Welcome to Albion School of Physics and Mathematics:

Intellectual Club

Let’s go over the homework

Graham is looking for his house key. The probability that it is in his pocket is $\frac{5}{9}$, while the probability that it is in his car is $\frac{1}{13}$. What is the probability that

a the key is either in his pocket or in his car

b the key is somewhere else?

Maya rolls an ordinary dice. What is the probability that the number on the dice is

a an even number

b a prime number

c either even or prime?

Your answer to part **c** should not be the sum of the answers to parts **a** and **b**. Why not?

Abigail has a bag containing discs of four different colours. One disc is removed at random. The table shows the probabilities of choosing three of the four colours.

Colour	red	white	blue	pink
Probability	$\frac{2}{7}$	$\frac{2}{9}$	$\frac{1}{4}$	

Abigail removes one disc at random. What is the probability that this disc is

a red or white

b white or blue

c red, white or blue

d pink?

Rajev has a pack of playing cards with some cards missing. There are 45 cards in the pack. He knows that all the clubs and hearts are in his pack. One card is drawn at random from the pack. What is the probability that this card is not a club or a heart?

Multiplying probabilities

- A set of all possible outcomes – a **probability space**
- Let’s draw a diagram showing the probability space of tossing a coin and rolling a die

Multiplying probabilities

- **If A and B are independent events then P(A and B) = P(A) * P(B)**

Exercises

A mother has an equal chance of giving birth to a boy or a girl. Holly plans to have two children.

a What is the probability that the first is a girl?

b What is the probability that both are boys?

c What is the probability that neither is a boy?

The probability that Olivia will have to wait before she can cross Westgate Street is $\frac{1}{3}$ and the probability that she will be able to cross High Street without waiting is $\frac{1}{4}$.

What is the probability that

a she does not have to wait to cross Westgate Street

b she has to wait to cross High Street

c she can cross both streets without waiting?

Mixed exercises

3 When Kim goes to the cinema the probability that she returns on foot is $\frac{2}{3}$, by bus $\frac{1}{6}$ and in a friend's car $\frac{1}{6}$.
What is the probability that she returns
a by bus or in a friend's car
b on foot or by bus?

4 The probability that Sam will complete the 5000 km race is 0.9 and the probability that Aaron will complete it is 0.6. What is the probability that both Sam and Aaron will complete the 5000 km race?

5 A pack of cards is cut, reshuffled and cut again. What is the probability that
a the first card cut is an ace or a king
b the second card cut is an ace or a king
c both cards cut are aces?

Tree diagrams

- We have seen a probability space presented as a table – for tossing a coin and rolling a die

		Dice					
		1	2	3	4	5	6
Coin	H	H, 1	H, 2	H, 3	H, 4	H, 5	H, 6
	T	T, 1	T, 2	T, 3	T, 4	T, 5	T, 6

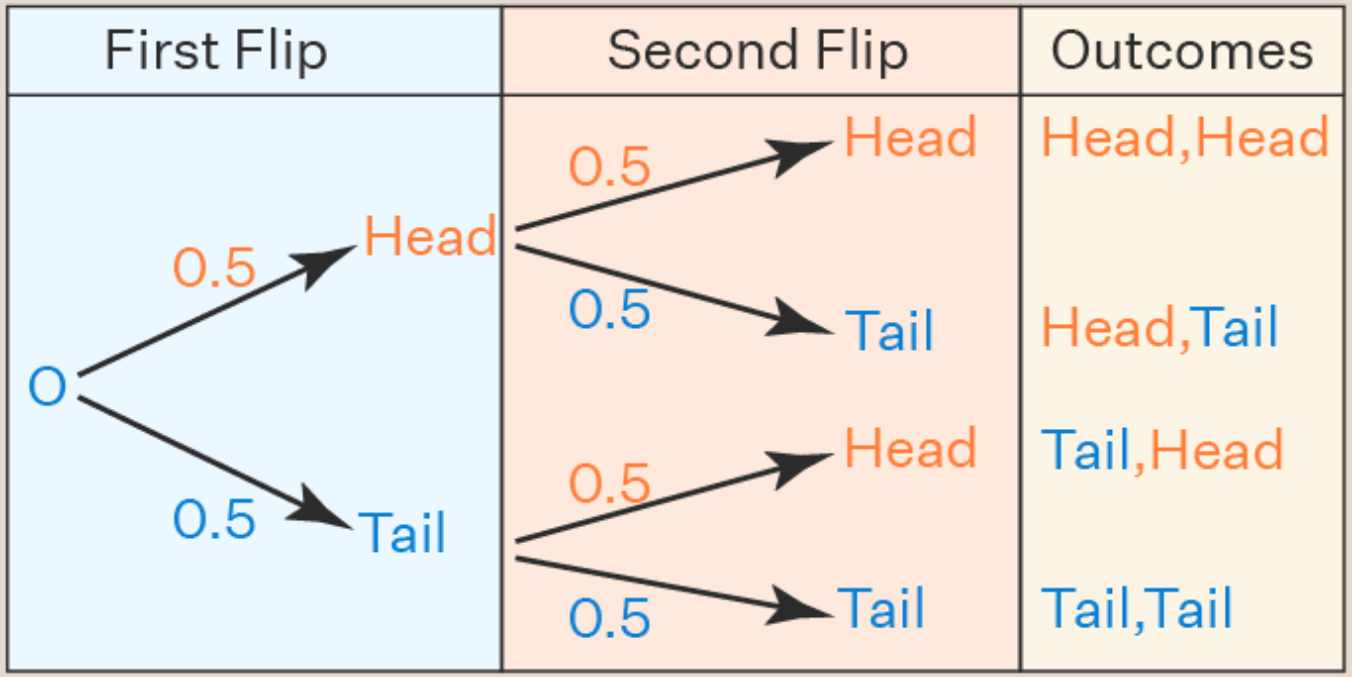
- Now suppose that three coins are tossed and we want the probability of getting two heads and a tail. Can we

Tree diagrams

- Now suppose two people are taking a driving test – can we draw up a table showing the probability of all possible outcomes?

