How to calculate probability - Worksheet

Skill

Group A - Mutually exclusive events

Work out the probabilities stated. In questions 9-12 the tables indicate the probabilities of the different outcomes:

1) Rolling a 3 or a 4 on a fair dice.

2) Rolling a 1 or a multiple of 3 on a fair dice.

3) Picking a **B** or **N** from cards with the letters **B R A I N**.

4) Picking a blue or green counter from a bag containing 2 blue counters, 4 green counters and 7 yellow counters.

5) Drawing a multiple of 3, 4,or 5 from a pack of 10 cards numbered 1 to 10.

6) Not rolling a 1 or a 2 on a fair dice.

7) On a biassed dice, the probability of rolling a 1 or 2 is 0.5 and the probability of rolling a 1 is 0.2. Find the probability of rolling a 2.

8) From a set of cards, the probability of picking a 4 or a 5 is $\frac{7}{10}$ and the probability of picking a 4 is $\frac{3}{10}$. Find the probability of picking a 5.

9) Find the probability for red.

Blue	Green	Red
0.1	0.4	

10) Find the probability for C.

A	B	C	D
0.15	0.3		0.25

11) The probabilities for train and walk are equal. What are they?

Car	Bus	Train	Walk
0.4	0.3		

12) Work out the probability for each colour.

Blue	Red	Green	Pink
x	$2x$	$3x$	$4x$

How to calculate probability - Worksheet

Group B - Independent events

Work out the probabilities stated. All events are independent:

1) Rolling a 5 on a dice and getting a head in a coin flip.

2) Getting a tail in a coin flip and rolling an even number on a dice.

3) Rolling a prime number on a dice and spinning a red on 3-sided spinner with sections red, blue, green.

4) Rolling an even number on a dice and picking a blue counter from a bag containing 7 blue counters and 5 green counters.

5) Rolling a dice three times and getting three 1s.

6) Flipping a coin 4 times and getting heads each time.

7) The probability Sean hands in his homework is 0.8. The probability Kizzie hands in her homework is 0.7. Find the probability they both hand in their homework.

8) The probability Lucy is late is 0.1. The probability Erin is late is 0.3. Find the probability Lucy is late and Erin is on time.

9) The probability Carson scores during a match is 0.4. The probability Tyrell scores is 0.3. Find the probability neither of them score.

10) The probability Niamh walks to school is $\frac{7}{10}$. The probability she walks and forgets her PE kit is $\frac{7}{40}$. Find the probability Niamh forgets her PE kit.

11) The probability Harry wears a green t-shirt is $\frac{1}{8}$. The probability both Harry and Peter both wear green t-shirts is $\frac{1}{48}$. Find the probability Peter wears a green t-shirt.

12) Ellen has a biassed dice. She rolls it twice. The probability she gets two 1s is $\frac{9}{49}$. Find the probability she rolls a 1 on a single roll.

How to calculate probability - Worksheet

Group C - Combined events

Work out the given probabilities:

1) Flipping two coins and getting two different outcomes.

2) Rolling two fair dice and getting 1 on one dice and not getting 1 on the other dice.

3) Picking one counter from a bag containing
4 pink counters and 8 blue counters, replacing it and picking the same colour again.

4) Picking one counter from a bag containing 4 pink counters and 8 blue counters, replacing it and picking the other colour.

5) Flipping three coins and getting the same
on all three.

6) Rolling a dice twice and getting the same number both times.

7) Alice has a bag containing 3 green counters, 4 blue counters and 5 yellow counters. She picks a counter, notes its colour and replaces it. She picks a second counter at random. What is the probability that she
picks the same colour both times?

8) Alice has a bag containing 3 green counters, 4 blue counters and 5 yellow counters. She picks a counter, notes its colour and replaces it. She picks a second counter and replaces it. What is the probability that she picks two different colours?

