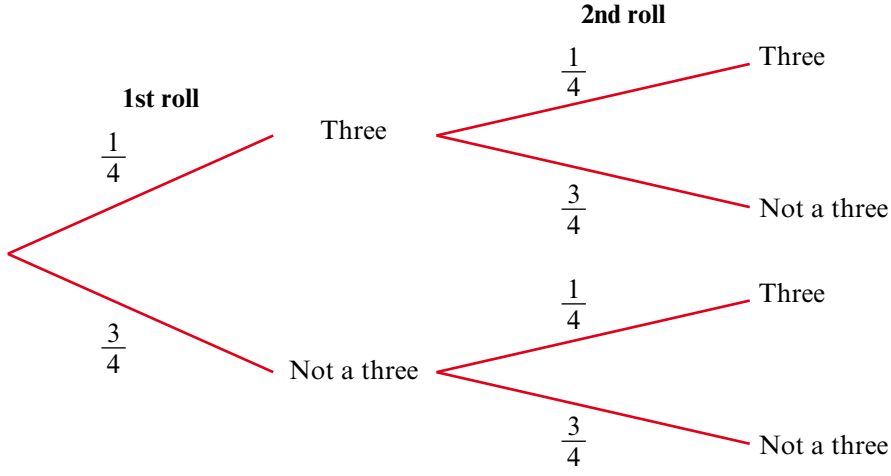


Use the tree diagram to work out these probabilities.

a Both boys are on time for school. **b** Both boys are late for school.

c Only one boy is on time for school.

24 Susan rolls a biased dice twice. The probability that the dice will land with three up is $\frac{1}{4}$.
This information has been used to draw a probability tree diagram.



Use the tree diagram to work out the probability that Susan will get these scores.

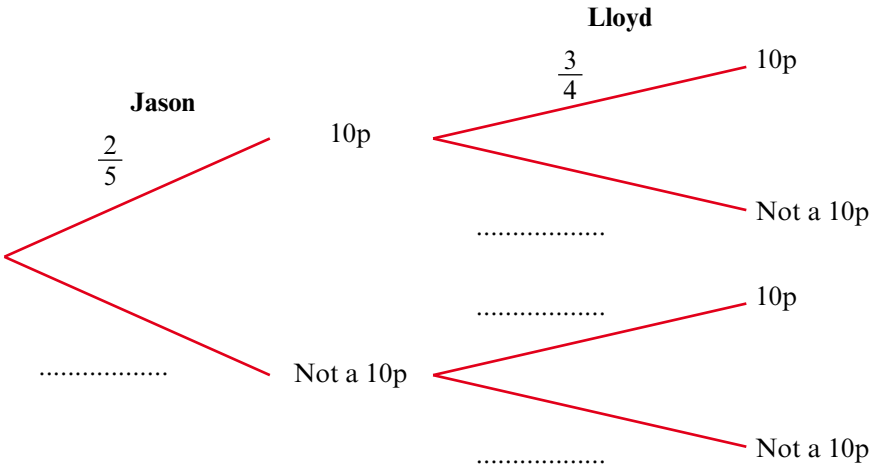
a A three both times **b** No threes **c** Only 1 three

25 Jason has two 10p coins and three other coins in his pocket.

Lloyd has three 10p coins and one other coin in his pocket.

Each boy takes a coin at random from their pocket.

a Copy and complete the probability tree diagram.



b Use your tree diagram to work out these probabilities.

i Both boys take a 10p.

ii Neither boy takes a 10p.

iii Only one of the boys takes a 10p.

26 In box A there are 3 red and 4 blue counters.

In box B there are 5 red and 3 blue counters.

A counter is taken at random from each box.

a Draw a probability tree diagram.

b Use your diagram to work out these probabilities.

i A red counter is taken from box A and a blue counter is taken from box B.

ii A red counter is taken from both boxes.

iii A blue counter is taken from both boxes.

27 The probability that it will rain on Saturday is 0.7.

The probability that it will rain on Sunday is 0.2.

Work out the probability that it will rain on only one of the two days.

28 The probability that Hugh is late for work on any one day is $\frac{1}{4}$.

If he is late for work, the probability that he will be late home is $\frac{4}{5}$.

If he is not late for work, the probability that he will be late home is $\frac{1}{3}$.

Work out these probabilities.

a He will be late for work and late home.

b He will be on time for work and late home.

c He will be on time for work and will get home on time.

29 The probability that Jemma wins a game of tennis is $\frac{2}{3}$.

The probability that Jemma wins a game of badminton is $\frac{1}{4}$.

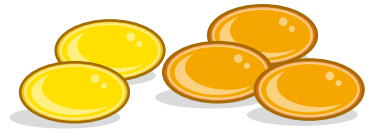
These are independent. She plays one tennis game and one badminton game.
Work out these probabilities.

a Jemma will win both games.

b Jemma will win at tennis and lose at badminton.

30 Kylie has 3 orange and 2 lemon sweets.

She takes a sweet and eats it, then takes and eats a second sweet.



a Write the probability that the first sweet is orange.

b Assuming that the first sweet is orange, write the probability that the second sweet is orange.

c Draw a probability tree diagram.

d Work out the probability that Kylie ate two orange sweets.

e Work out the probability that Kylie ate an orange sweet and a lemon sweet.