THIRD SPACE LEARNING

GCSE Maths Intervention Pack

Finding Probabilities Using Tree Diagrams

Grade 6

Teacher Notes

Question Sets

Set 1: Using simple probability trees

Use simple probability trees to calculate the probabilities of multiple events

Key words: And, branch, event, independent, mutually exclusive events, or, outcome, probability, probability tree, random

Set 2: Calculating probabilities without replacement

Use probability trees to calculate the probabilities of multiple events when events are dependent (without replacement)

Key words: And, branch, conditional, dependent, event, mutually exclusive events, or, outcome, probability, probability tree, random

Set 3: Completing more complex tree diagrams

Use probability trees to calculate more complicated problems involving the probabilities of multiple events.

Key words: And, branch, conditional, dependent, event, independent, mutually exclusive events, or, outcome, probability, probability tree, random

Slide 1: Cover Slide

Teaching Prompts

- Which calculation do you think is correct?
- What would be the probability of picking a red sweet first ? $\left(\frac{3}{7}\right)$
- If you eat that sweet how many sweets are you left with? (6)
- What is the probability of picking a blue sweet from those? $\left(\frac{2}{6}\right)$
- How do we calculate AND in probability? (multiply)

Answers

C. $\frac{3}{7} \times \frac{2}{6} = \frac{6}{42} = \frac{1}{7}$

Teacher Reference Only

Common Misconceptions

- Students confuse the conditions for adding and multiplying probabilities.
- Students have misconceptions based on the operations with fractions.
- When constructing a tree diagram for a given situation, some students may struggle to distinguish between how events, and outcomes of those events, are represented.
- Students may not fully complete a tree diagram, leaving branches blank.
- Students do not edit the probability when the probability is dependent on the previous event (e.g. removing a button from a bag, changes the number of buttons of that colour, and the number of buttons in the bag).

Terminology

- Probability: How likely it is that some event will occur.
- Outcome: A possible result of an experiment.
- Event: One (or more) outcomes of an experiment.
- Mutually exclusive: Events that can't happen at the same time.
- Random: Happening by chance. Not able to be predicted.

THIRD SPACE LEARNING

Slide 2: Try this exam-style question

Set 1: Using Simple Probability Trees.

Teaching Prompts

- Can you try this question by yourself?

If Stuck

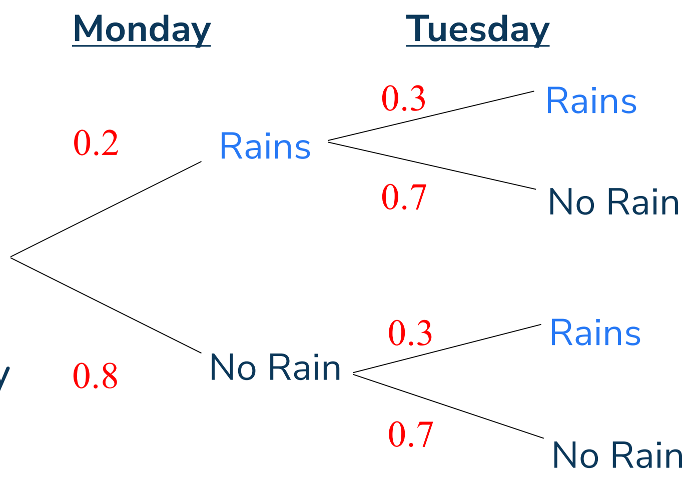
- Move on to the next slide.

Mark Scheme

(a)

- (1 mark) first set of branches correct
- (1 mark) all branches correct

(probabilities do not need to be calculated)



(b)

- (1 mark) $0.2 \times 0.3 = 0.06$

(c)

- (1 mark) method to calculate probability

(e.g. $P(R$ and $N) + P(N$ and $R)$)

- (1 mark) $0.14 + 0.24 = 0.38$

Watch out for

- Students confuse the conditions for adding and multiplying probabilities.
- Students have misconceptions based on the operations with fractions.
- When constructing a tree diagram for a given situation, some students may struggle to distinguish between how events, and outcomes of those events, are represented.
- Students may not fully complete a tree diagram, leaving branches blank.

Slide 3: Let's go through it together…

Set 1: Using Simple Probability Trees.

Teaching Prompts

- If the probability of it raining is 0.2, what is the probability of it not raining? (0.8)
- What is the probability of it raining on Tuesday? (0.3)
- So what is the probability of it not raining? ($1\text{-}0.3 = 0.7$)
- Can you calculate each of the possible outcomes by multiplying along the branches

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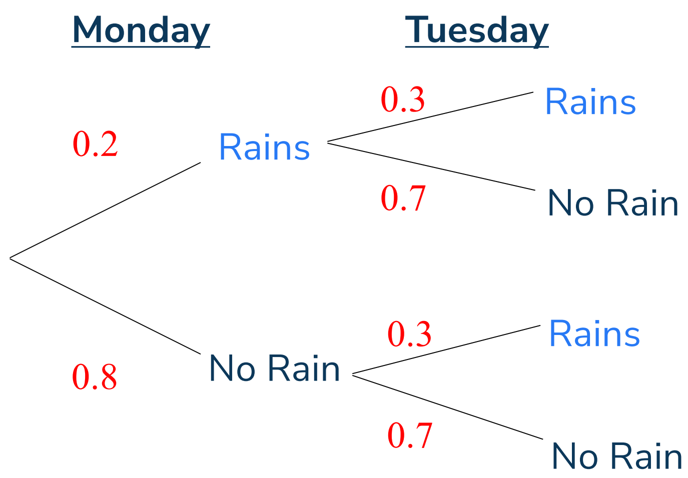
Answers



Mark Scheme

(a)

- (1 mark) first set of branches correct
- (1 mark) all branches correct (probabilities do not need to be calculated)

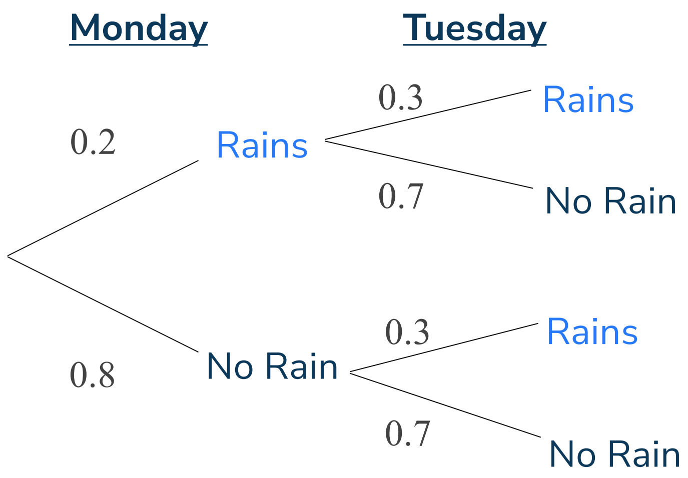
Slide 4: Let's go through it together...

Set 1: Using Simple Probability Trees.

Teaching Prompts

- Can you identify the probability for it raining both on Monday and Tuesday?

Answers



$P(R \text{ and } R) = 0.2 \times 0.3 = 0.06$

$P(R \text{ and } N) = 0.2 \times 0.7 = 0.14$

$P(N \text{ and } R) = 0.8 \times 0.3 = 0.24$

$P(N \text{ and } N) = 0.8 \times 0.7 = 0.56$

Mark Scheme

(b)

- (1 mark) $0.2 \times 0.3 = 0.06$

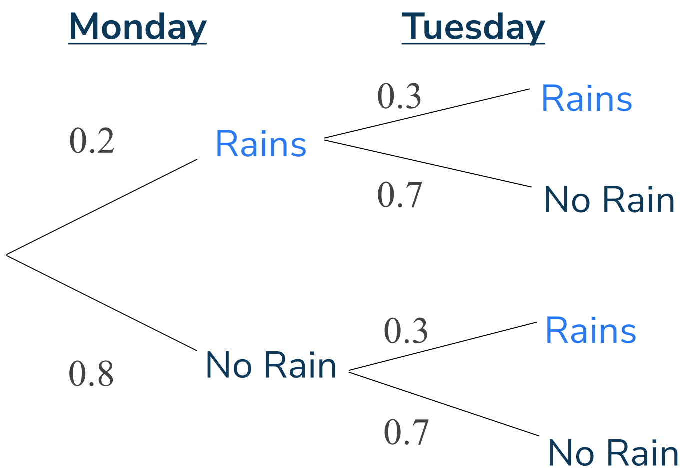
Slide 5: Let's go through it together...

Set 1: Using Simple Probability Trees.

Teaching Prompts

- Can you work out which outcomes we need from the diagram?

Answers



$P(R \text{ and } R) = \quad 0.2 \times 0.3 = 0.06$

$P(R \text{ and } N) = \quad 0.2 \times 0.7 = 0.14$

$P(N \text{ and } R) = \quad 0.8 \times 0.3 = 0.24$

$P(N \text{ and } N) = \quad 0.8 \times 0.7 = 0.56$

Mark Scheme

(c)

- (1 mark) method to calculate probability (e.g. $P(R$ and $N) + P(N$ and $R)$)
- (1 mark) $0.14 + 0.24 = 0.38$

Slide 6: Your turn...

Set 1: Using Simple Probability Trees.

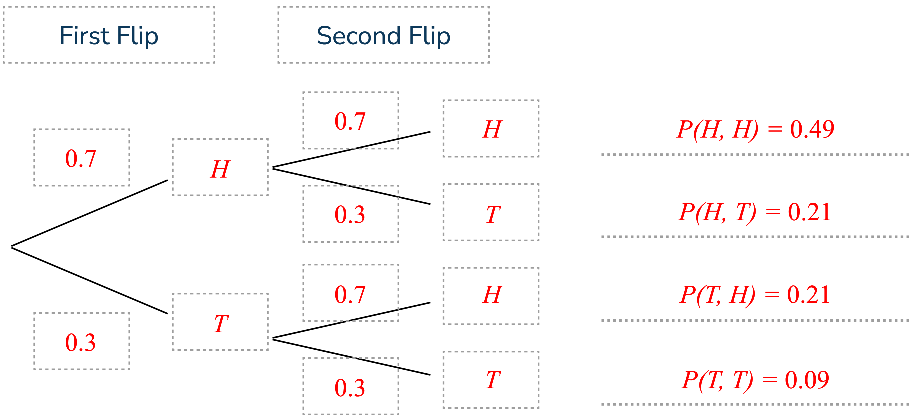
Teaching Prompts

- What could we title each set of branches? (first flip, second flip)
- What do we need to label each branch? (H and T)
- What is the probability of getting a heads? (0.7)
- So what is the probability of getting a tails? (0.3)

Mark Scheme

(a)

- (1 mark) first set of branches correct
- (1 mark) all branches correct (probabilities do not need to be calculated)



(b)

- (1 mark) $0.7 \times 0.7 = 0.49$

(c)

- (1 mark) method to calculate probability e.g. $P(H,T) + P(H,T)$

(1 mark) $0.21 + 0.21 = 0.42$

Slide 7: Try this exam-style question

Set 2: Calculating Probabilities without Replacement.

Teaching Prompts

- Can you try this question by yourself?

If Stuck

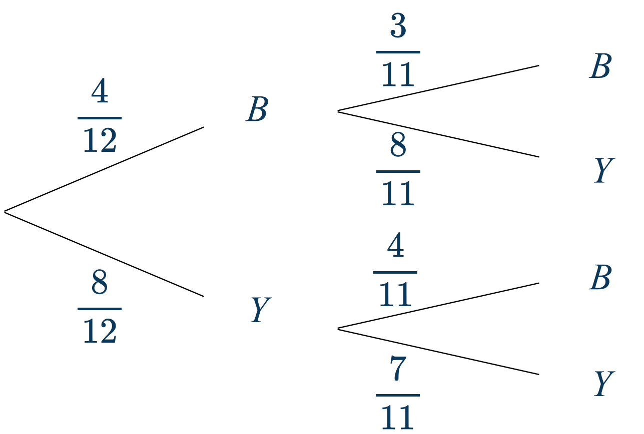
- Move on to the next slide.