9) Alice has a bag containing 3 green counters, 4 blue counters and 5 yellow counters. She picks a counter, notes its colour and replaces it. She picks a second counter, notes its colour and replaces it. She picks a third counter, notes its colour and replaces it. What is the probability that she picks the same colour three times?

10) The probability that Mark scores a penalty is $\frac{1}{3}$. Mark takes 2 penalties. Find the probability that he scores at least once.

11) Phil flips three coins. What is the probability he gets at least one each of heads and tails?

12) Jenna rolls two dice. What is the probability she gets different numbers on the two dice?

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Applied

1) A set of cards contains multiple cards numbered $1 - 4$.
The probability of drawing a 1 or a 2 is 0.4.
The probability of drawing a 2 or 3 is 0.6.
The probability of drawing a 3 is 0.5.

(a) Find the probability of drawing a 1.

(b) Find the probability of drawing a 4.

2) George has a set of coloured cards. The table shows the probability of picking each colour from his set:

Blue	Red	Green	Pink
0.1	0.3	x	$2x$

(a) Work out the value of x and therefore the probability of picking a Green card and the probability of picking a Pink card.

(b) George has 20 cards. How many of the cards are blue?

3) A fair six sided dice is rolled three times. Find the probability that the dice lands on the same number on each of the three rolls.

4) Florence has a biassed coin. The coin is three times as likely to land on heads as it is to land on tails. Florence flips the coin twice. Find the probability she gets tails both times.

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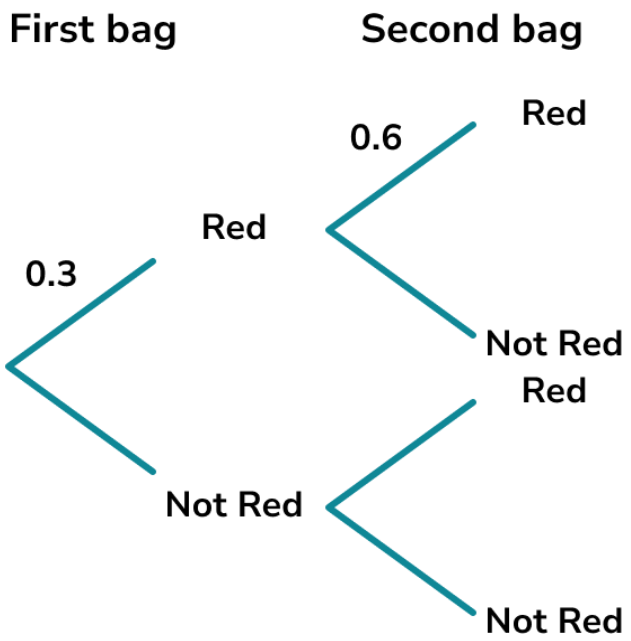
5) Geri has two bags of counters. She takes a counter from each bag.
The probability that she takes a red counter from the first bag is 0.3.
The probability that she takes a red counter from the second bag is 0.6.

(a) Complete the tree diagram.



(b) Calculate the probability that Geri picks two red counters.

How to calculate probability - Exam Questions

1) **(a)** The table below shows the probability of landing on a particular number on a biassed spinner.

1	2	3	4
0.2	0.3		0.15

Work out the probability of landing on a 3.

.....

(2)

(b) What is the probability of landing on a 2 or a 4?

.....

(2)

(4 marks)

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2) Aled has 10 cards numbered $1 - 10$. He designs a game in which a player wins if they pick the number 1 or a multiple of 5.

Aled charges £2 to play the game.
Winning players receive £4.
200 people play the game.

How much profit would Aled expect to make?

