



Tree diagrams

A tree diagram shows all the possible outcomes from a series of events and their probabilities.

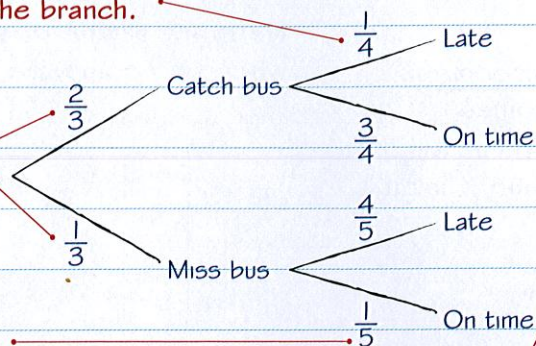
This is a tree diagram for Holly's journey to school.

You write the probability for each event on the branch.

At each branch the probabilities add up to 1.
 $\frac{2}{3} + \frac{1}{3} = 1$

The outcome of the first event can affect the probability of the second.

Holly is less likely to be on time if she misses the bus.



Each branch is like a different parallel universe. In this universe, Holly catches the bus and gets to school on time.

You write the outcomes at the ends of the branches.

You can use shorthand like this.

Outcome	Probability
CL	$\frac{2}{3} \times \frac{1}{4} = \frac{2}{12} = \frac{1}{6}$
CO	$\frac{2}{3} \times \frac{3}{4} = \frac{6}{12} = \frac{1}{2}$
ML	$\frac{1}{3} \times \frac{4}{5} = \frac{4}{15}$
MO	$\frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$

You multiply along the branches to find the probability of each outcome.

The probability that Holly misses the bus and is late for school is $\frac{4}{15}$.

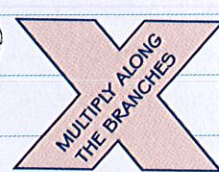
Golden rules

1 Look out for the words REPLACE or PUT BACK in a probability question.

WITH replacement: probabilities stay the same.

WITHOUT replacement: first probability stays the same while the others change.

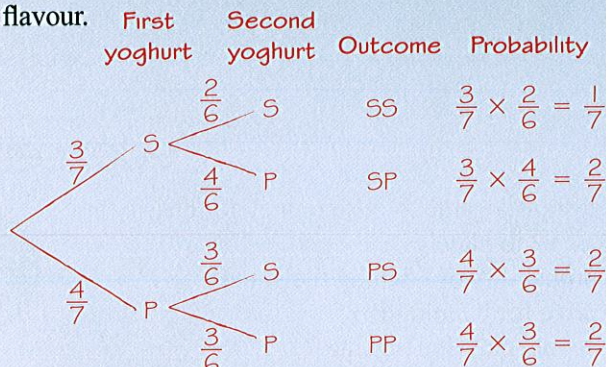
2



Worked example

grade A*

There are 3 strawberry yoghurts and 4 peach yoghurts in a fridge. Kate takes a yoghurt at random from the fridge. She eats the yoghurt. She then takes a second yoghurt at random from the fridge. Work out the probability that both the yoghurts were the same flavour.



$$P(\text{both yoghurts same flavour}) = P(SS) + P(PP) \\ = \frac{1}{7} + \frac{2}{7} = \frac{3}{7}$$

EXAM ALERT!

Use a tree diagram to answer question 1 below. Only one in ten students got full marks for this question in the exam.

This was a real exam question that caught students out – be prepared!

ResultsPlus

Now try this

edexcel

- Fred has a biased coin. The probability of getting Heads on one throw of the coin is $\frac{3}{4}$. He throws the biased coin 3 times. Work out the probability that he gets at least two Heads. (3 marks)
- There are 4 bottles of orange juice, 3 bottles of apple juice, and 2 bottles of tomato juice. Viv takes a bottle at random and drinks the juice. Then Caroline takes a bottle at random and drinks the juice. Work out the probability that they both take a bottle of the same type of juice. (4 marks)

grade A*

grade A*