Mark Scheme

(a)

- (1 mark) first set of branches correct
- (1 mark) all branches correct (probabilities do not need to be calculated)

First Pick   Second Pick



$$P(BB) = \frac{4}{12} \times \frac{3}{11} = \frac{12}{132}$$

$$P(BY) = \frac{4}{12} \times \frac{8}{11} = \frac{32}{132}$$

$$P(YB) = \frac{8}{12} \times \frac{4}{11} = \frac{32}{132}$$

$$P(YY) = \frac{8}{12} \times \frac{7}{11} = \frac{56}{132}$$

(b)

- (1 mark) $\frac{32}{132}$ **or equivalent**

(c)

- (1 mark) method to calculate probability e.g. $1 - \frac{56}{132}$
- (1 mark) $\frac{76}{132}$ **or equivalent**

Slide 7: Try this exam-style question

Watch out for

- Students confuse the conditions for adding and multiplying probabilities.
- Students have misconceptions based on the operations with fractions.
- When constructing a tree diagram for a given situation, some students may struggle to distinguish between how events, and outcomes of those events, are represented.
- Students may not fully complete a tree diagram, leaving branches blank.
- Students do not edit the probability when the probability is dependent on the previous event (e.g. removing a button from a bag, changes the number of buttons of that colour, and the number of buttons in the bag).

Slide 8: Let's go through it together…

Set 2: Calculating Probabilities without Replacement.

Teaching Prompts

1) If Rachel starts with 12 cubes and 4 are blue, what is the probability on her first pick that the cube will be blue? $\left(\frac{4}{12}\right)$

1) Therefore, what is the probability of the cube being yellow? $\left(\frac{8}{12}\right)$

2a) If she picks a blue cube first, how many blue cubes are left? (3) And how many cubes in total? (11) So what is the probability of picking blue now? $\left(\frac{3}{11}\right)$

2a) And what is the probability of picking yellow if she picked blue first? $\left(\frac{8}{11}\right)$

2b) If she picks a yellow cube first, how many blue cubes are left? (4) And how many cubes in total? (11) So what is the probability of picking blue ? $\left(\frac{4}{11}\right)$

2b) If she picks yellow first, how many yellow cubes are left? (7) So what is the probability now of picking yellow? $\left(\frac{7}{11}\right)$

- Can you complete the outcomes?

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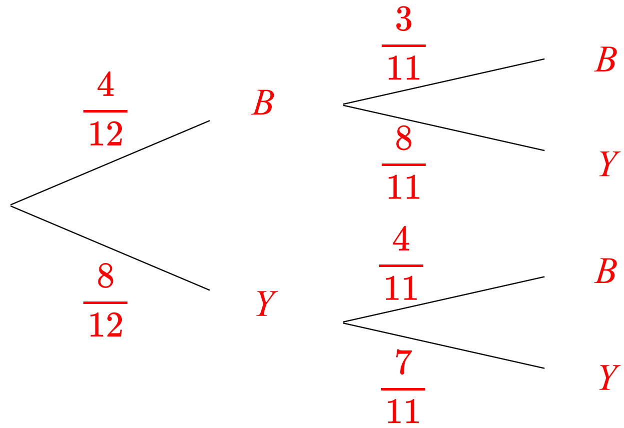
Mark Scheme

(a)

- (1 mark) first set of branches correct
- (1 mark) all branches correct (probabilities do not need to be calculated)

First Pick Second Pick



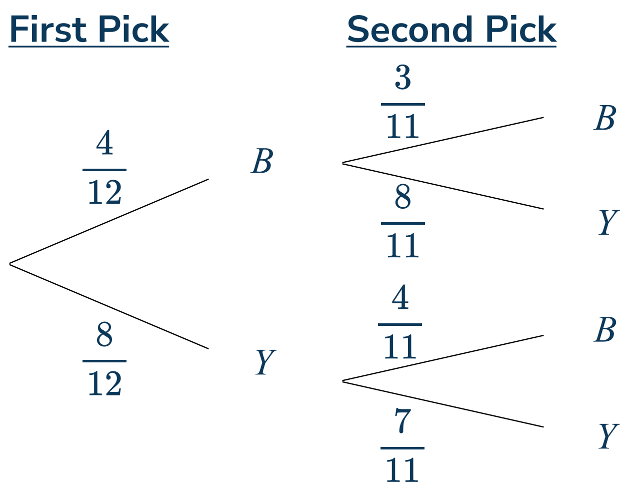
Slide 9: Let's go through it together...

Set 2: Calculating Probabilities without Replacement.

Teaching Prompts

- Can you highlight which branches would be needed to pick a blue and then a yellow?
- What is the rule when we hve the probability of one event, and another event? (multiply the probabilities)
- Do any other branches need to be considered? (No)

Mark Scheme



$$P(BB) = \frac{4}{12} \times \frac{3}{11} = \frac{12}{132}$$

$$P(BY) = \frac{4}{12} \times \frac{8}{11} = \frac{32}{132}$$

$$P(YB) = \frac{8}{12} \times \frac{4}{11} = \frac{32}{132}$$

$$P(YY) = \frac{8}{12} \times \frac{7}{11} = \frac{56}{132}$$

(b)

- (1 mark) $\frac{32}{132}$ **or equivalent**

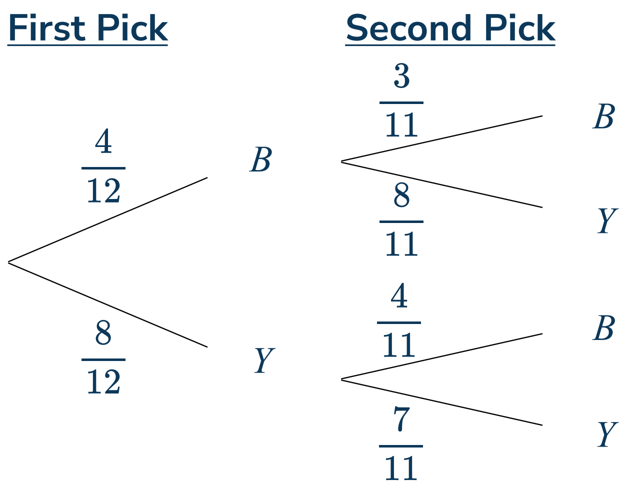
Slide 10: Let's go through it together...

Set 2: Calculating Probabilities without Replacement.

Teaching Prompts

- Can you highlight the ways you could pick at least one blue cube?
- How could we use the probability of this NOT happening to calculate the solution quickly? (We can use 1 - $P(Y,Y)$ to find the total of the other probabilities)

Mark Scheme



$$P(BB) = \frac{4}{12} \times \frac{3}{11} = \frac{12}{132}$$

$$P(BY) = \frac{4}{12} \times \frac{8}{11} = \frac{32}{132}$$

$$P(YB) = \frac{8}{12} \times \frac{4}{11} = \frac{32}{132}$$

$$P(YY) = \frac{8}{12} \times \frac{7}{11} = \frac{56}{132}$$

(c)

- (1 mark) method to calculate probability e.g. $1 - \frac{56}{132}$
- **(1 mark) $\frac{76}{132}$ or equivalent**

Slide 11: Your turn...

Set 2: Calculating Probabilities without Replacement.

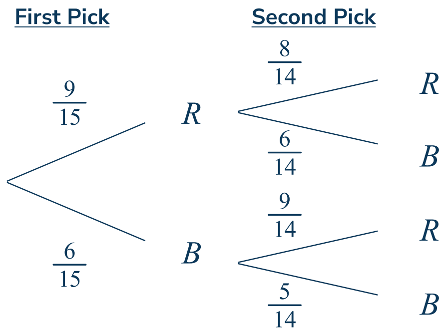
Teaching Prompts

- If Harley starts with 15 buttons and 9 are red, what is the probability on her first pick being red? $\left(\frac{9}{15}\right)$
- And the probability of it being blue? $\left(\frac{6}{15}\right)$
- If she picks a red button first, how many red buttons are left? (8) And how many cubes in total? (14) So what is the probability of picking red now? $\left(\frac{8}{14}\right)$
- And what is the probability of picking blue if she picked red first? $\left(\frac{6}{14}\right)$
- If she picks a blue button first, how many red buttons are left? (9) And how many cubes in total? (14) So what is the probability of picking blue ? $\left(\frac{9}{14}\right)$
- If she picks blue first, how many blue buttons are left? (5) So what is the probability now of picking yellow? $\left(\frac{5}{14}\right)$
- Can you complete the outcomes?

Mark Scheme

(a)

- (1 mark) first set of branches correct
- (1 mark) all branches correct (probabilities do not need to be calculated)



$P(R, R) = \frac{9}{15} \times \frac{8}{14} = \frac{12}{35}$

$P(R, B) = \frac{9}{15} \times \frac{6}{14} = \frac{9}{35}$

$P(B, R) = \frac{6}{15} \times \frac{9}{14} = \frac{9}{35}$

$P(B, B) = \frac{6}{15} \times \frac{5}{14} = \frac{1}{7}$

(b)

- (1 mark) $\frac{1}{7}$ or equivalent

(c)

- (1 mark) method to calculate probability e.g. $1 - \frac{1}{7}$
- (1 mark) $\frac{6}{7}$ or equivalent

Slide 12: Try this exam-style question

Set 3: Completing More Complex Tree Diagrams.

Teaching Prompts

- Can you try this question by yourself?

If Stuck

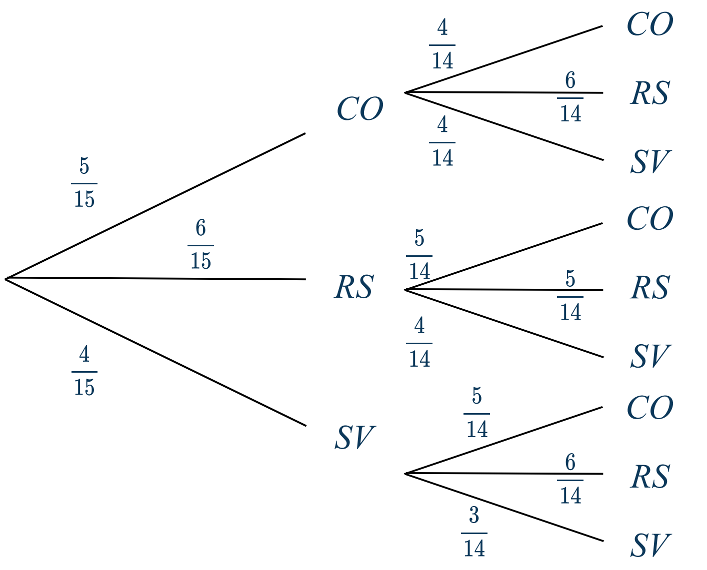
- Move on to the next slide.

Mark Scheme

(a)

- (1 mark) first set of branches correct
- (1 mark) five of branches in second set correct
- (1 mark) all branches correct (probabilities do not need to be calculated)

<u>First Pick</u> <u>Second Pick</u>



$$P(CO, CO) = \frac{5}{15} \times \frac{4}{14} = \frac{20}{210} = \frac{2}{21}$$
$$P(CO, RS) = \frac{5}{15} \times \frac{6}{14} = \frac{30}{210} = \frac{1}{7}$$
$$P(CO, SV) = \frac{5}{15} \times \frac{4}{14} = \frac{20}{210} = \frac{2}{21}$$
$$P(RS, CO) = \frac{6}{15} \times \frac{5}{14} = \frac{30}{210} = \frac{1}{7}$$
$$P(RS, RS) = \frac{6}{15} \times \frac{5}{14} = \frac{30}{210} = \frac{1}{7}$$
$$P(RS, SV) = \frac{6}{15} \times \frac{4}{14} = \frac{24}{210} = \frac{4}{35}$$
$$P(SV, CO) = \frac{4}{15} \times \frac{5}{14} = \frac{20}{210} = \frac{2}{21}$$
$$P(SV, RS) = \frac{4}{15} \times \frac{6}{14} = \frac{24}{210} = \frac{4}{35}$$
$$P(SV, SV) = \frac{4}{15} \times \frac{3}{14} = \frac{12}{210} = \frac{2}{35}$$

Slide 12: Try this exam-style question

(b)

- (1 mark) identifies two ways she can pick same flavour

$P(CO, CO) = \frac{5}{15} \times \frac{4}{14} = \frac{20}{210} = \frac{2}{21}$

$P(RS, RS) = \frac{6}{15} \times \frac{5}{14} = \frac{30}{210} = \frac{1}{7}$

$P(SV, SV) = \frac{4}{15} \times \frac{3}{14} = \frac{12}{210} = \frac{2}{35}$

- (1 mark) identifies all possible ways she can pick the same flavour
- (1 mark) $\frac{2}{21} + \frac{1}{7} + \frac{2}{35} = \frac{31}{105}$

(c)

- (1 mark) identifies two ways she can pick at least one pack of ready salted OR all the ways she can not

(At least one RS)

$P(CO, RS) = \frac{5}{15} \times \frac{6}{14} = \frac{30}{210} = \frac{1}{7}$

$P(RS, CO) = \frac{6}{15} \times \frac{5}{14} = \frac{30}{210} = \frac{1}{7}$

$P(RS, RS) = \frac{6}{15} \times \frac{5}{14} = \frac{30}{210} = \frac{1}{7}$

$P(RS, SV) = \frac{6}{15} \times \frac{4}{14} = \frac{24}{210} = \frac{4}{35}$

$P(SV, RS) = \frac{4}{15} \times \frac{6}{14} = \frac{24}{210} = \frac{4}{35}$

(No RS)

$P(CO, CO) = \frac{5}{15} \times \frac{4}{14} = \frac{20}{210} = \frac{2}{21}$

$P(CO, SV) = \frac{5}{15} \times \frac{4}{14} = \frac{20}{210} = \frac{2}{21}$

$P(SV, CO) = \frac{4}{15} \times \frac{5}{14} = \frac{20}{210} = \frac{2}{21}$

$P(SV, SV) = \frac{4}{15} \times \frac{3}{14} = \frac{12}{210} = \frac{2}{35}$

- (1 mark) $\frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{4}{35} + \frac{4}{35}$ or $1 - \frac{2}{21} + \frac{2}{21} + \frac{2}{21} + \frac{2}{35}$
- (1 mark) $\frac{23}{35}$

Watch out for

- Students confuse the conditions for adding and multiplying probabilities.
- Students have misconceptions based on the operations with fractions.
- Students do not edit the probability when the probability is dependent on the previous event (e.g. removing a button from a bag, changes the number of buttons of that colour, and the number of buttons in the bag).