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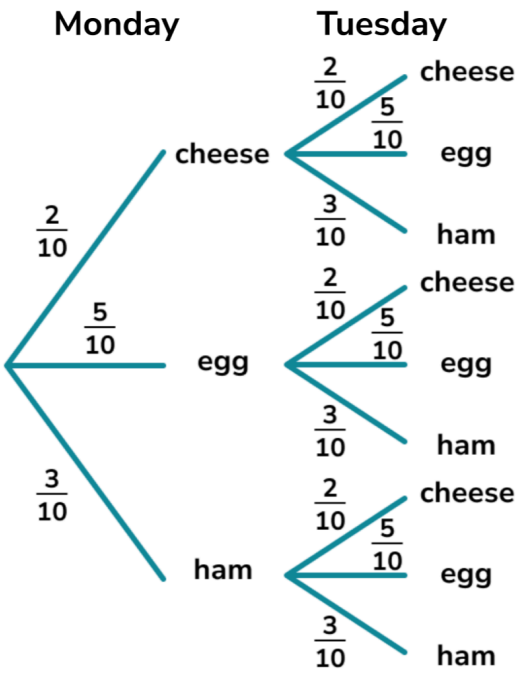
(4)

How to calculate probability - Exam Questions

3) The tree diagram shows the probability that Gary chooses each type of sandwich over two days.



Find the probability he has different sandwiches on Monday and Tuesday.

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(2)

(3 marks)

How to calculate probability - Answers

	Question	Answer
	Skill Questions	
Group A	**1)** Rolling a 3 or a 4 on a fair dice	**1)** $\frac{2}{6}$ or $\frac{1}{3}$
	2) Rolling a 1 or a multiple of 3 on a fair dice	**2)** $\frac{3}{6}$ or $\frac{1}{2}$
	3) Picking a **B** or **N** from cards with the letters **B R A I N**.	**3)** $\frac{2}{5}$
	4) Picking a blue or green counter from a bag containing 2 blue counters, 4 green counters and 7 yellow counters	**4)** $\frac{6}{13}$
	5) Drawing a multiple of 3, 4, or 5 from a pack of 10 cards numbered 1 to 10.	**5)** $\frac{7}{10}$
	6) Not rolling a 1 or a 2 on a fair dice	**6)** $\frac{4}{6}$ or $\frac{2}{3}$
	7) On a biassed dice, the probability of rolling a 1 or 2 is 0.5 and the probability of rolling a 1 is 0.2. Find the probability of rolling a 2.	**7)** 0.3
	8) From a set of cards, the probability of picking a 4 or a 5 is $\frac{7}{10}$ and the Probability of picking a 4 is $\frac{3}{10}$. Find the probability of picking a 5.	**8)** $\frac{4}{10}$ or $\frac{2}{5}$
	9) Find the probability for red Blue: 0.1 | Green: 0.4 | Red:	**9)** 0.5
	10) Find the probability for C A: 0.15 | B: 0.3 | C: | D: 0.25	**10)** 0.3
	11) The probabilities for train and walk are equal. What are they? Car: 0.4 | Bus: 0.3 | Train: | Walk:	**11)** 0.15
	12) Work out the probability for each colour Blue: x | Red: $2x$ | Green: $3x$ | Pink: $4x$	**12)** 0.1, 0.2, 0.3, 0.4

How to calculate probability - Answers

Group B	**1)** Rolling a 5 on a dice and getting a head in a coin flip	**1)** $\frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$
	2) Getting a tail in a coin flip and rolling an even number on a dice	**2)** $\frac{1}{2} \times \frac{3}{6} = \frac{3}{12}$ or $\frac{1}{4}$
	3) Rolling a prime number on a dice and spinning a red on 3-sided spinner with sections red, blue, green.	**3)** $\frac{3}{6} \times \frac{1}{3} = \frac{3}{18}$ or $\frac{1}{6}$
	4) Rolling an even number on a dice and picking a blue counter from a bag containing 7 blue counters and 5 green counters	**4)** $\frac{3}{6} \times \frac{7}{12} = \frac{21}{72}$ or $\frac{7}{24}$
	5) Rolling a dice three times and getting three 1s	**5)** $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{216}$
	6) Flipping a coin 4 times and getting heads each time	**6)** $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{16}$
	7) The probability Sean hands in his homework is 0.8. The probability Kizzie hands in her homework is 0.7. Find the probability they both hand in their homework.	**7)** $0.8 \times 0.7 = 0.56$
	8) The probability Lucy is late is 0.1. The probability Erin is late is 0.3. Find the probability Lucy is late and Erin is on time.	**8)** $0.1 \times (1 - 0.3) = 0.07$
	9) The probability Carson scores during a match is 0.4. The probability Tyrell scores is 0.3. Find the probability neither of them score.	**9)** $(1 - 0.4) \times (1 - 0.3)$ $= 0.6 \times 0.7 = 0.42$
	10) The probability Niamh walks to school is $\frac{7}{10}$. The probability she walks and forgets her PE kit is $\frac{7}{40}$. Find the probability Niamh forgets her PE kit.	**10)** $\frac{7}{40} \div \frac{7}{10} = \frac{1}{4}$