Slide 13: Let's go through i together...

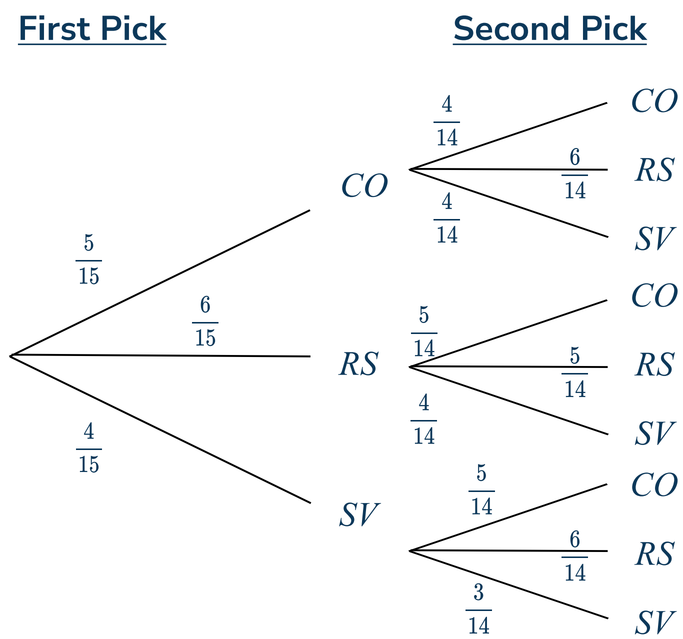
Set 3: Completing More Complex Tree Diagrams.

Teaching Prompts

- Does Ethel replace the pack after she picks it? (No)
- How will this effect our probabilities in our second pick? (it will be out of 14 instead and we need to subtract 1 from whichever pack she did pick)

Answers

(a)



Mark Scheme

(a)

- (1 mark) first set of branches correct
- (1 mark) five of branches in second set correct
- (1 mark) all branches correct (probabilities do not need to be calculated)

Slide 14: Let's go through it together...

Set 3: Completing More Complex Tree Diagrams.

Teaching Prompts

- How may possible ways can you pick the same flavour? (3)
- What branches can be followed giving the event of two packs of crisps with the same flavour?
- What do you do with the probabilities when moving along the branches? (multiply)
- Whaat do you do with the probabilities after multiplying along the branches? (add them together)

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(b)

- (1 mark) identifies two ways she can pick same flavour

$$P(CO, CO) = \frac{5}{15} \times \frac{4}{14} = \frac{20}{210} = \frac{2}{21}$$

$$P(RS, RS) = \frac{6}{15} \times \frac{5}{14} = \frac{30}{210} = \frac{1}{7}$$

$$P(SV, SV) = \frac{4}{15} \times \frac{3}{14} = \frac{12}{210} = \frac{2}{35}$$

- (1 mark) identifies all possible ways she can pick the same flavour
- (1 mark) $\frac{2}{21} + \frac{1}{7} + \frac{2}{35} = \frac{31}{105}$

THIRD SPACE LEARNING

Slide 15: Let's go through it together...

Set 3: Completing More Complex Tree Diagrams.

Teaching Prompts

- How may possible ways can you pick at least one RS? (5)
- What branches can be followed giving the event of at least one RS?
- What do you do with the probabilities when moving along the branches? (multiply)
- What do you do with the probabilities after multiplying along the branches? (add them together)

(c)

- (1 mark) identifies two ways she can pick at least one pack of ready salted OR all the ways she can not

(At least one RS)

$P(CO, RS) = \frac{5}{15} \times \frac{6}{14} = \frac{30}{210} = \frac{1}{7}$

$P(RS, CO) = \frac{6}{15} \times \frac{5}{14} = \frac{30}{210} = \frac{1}{7}$

$P(RS, RS) = \frac{6}{15} \times \frac{5}{14} = \frac{30}{210} = \frac{1}{7}$

$P(RS, SV) = \frac{6}{15} \times \frac{4}{14} = \frac{24}{210} = \frac{4}{35}$

$P(SV, RS) = \frac{4}{15} \times \frac{6}{14} = \frac{24}{210} = \frac{4}{35}$

(No RS)

$P(CO, CO) = \frac{5}{15} \times \frac{4}{14} = \frac{20}{210} = \frac{2}{21}$

$P(CO, SV) = \frac{5}{15} \times \frac{4}{14} = \frac{20}{210} = \frac{2}{21}$

$P(SV, CO) = \frac{4}{15} \times \frac{5}{14} = \frac{20}{210} = \frac{2}{21}$

$P(SV, SV) = \frac{4}{15} \times \frac{3}{14} = \frac{12}{210} = \frac{2}{35}$

- (1 mark) $\frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{4}{35} + \frac{4}{35}$ or $1 - \frac{2}{21} + \frac{2}{21} + \frac{2}{21} + \frac{2}{35}$
- (1 mark) $\frac{23}{35}$

Slide 16: Your turn...

Set 3: Completing More Complex Tree Diagrams.

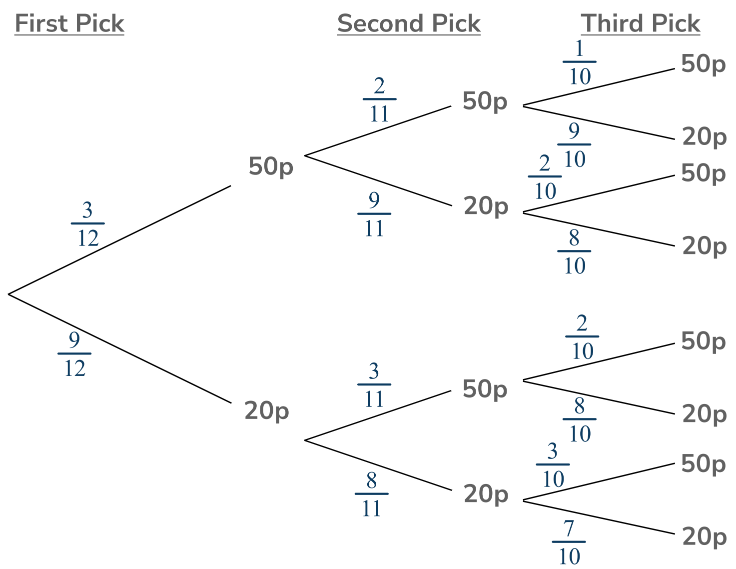
Teaching Prompts

- Does Mandy replace the coins? (No)
- What is the probability of getting each coin on the first pick? (50p = $\frac{3}{12}$, 20p = $\frac{9}{12}$)
- What is the probability of getting each coin on the second pick if you picked 50p first? (50p = $\frac{2}{11}$, 20p = $\frac{9}{11}$)
- What is the probability of getting each coin on the second pick if you picked 20p first? (50p = $\frac{3}{11}$, 20p = $\frac{8}{11}$)
- What is the probability of getting each coin on the third pick, if you picked 50p then 50p? (50p = $\frac{1}{10}$, 20p = $\frac{9}{10}$)

Mark Scheme

(a)

- (1 mark) first set of branches correct
- (1 mark) second set of branches correct
- (1 mark) all branches correct (probabilities don't need to be calculated)



Slide 16: Your turn...

(b)

- (1 mark) identifies two ways she can pick £1.20

  P(50p, 50p, 20p) = $\frac{9}{220}$

  P(50p, 20p, 50p) = $\frac{9}{220}$

  P(20p, 50p, 50p) = $\frac{9}{220}$

- (1 mark) identifies all possible ways she can pick £1.20
- (1 mark) $\frac{9}{220} + \frac{9}{220} + \frac{9}{220} = \frac{27}{220}$

(c)

- (1 mark) identifies two ways she can pick 90p

  P(50p, 20p, 20p) = $\frac{9}{55}$

  P(20p, 50p, 20p) = $\frac{9}{55}$

  P(20p, 20p, 50p) = $\frac{9}{55}$

- (1 mark) identifies all possible ways she can pick 90p
- (1 mark) $\frac{9}{55} + \frac{9}{55} + \frac{9}{55} = \frac{27}{55}$

Slide 17: Ready for a Challenge?

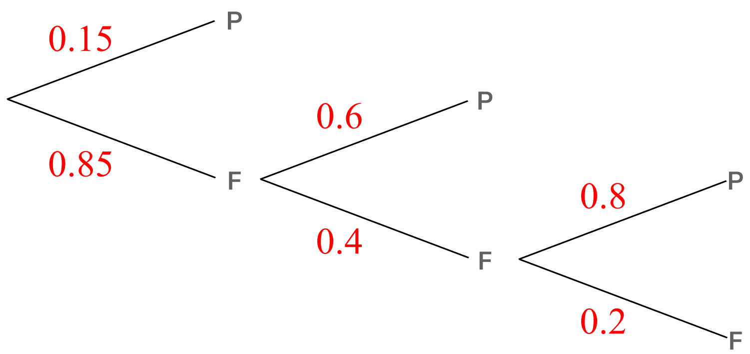
Teaching Prompts

- Do you need any branches after a Pass? (No)
- What is the probability that she fails each time? (0.85, 0.4, 0.2)

Mark Scheme

(a)

- (1 mark) two sets of branches correct
- (1 mark) all branches correct



(b)

- (1 mark) attempt to multiply 0.85 x 0.6
- (1 mark) 0.51

(c)

- (1 mark) attempt to multiply 0.85 x 0.4 x 0.2
- (1 mark) 0.068

Slide 18: What have we learnt?

Teaching Prompts

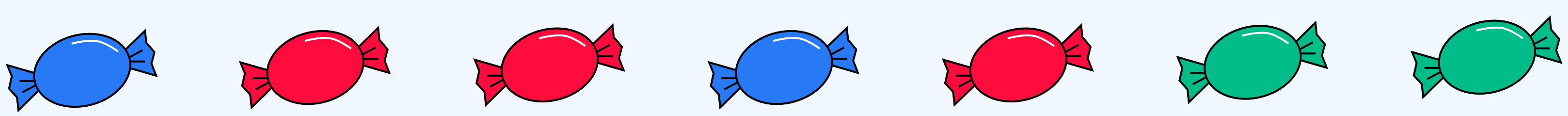
- Can you see where the student has gone wrong? (they haven't multiplied along the branches)
- What should they have done instead?
- $P(RR) = \frac{7}{12} \times \frac{7}{12} = \frac{49}{144}$
- $P(BB) = \frac{5}{12} \times \frac{5}{12} = \frac{25}{144}$
- $P(RR \text{ or } BB) = \frac{74}{144}$

- Can you see where the student has gone wrong? (they haven't accounted for the fact there is one less sock)
- What should they have done instead?
- $P(BW) = \frac{5}{11} \times \frac{6}{10} = \frac{30}{110}$
- $P(WB) = \frac{6}{10} \times \frac{5}{11} = \frac{30}{110}$
- $P(BW \text{ or } WB) = \frac{60}{110}$

Finding Probabilities Using Tree Diagrams

Which answer is correct?

I randomly pick a sweet and eat it. I then pick a second sweet.



What is the probability that I pick a red sweet first and then a blue sweet second?

A. $\frac{3}{7} \times \frac{2}{7} = \frac{6}{49}$

B. $\frac{3}{7} + \frac{2}{7} = \frac{5}{7}$

C. $\frac{3}{7} \times \frac{2}{6} = \frac{6}{42} = \frac{1}{7}$

D. $\frac{3}{7} + \frac{2}{6} = \frac{32}{42} = \frac{16}{21}$

THIRD SPACE
LEARNING

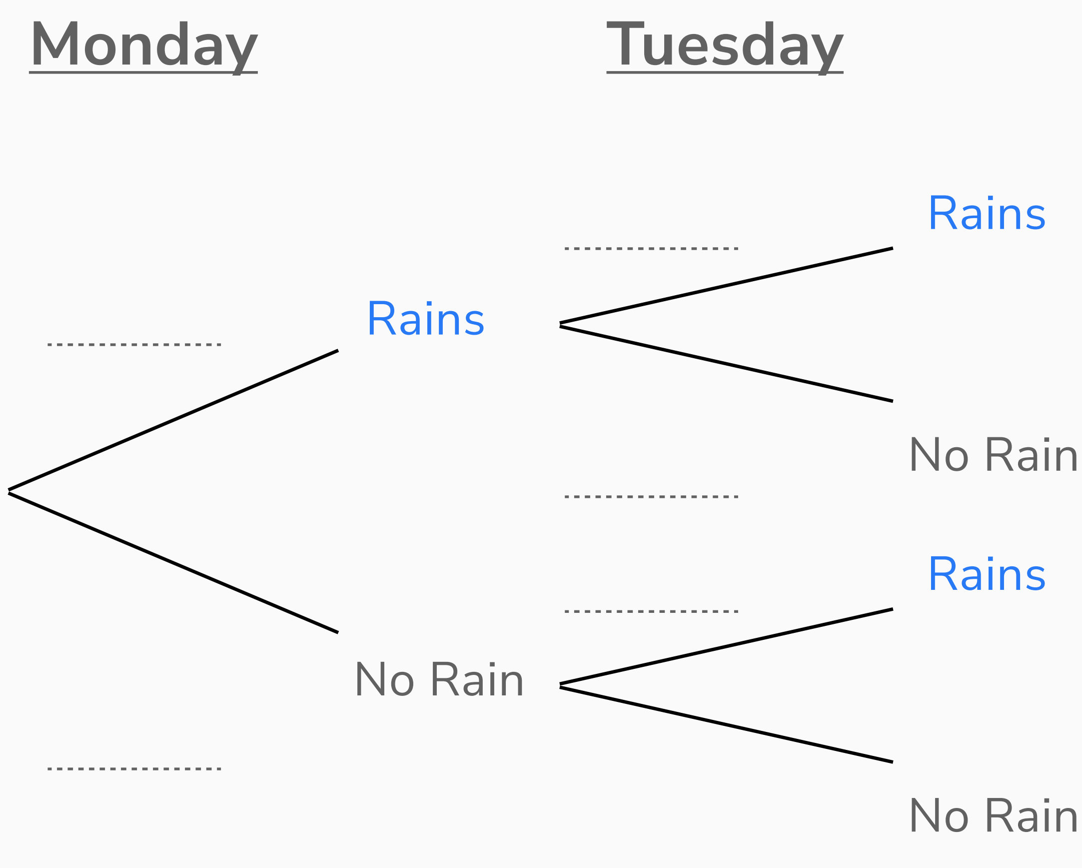
Try this exam-style question...

The probability that it will rain on Monday is 0.2. The probability that it will rain on Tuesday is 0.3.

a) Complete the tree diagram to represent this situation. (2)

b) Find the probability it rains on both Monday and Tuesday. .... (1)

c) Find the probability it rains on either Monday or Tuesday. .... (2)



$P(R \text{ and } R) =$ ....

$P(R \text{ and } N) =$ ....

$P(N \text{ and } R) =$ ....

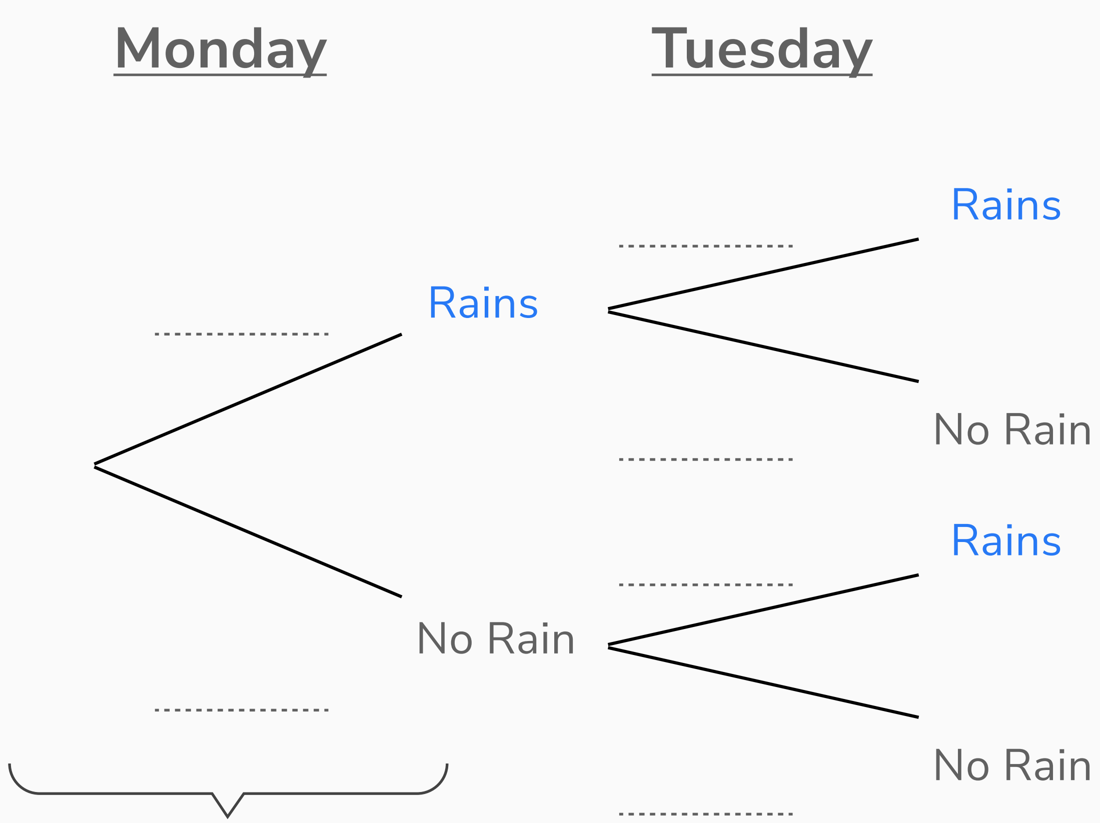
$P(N \text{ and } N) =$ ....

Let's go through it together...

The probability that it will rain on Monday is 0.2. The probability that it will rain on Tuesday is 0.3.

a) Complete the tree diagram to represent this situation. (2)

A **tree diagram** is a way of representing and calculating probabilities of **two or more events**.



The probabilities of each event are shown on the arms of each branch and sum to 1.

The probability of it raining on Monday is 0.2.

The probability of it not raining on Monday is $1 - 0.2 = 0.8$.

The probability of it raining on Tuesday is 0.3.

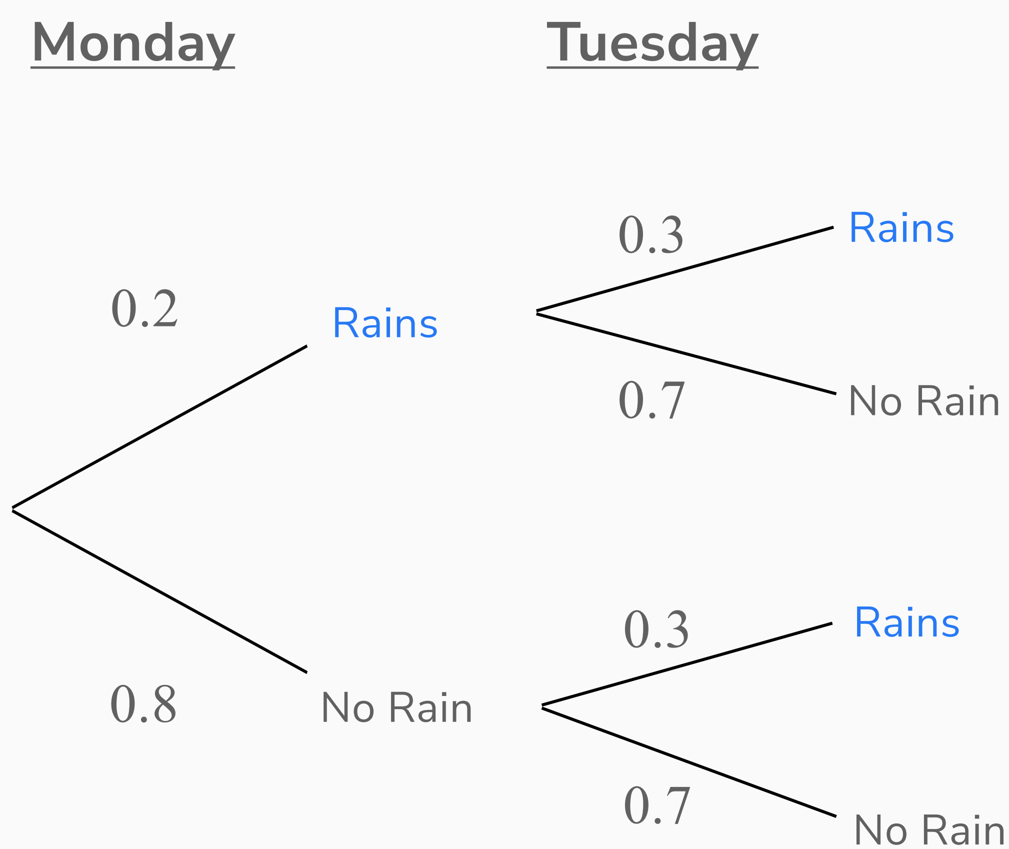
The probability of it not raining on Tuesday is $1 - 0.3 = 0.7$.

Let's go through it together...

The probability that it will rain on Monday is 0.2. The probability that it will rain on Tuesday is 0.3.

b) Find the probability it rains on both Monday and Tuesday.

P(A and B) = P(A) × P(B) so we multiply across branches



$P(R \text{ and } R) =$ ....

$P(R \text{ and } N) =$ ....

$P(N \text{ and } R) =$ ....

$P(N \text{ and } N) =$ ....