How to calculate probability - Answers

Group B	**11)** The probability Harry wears a green t-shirt is $\frac{1}{8}$. The probability both Harry and Peter both wear green t-shirts is $\frac{1}{48}$. Find the probability Peter wears a green t-shirt. **12)** Ellen has a biassed dice. She rolls it twice. The probability she gets two 1s is $\frac{9}{49}$. Find the probability she rolls a 1 on a single roll.	**11)** $\frac{1}{48} \div \frac{1}{8} = \frac{1}{6}$ **12)** $\sqrt{\frac{9}{49}} = \frac{3}{7}$
Group C	**1)** Flipping two coins and getting two different outcomes	**1)** TH or HT = $(\frac{1}{2} \times \frac{1}{2}) + (\frac{1}{2} \times \frac{1}{2})$ $= \frac{1}{4} + \frac{1}{4} = \frac{2}{4}$ or $\frac{1}{2}$
	2) Rolling two fair dice and getting 1 on one dice and not getting 1 on the other dice	**2)** $(\frac{1}{6} \times \frac{5}{6}) + (\frac{5}{6} \times \frac{1}{6})$ $= \frac{5}{36} + \frac{5}{36} = \frac{10}{36}$ or $\frac{5}{18}$
	3) Picking one counter from a bag containing 4 pink counters and 8 blue counters, replacing it and picking the same colour again	**3)** $(\frac{4}{12} \times \frac{4}{12}) + (\frac{8}{12} \times \frac{8}{12})$ $= \frac{16}{144} + \frac{64}{144} = \frac{80}{144}$ or $\frac{5}{9}$
	4) Picking one counter from a bag containing 4 pink counters and 8 blue counters, replacing it and picking the other colour	**4)** $(\frac{4}{12} \times \frac{8}{12}) + (\frac{8}{12} + \frac{4}{12})$ $= \frac{32}{144} + \frac{32}{144} = \frac{64}{144}$ or $\frac{4}{9}$
	5) Flipping three coins and getting the same on all three	**5)** $(\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}) + (\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2})$ $= \frac{1}{8} + \frac{1}{8} = \frac{2}{8}$ or $\frac{1}{4}$
	6) Rolling a dice twice and getting the same number both times.	**6)** $(\frac{1}{6} \times \frac{1}{6}) \times 6 = \frac{6}{36}$ or $\frac{1}{6}$
	7) Alice has a bag containing 3 green counters, 4 blue counters and 5 yellow counters. She picks a counter, notes its colour and replaces it. She picks a second counter at random. What is the probability that	**7)** $(\frac{3}{12} \times \frac{3}{12}) + (\frac{4}{12} \times \frac{4}{12})$ $+ (\frac{5}{12} \times \frac{5}{12})$ $= \frac{9}{144} + \frac{16}{144} + \frac{25}{144}$ $= \frac{50}{144}$ or $\frac{25}{72}$

	she picks the same colour both times?	