1 There is only one outcome where it rains on both Monday and Tuesday, what is the probability of this outcome?

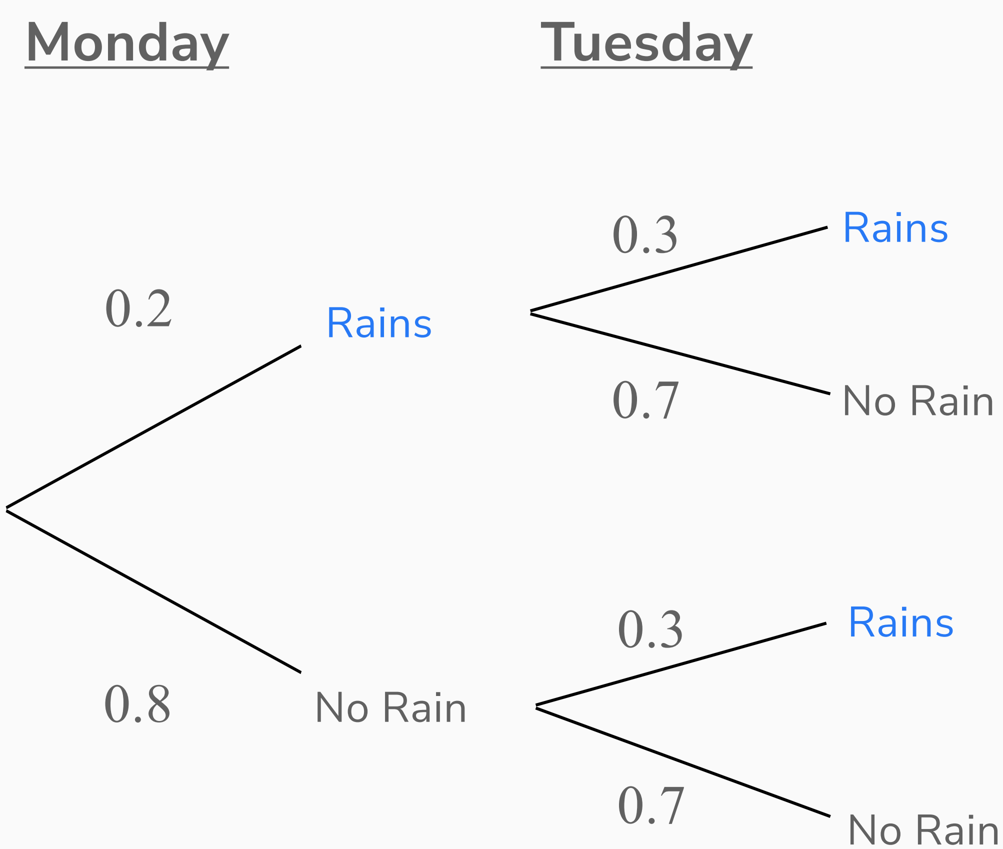
.... (1)

Let's go through it together...

The probability that it will rain on Monday is 0.2. The probability that it will rain on Tuesday is 0.3.

c) Find the probability it rains on either Monday <u>or</u> Tuesday.

P(A or B) = P(A) + P(B)
so we add if there are
multiple ways to get
an outcome



$P(R \text{ and } R) = 0.2 \times 0.3 = 0.06$

$P(R \text{ and } N) = 0.2 \times 0.7 = 0.14$

$P(N \text{ and } R) = 0.8 \times 0.3 = 0.24$

$P(N \text{ and } N) = 0.8 \times 0.7 = 0.56$

2 There are multiple ways that it could rain on either Monday or Tuesday. ADD these to find the total probability.

.... (2)

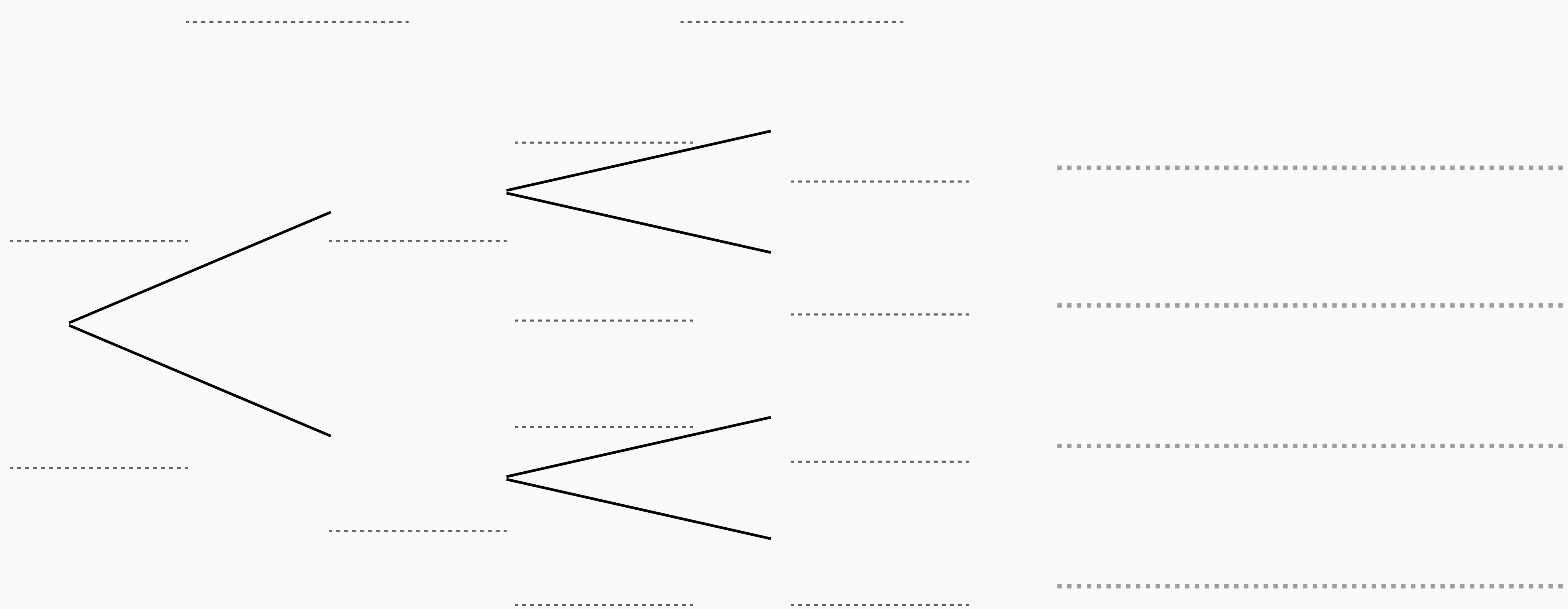
Your turn...

The probability of getting Heads on a biased coin is 0.7. The coin is flipped twice.

a) Complete the tree diagram. (2)

b) What is the probability of getting Heads twice? .... (1)

c) What is the probability of getting one each of Heads and Tails? .... (2)



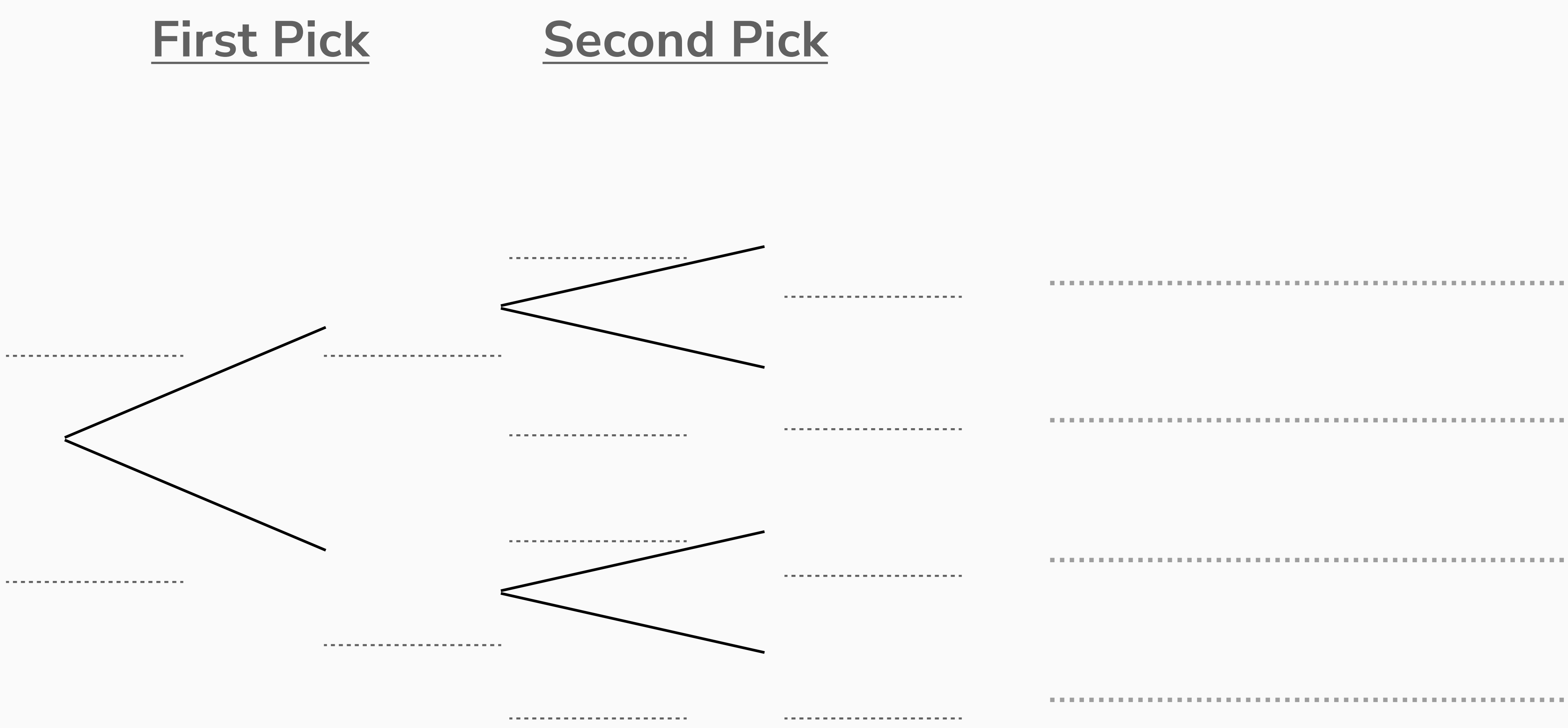
Try this exam-style question...

Rachel has 12 sweets in a bag. Four are blue and the rest are yellow.
She takes a sweet from the bag at random, eats it, then takes a second sweet.

a) Complete the tree diagram to show all possible outcomes. (2)

b) Calculate the probability she picks a blue sweet then a yellow sweet. (1)

c) Calculate the probability she picks a blue sweet at least once. (2)

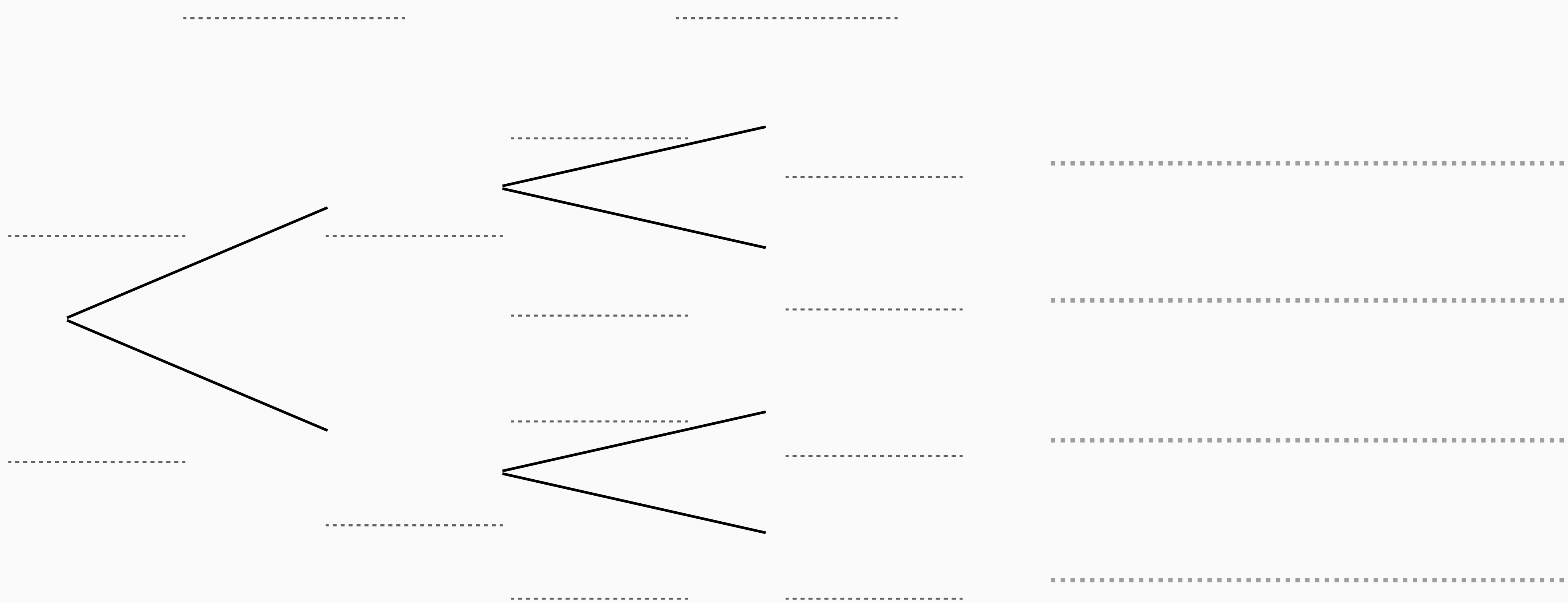


Let's go through it together...

Rachel has 12 sweets in a bag. Four are blue and the rest are yellow.
She takes a sweet from the bag at random, eats it, then takes a second sweet.

a) Complete the tree diagram to show all possible outcomes. (2)

First Pick Second Pick



We must consider whether an item is or is not replaced.
If it is not replaced, we need to adjust the second set of branches in our tree diagram to show this.

1. Complete the first set of branches.

2. Now consider, what happens if:

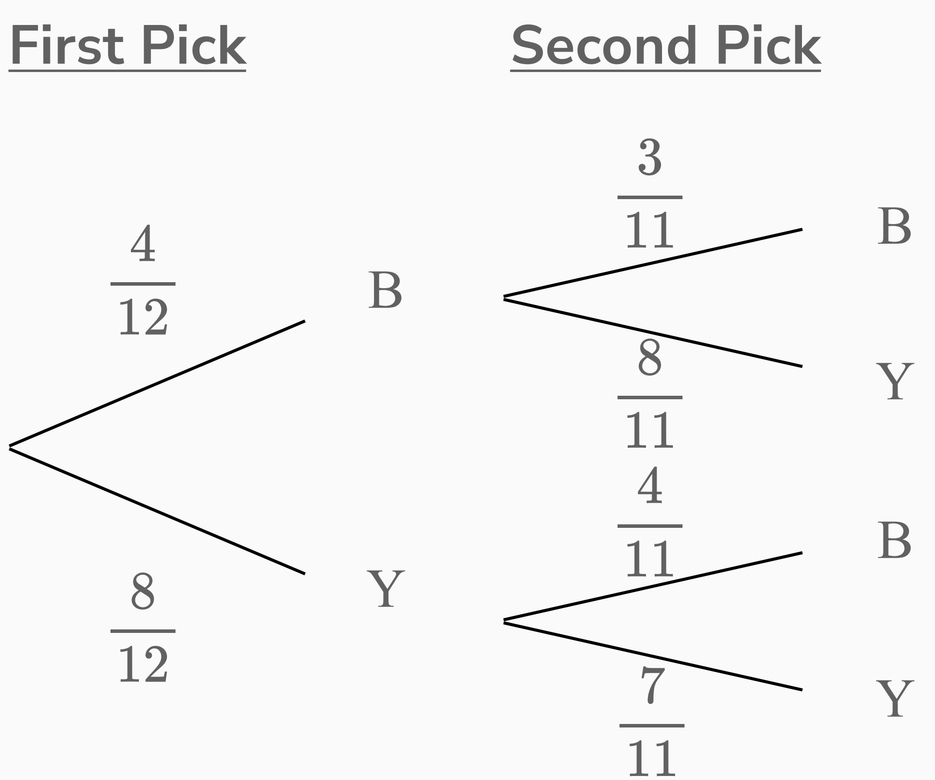
   a) She picked a blue sweet first?

   b) She picked a yellow sweet first?

Let's go through it together...

Rachel has 12 coloured sweets in a bag. Four of them are blue and the rest are yellow.
She takes a sweet from the bag at random, eats it, then takes a second sweet.

b) Calculate the probability she picks a blue sweet then a yellow sweet. (1)



$P(B \text{ and } B) =$ ....

$P(B \text{ and } Y) =$ ....

$P(Y \text{ and } B) =$ ....

$P(Y \text{ and } Y) =$ ....

1 There is only one outcome where Rachel picks a blue sweet and then a yellow, what is the probability of this outcome?

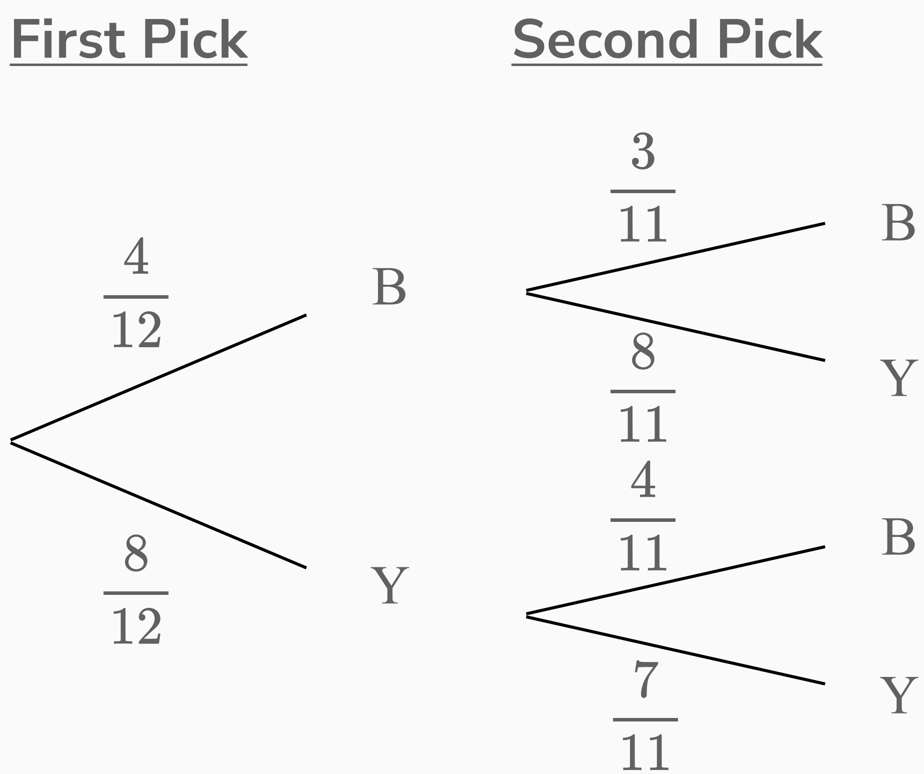
....

(1)

Let's go through it together...

Rachel has 12 coloured sweets in a bag. Four of them are blue and the rest are yellow.
She takes a sweet from the bag at random, eats it, then takes a second sweet.

c) Calculate the probability she picks a blue sweet at least once. (2)



$P(B \text{ and } B) = \frac{4}{12} \times \frac{3}{11} = \frac{12}{132}$

$P(B \text{ and } Y) = \frac{4}{12} \times \frac{8}{11} = \frac{32}{132}$

$P(Y \text{ and } B) = \frac{8}{12} \times \frac{4}{11} = \frac{32}{132}$

$P(Y \text{ and } Y) = \frac{8}{12} \times \frac{7}{11} = \frac{56}{132}$

2 There are multiple ways that Rachel, could pick a blue sweet - how could we work out this probability?

....

(2)

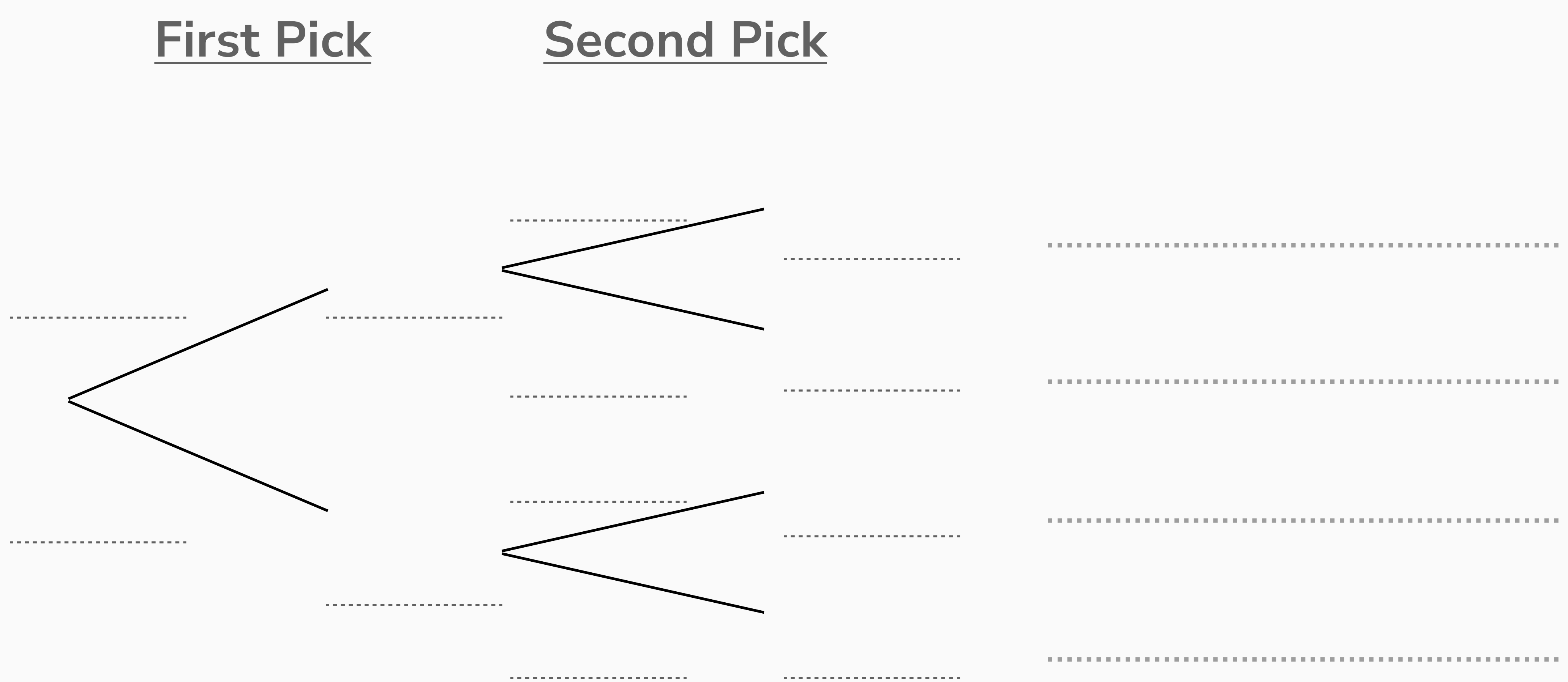
Your turn...

There are 15 buttons in a bag. 9 are red, 6 are blue.
Harley picks one at random, and keeps it. She then takes a second button from the bag.

a) Complete the tree diagram to show all possible outcomes. (2)

b) Calculate the probability a blue button is picked both times. .... (1)

c) Calculate the probability a red button is picked at least once. .... (2)



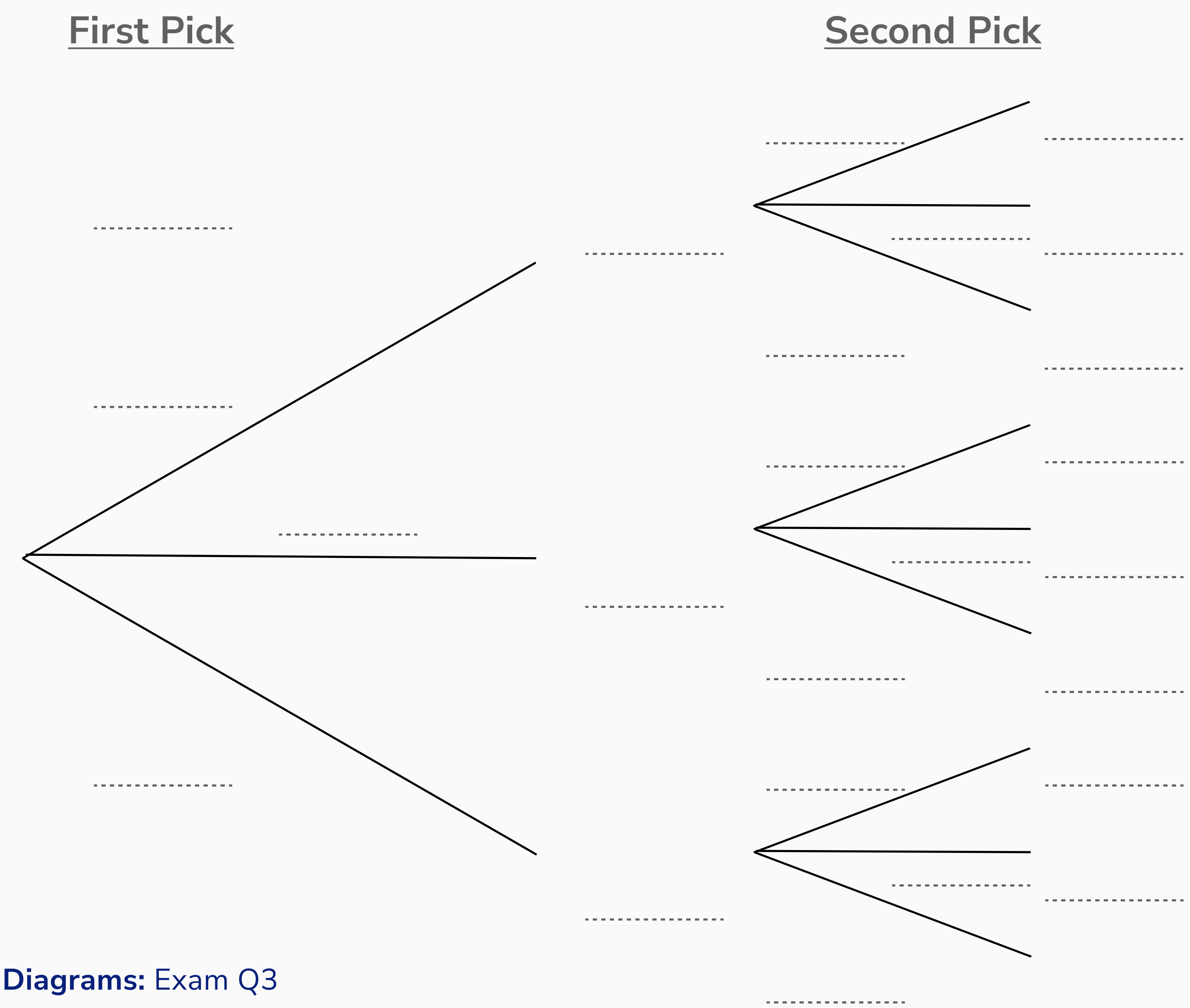
Try this exam-style question...