How to calculate probability - Answers

Group C contd	**8)** Alice has a bag containing 3 green counters, 4 blue counters and 5 yellow counters. She picks a counter, notes its colour and replaces it. She picks a second counter and replaces it. What is the probability that she picks two different colours?	**8)** $(\frac{3}{12} \times \frac{9}{12}) + (\frac{4}{12} \times \frac{8}{12}) + (\frac{5}{12} \times \frac{7}{12})$ $= \frac{27}{144} + \frac{32}{144} + \frac{35}{144}$ $= \frac{94}{144}$ or $\frac{47}{72}$
	9) Alice has a bag containing 3 green counters, 4 blue counters and 5 yellow counters. She picks a counter, notes its colour and replaces it. She picks a second counter, notes its colour and replaces it. She picks a third counter, notes its colour and replaces it. What is the probability that she picks the same colour three times?	**9)** $(\frac{3}{12})^3 + (\frac{4}{12})^3 + (\frac{5}{12})^3$ $= \frac{27}{1728} + \frac{64}{1728} + \frac{125}{1728}$ $= \frac{216}{1728}$ or $\frac{1}{8}$
	10) The probability that Mark scores a penalty is $\frac{1}{3}$. Mark takes 2 penalties. Find the probability that he scores at least once.	**10)** $(\frac{1}{3} \times \frac{1}{3}) + (\frac{1}{3} \times \frac{2}{3}) + (\frac{2}{3} \times \frac{1}{3})$ $= \frac{1}{9} + \frac{2}{9} + \frac{2}{9}$ $= \frac{5}{9}$
	11) Phil flips three coins. What is the probability he gets at least one each of heads and tails?	**11)** 1-P(HHH)-P(TTT) $1 - \frac{1}{8} - \frac{1}{8} = \frac{6}{8}$ or $\frac{3}{4}$
	12) Jenna rolls two dice. What is the probability she gets different numbers on the two dice?	**12)** 1-P(all same) $1 - (\frac{1}{6} \times \frac{1}{6} \times 6)$ $= 1 - \frac{6}{36}$ $= \frac{30}{36}$ or $\frac{5}{6}$

How to calculate probability - Answers

	Question	Answer
	Applied Questions	
1)	A set of cards contains multiple cards numbered $1 - 4$. The probability of drawing a 1 or a 2 is 0.4. The probability of drawing a 2 or 3 is 0.6. The probability of drawing a 3 is 0.5. **a)** Find the probability of drawing a 1. **b)** Find the probability of drawing a 4.	**a)** $P(2) = 0.6 - 0.5 = 0.1$ $P(1) = 0.4 - 0.1 = 0.3$ **b)** $1 - (0.3 + 0.1 + 0.5) = 0.1$
2)	George has a set of coloured cards. The table shows the probability of picking each colour from his set: **a)** Work out the value of x and therefore the probability of picking a Green card and the probability of picking a Pink card. **b)** George has 20 cards. How many of the cards are blue?	**a)** $0.1 + 0.3 + x + 2x = 1$ $0.4 + 3x = 1$ $3x = 0.6$ $x = 0.2$ P(Green) $= 0.2$ P(Pink) $= 0.4$ **b)** $20 \times 0.1 = 2$
3)	A fair six sided dice is rolled three times. Find the probability that the dice lands on the same number on each of the three rolls.	$\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} \times 6$ $= \frac{6}{216}$ or $\frac{1}{36}$
4)	Florence has a biassed coin. The coin is three times as likely to land on heads as it is to land on tails. Florence flips the coin twice. Find the probability she gets tails both times.	Ratio $1:3$ $1 \div (1 + 3) = \frac{1}{4}$ $\frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$