There are three types of crisps in a box. 5 cheese and onion (CO), 6 ready salted (RS), and 4 salt and vinegar (SV). Ethel picks two packs at random.

a) Complete the diagram. (3)

b) Find the probability she picks two packs of the same flavour. .... (3)

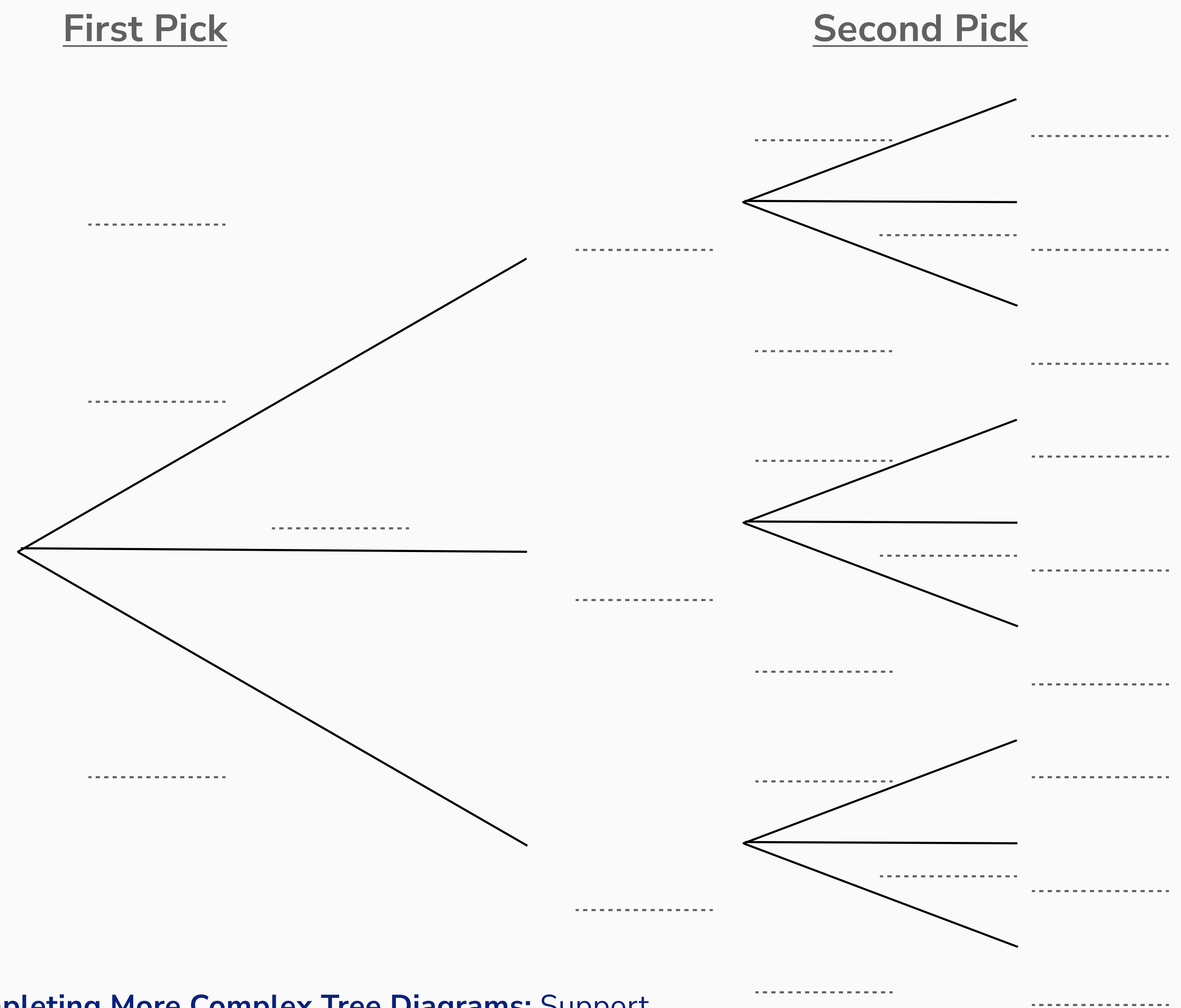
c) Find the probability she picks at least one pack of Ready Salted. .... (3)



Let's go through it together...

There are three types of crisps in a box. 5 cheese and onion (CO), 6 ready salted (RS), and 4 salt and vinegar (SV). Ethel picks two packs at random.

a) Complete the diagram.

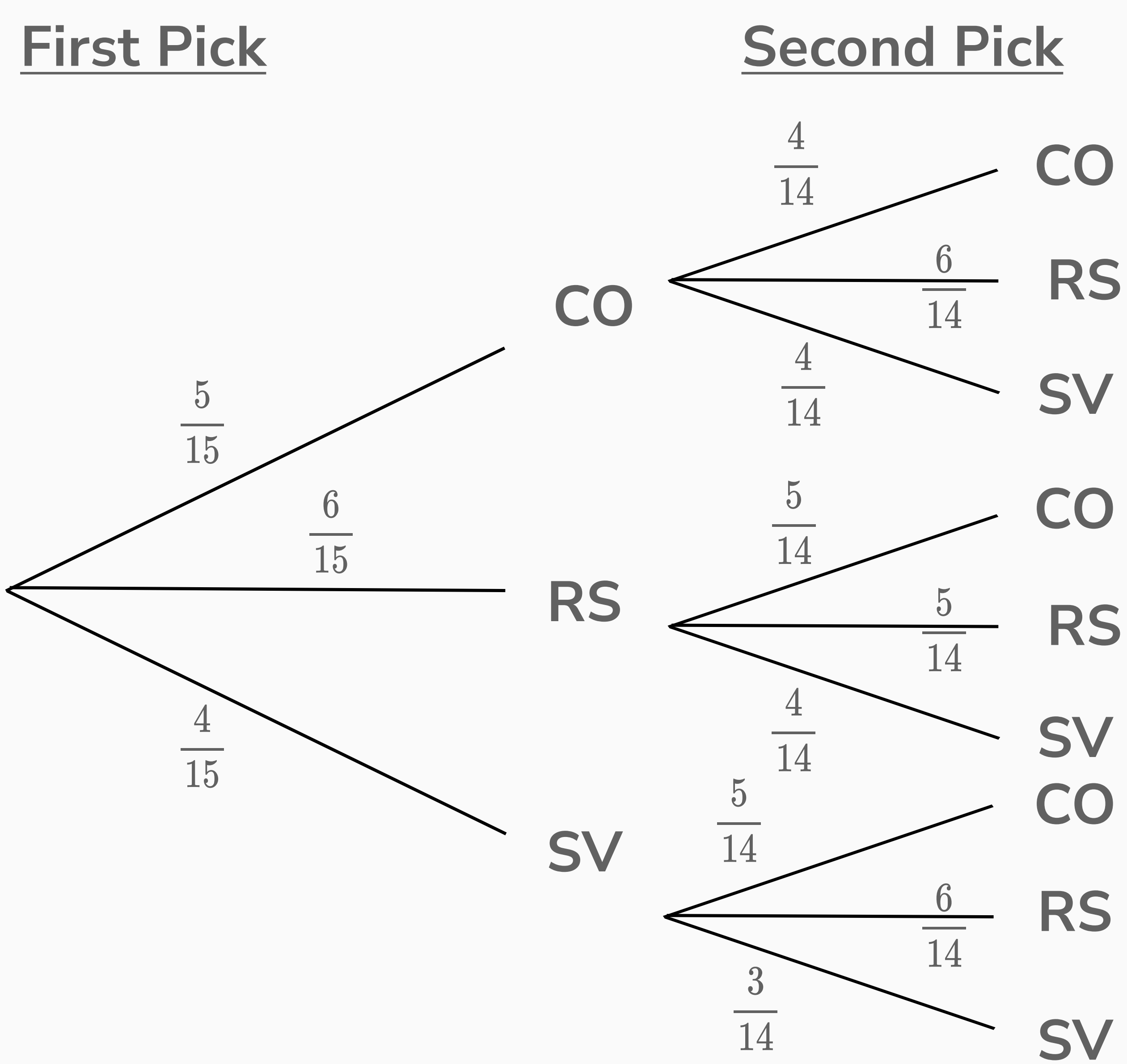


Remember to think about whether the first pack has been replaced!

Let's go through it together...

There are three types of crisps in a box. 5 cheese and onion (CO), 6 ready salted (RS), and 4 salt and vinegar (SV). Ethel picks two packs of crisps at random.

b) Find the probability she picks two packs of the same flavour. .... (3)

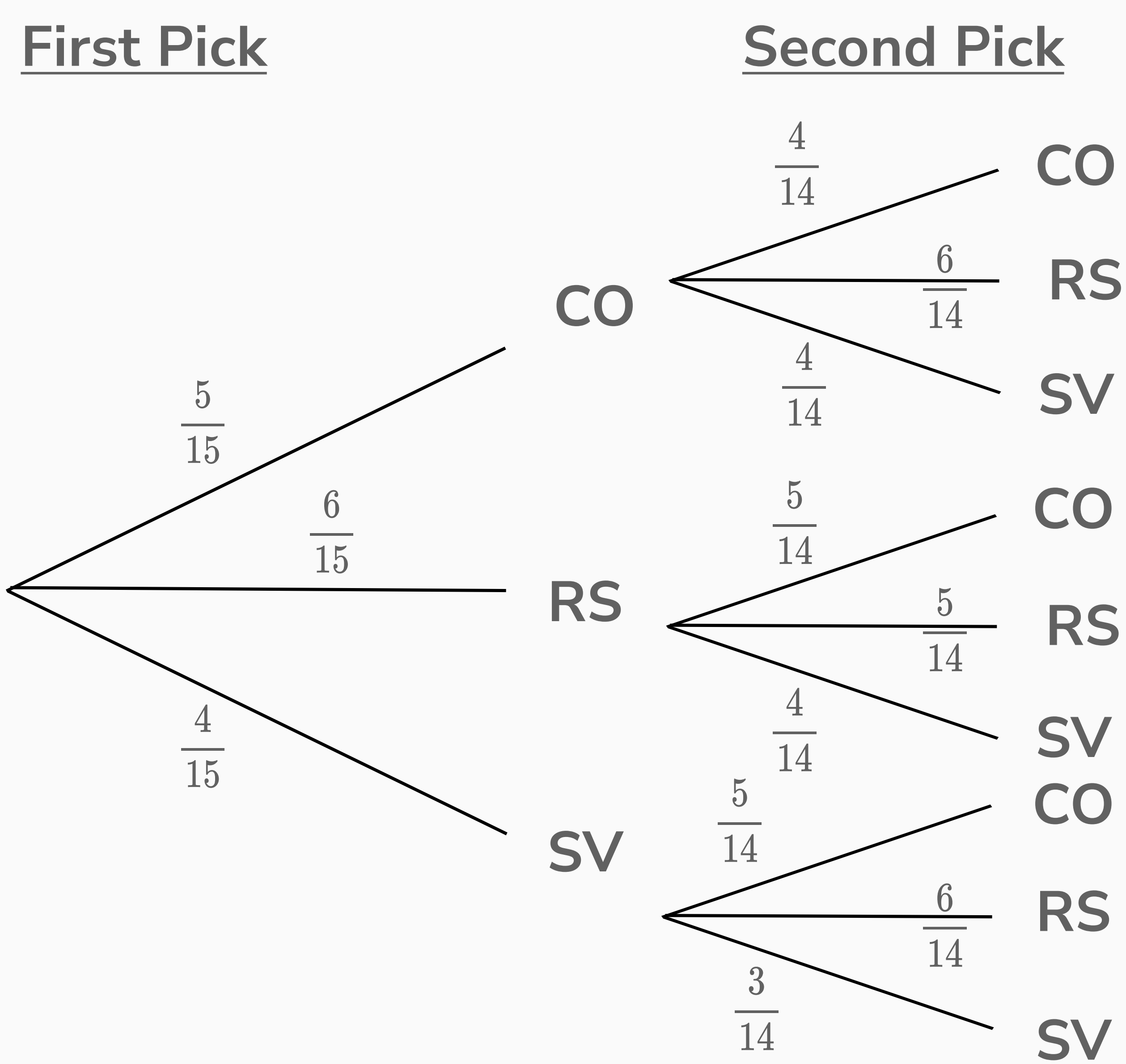


1. Highlight all the pathways which would result in two packs of the same flavour.
2. Calculate the probabilities for those pathways.
3. Add together the probabilities to find the total probability of packing two packs of the same flavour.

Let's go through it together...

There are three types of crisps in a box. 5 cheese and onion (CO), 6 ready salted (RS), and 4 salt and vinegar (SV). Ethel picks two packs of crisps at random.

c) Find the probability she picks at least one pack of Ready Salted. .... (3)



1. Highlight all the pathways which would result in **at least** one pack of Ready Salted.
2. Calculate the probabilities for those pathways.
3. Add together the probabilities to find the total probability of picking at least one pack of Ready Salted.

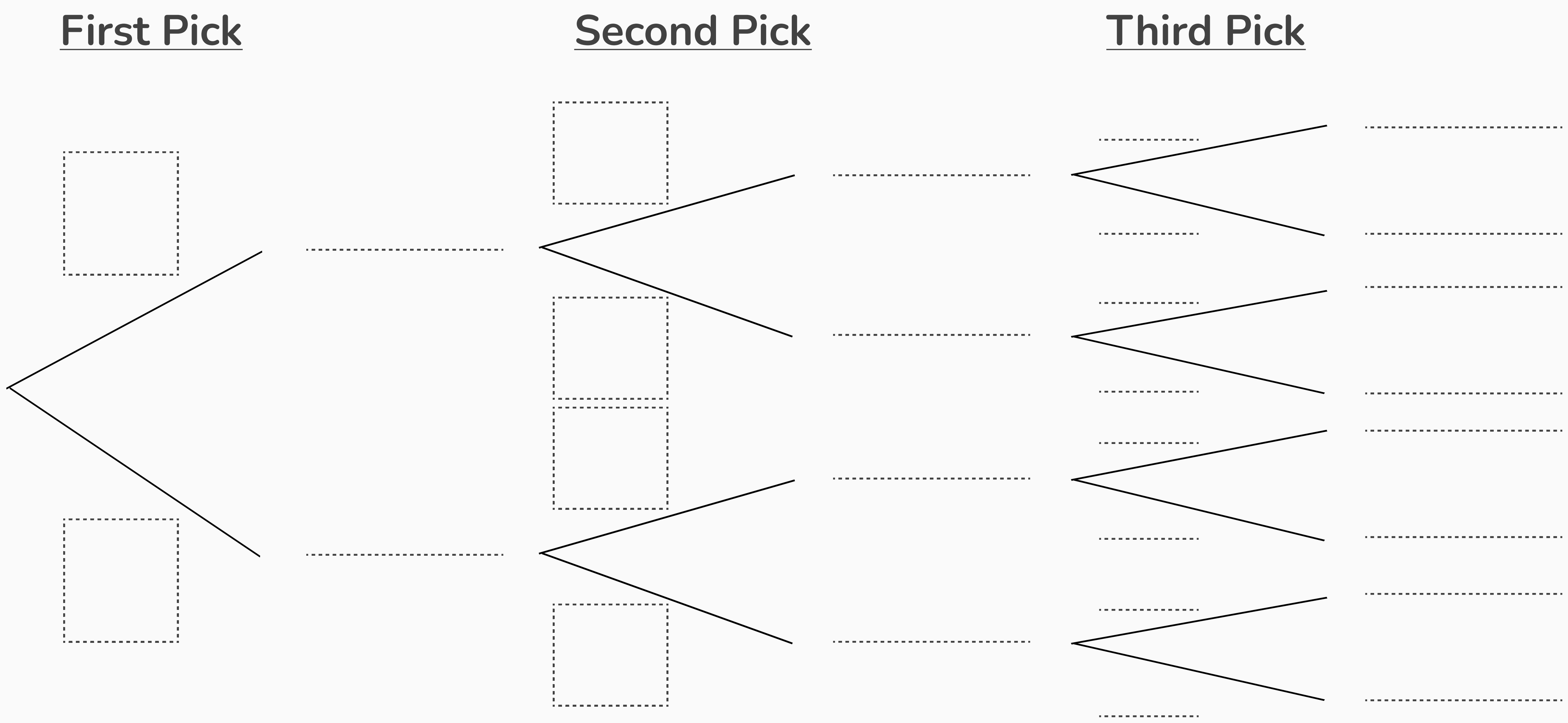
Your turn...

Mandy has 12 coins in a bag. There are three 50p pieces and nine 20p pieces. Mandy takes three coins from the bag at random.

a) Complete the diagram. (3)

b) What is the probability Mandy picks coins which sum £1.20? .... (3)

c) What is the probability Mandy picks coins which sum to 90p? .... (3)



Ready for a Challenge?

Maheema is taking her driving test.
The probability she passes first time is 0.15, the probability she passes second time is 0.6 and the probability she passes third time is 0.8.

a) Draw a tree diagram to represent all possible outcomes. (2)

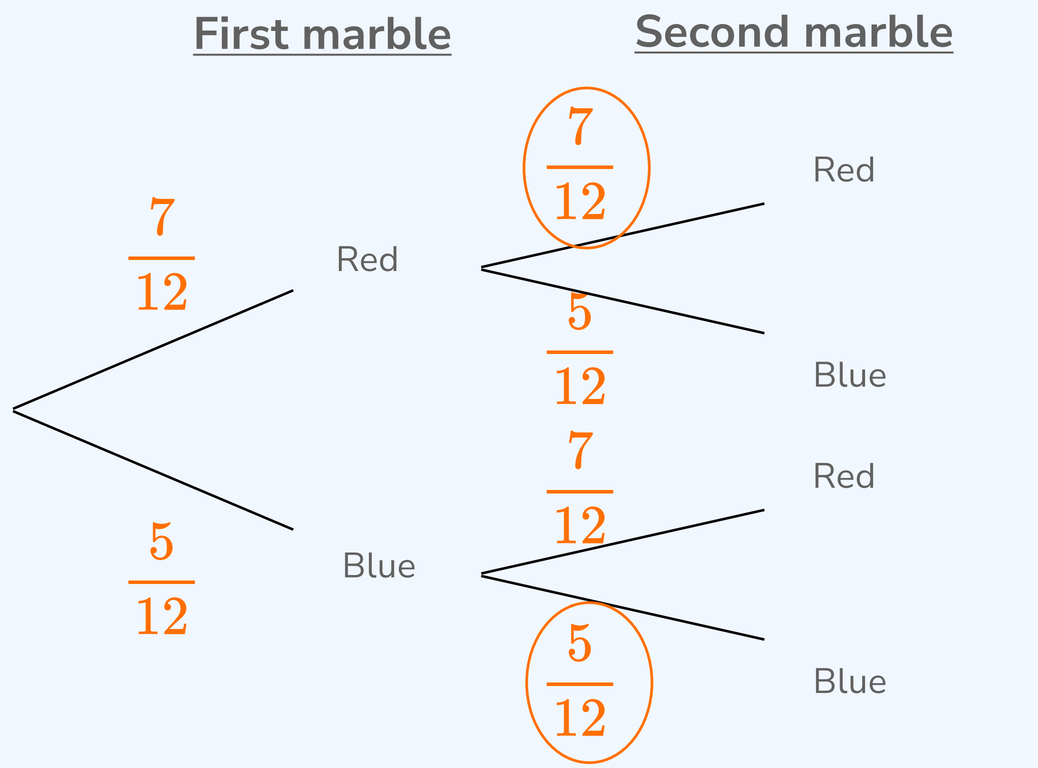
b) Calculate the probability she passes the second time. .... (2)

c) Calculate the probability she fails all three times. .... (2)

What have we learnt?

Can you correct the answers to the questions below?

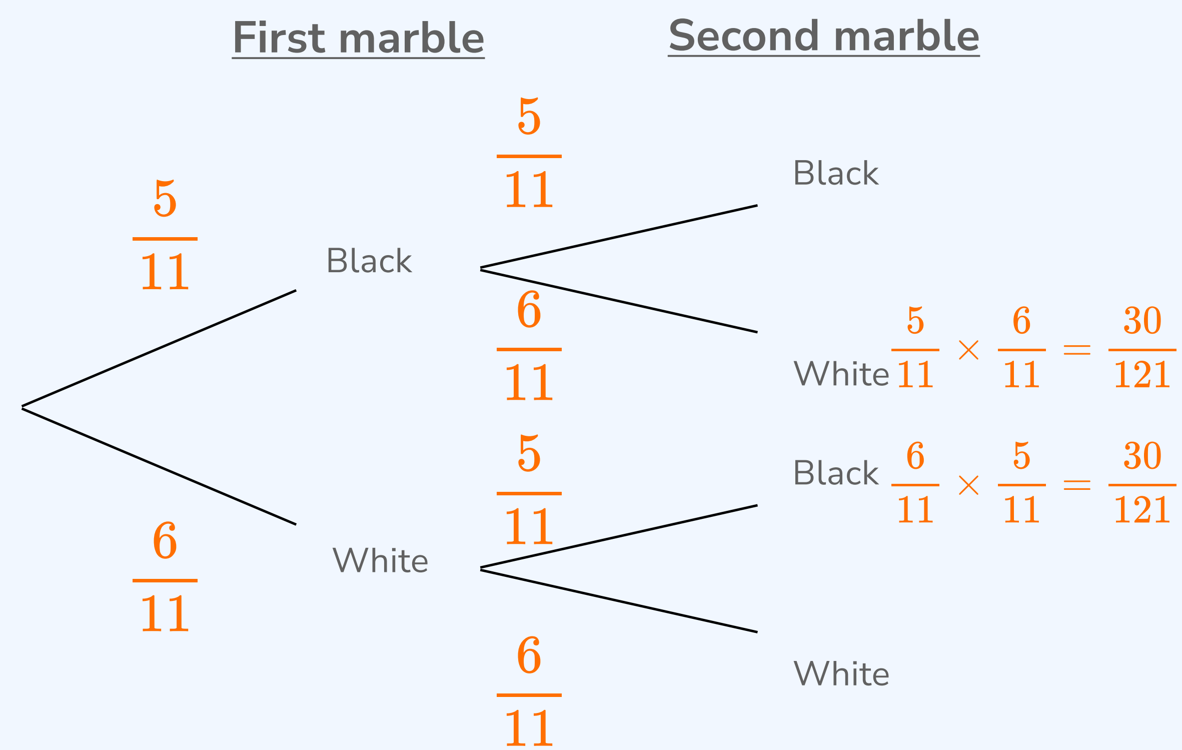
Alex has 7 red marbles and 5 blue marbles. She picks one out, puts it back, then picks another. Find the probability the marbles are the same colour.



$$\frac{7}{12} + \frac{5}{12} = \frac{12}{12} = 1$$

....

Lara takes two socks out of her draw. She has 5 black socks and 6 white socks. Find the probability the socks she picks are different colours.



$$\frac{30}{121} + \frac{30}{121} = \frac{60}{121}$$

....

Where to go next?

For more diagnostic questions, and GCSE maths revision resources and worksheets to support students in fixing any misconceptions take a look at the free Third Space Learning GCSE maths revision pages.

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