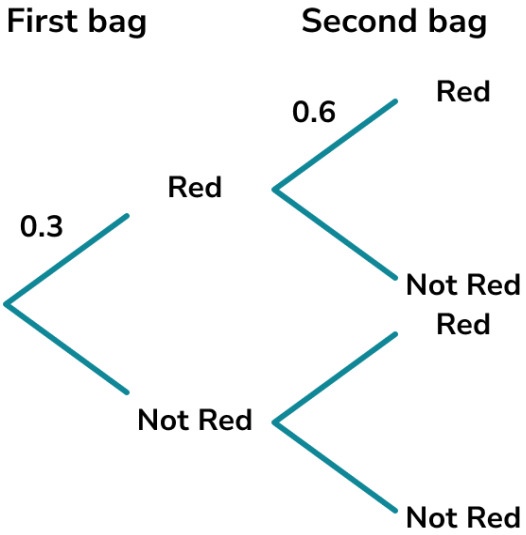
Blue	Red	Green	Pink
0.1	0.3	x	$2x$

How to calculate probability - Answers

5) Geri has two bags of counters. She takes a counter from each bag.

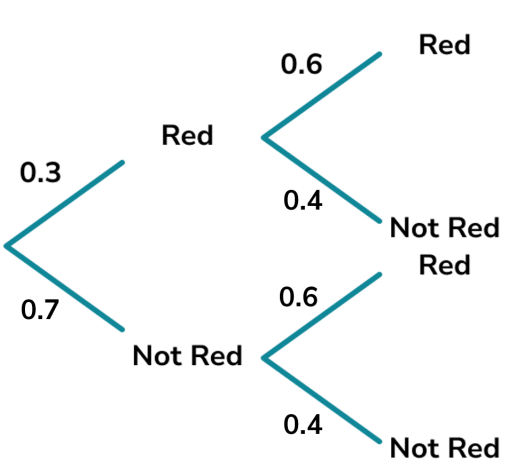
The probability that she takes a red counter from the first bag is 0.3.
The probability that she takes a red counter from the second bag is 0.6.

a) Complete the tree diagram.



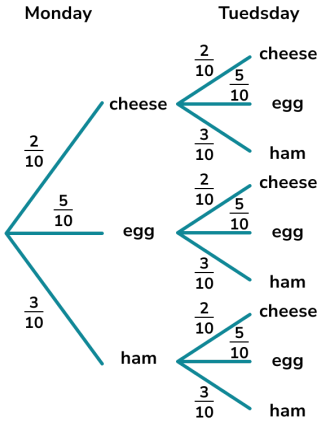
b) Calculate the probability that Geri picks two red counters.

a)



b) $0.3 \times 0.6 = 0.18$

How to calculate probability - Mark Scheme

	Question	Answer	
	Exam Questions		
1) (a)	The table below shows the probability of landing on a particular number on a biassed spinner. 1: 0.2 | 2: 0.3 | 3: | 4: 0.15 Work out the probability of landing on a 3.	(a) $1 - (0.2 + 0.3 + 0.15)$ $= 0.35$	(1) (1)
(b)	What is the probability of landing on a 2 or a 4?	(b) $0.3 + 0.15$ $= 0.45$	(1) (1)
2)	Aled has 10 cards numbered $1 - 10$. He designs a game in which a player wins if they pick the number 1 or a multiple of 5. Aled charges £2 to play the game. Winning players receive £4. 200 people play the game. How much profit would Aled expect to make?	P(win) $= \frac{3}{10}$ Expected number of winners: $\frac{3}{10} \times 200 = 60$ $60 \times £4 = £240$ £400-£240=£160	(1) (1) (1) (1)
3)	The tree diagram shows the probability that Gary chooses each type of sandwich over two days.  Find the probability he has different sandwiches on Monday and Tuesday.	P(cheese and cheese) $= \frac{4}{100}$ **or** P(egg and egg) $= \frac{25}{100}$ **or** P(ham and ham) $= \frac{9}{100}$ $\frac{4}{100}$ **and** $\frac{25}{100}$ **and** $\frac{9}{100}$ **Alternative method** P(two different) $= 1 - \frac{4}{100} - \frac{25}{100} - \frac{9}{100}$ P(two different) $= \frac{62}{100}$	(1) (1) (1) (1)