- Now suppose that three coins are tossed and we want the probability of getting two heads and a tail - can we draw up a table showing the probability of all possible outcomes?

Tree diagram



- We multiply probabilities when we follow a path along branches

Tree diagram

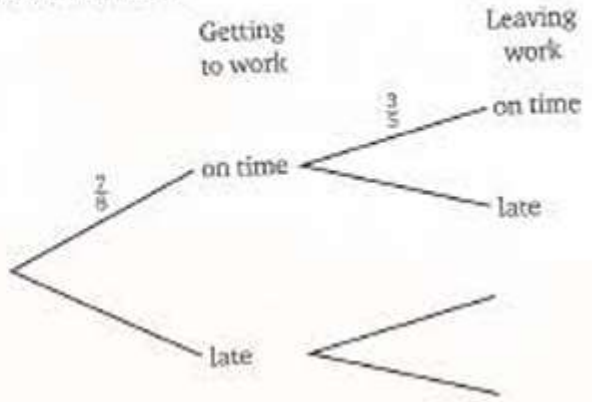
- A coin is tossed and a dice is thrown. Find the probability that:
  1. The coin lands head up and the dice does not show a six
  2. The coin lands tail up and the dice shows a six

Exercises

1 The probability that Mark gets to work on time is $\frac{7}{8}$ and the probability that he leaves work on time is $\frac{3}{5}$.

a Find the probability that he does not leave work on time.

b Copy and complete the tree diagram.



What is the probability that

c Mark gets to work on time but does not leave on time

d Mark is late for work but leaves on time?

Exercises

2 When a drawing pin falls to the ground the probability that it lands point up is 0.2.

a Find the probability that a pin does not land point up.

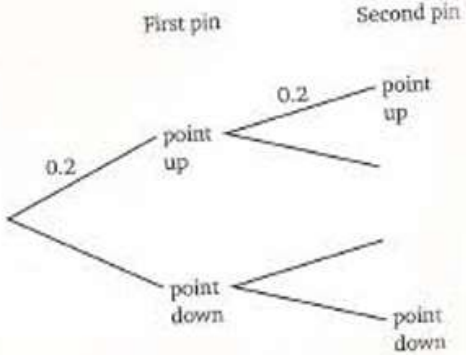
Two drawing pins fall one after the other.

b Copy and complete the tree diagram.

Find the probability that

c both drawing pins land point up

d both drawing pins land point down.



How to use a tree diagram

- We have solved some examples using a tree diagram – let’s generalise the rules of using one to find probabilities.
- Two coins are tossed. Find the probability that they land showing a head and a tail

We MULTIPLY the probabilities when we follow a path along the branches and ADD the results of following different paths.

Exercises

given information.

7 In a group of six girls, four have fair hair and two have dark hair. In a group of five boys, two have fair hair and three have dark hair. One boy and one girl are picked at random. What is the probability that, of the two students picked, one has fair hair and one has dark hair?

8 In a class of 20, four students are left-handed. In a second class of 24, six students are left-handed. One student is chosen at random from each class. What is the probability that one of the students is left-handed and one is not?

9 Derek and Alexis keep changing their minds about whether to send Christmas cards to each other. In any one year, the probability that Derek sends a card is $\frac{3}{4}$ and that Alexis sends one is $\frac{5}{6}$.
Find the probability that next year

a they both send cards

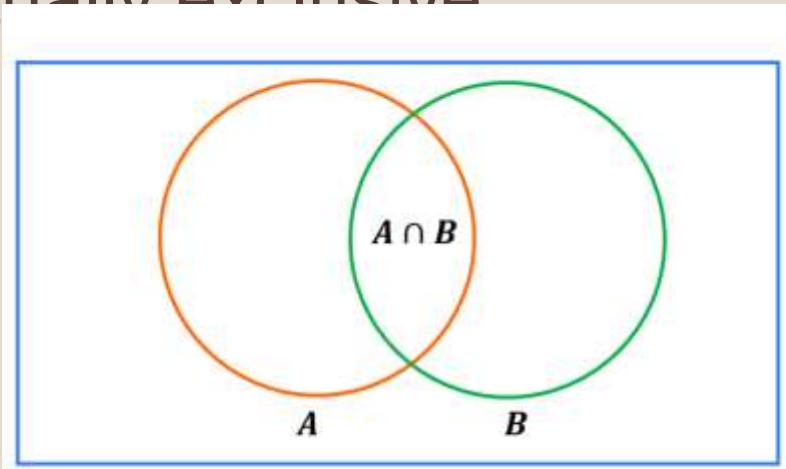
b only one of them sends a card

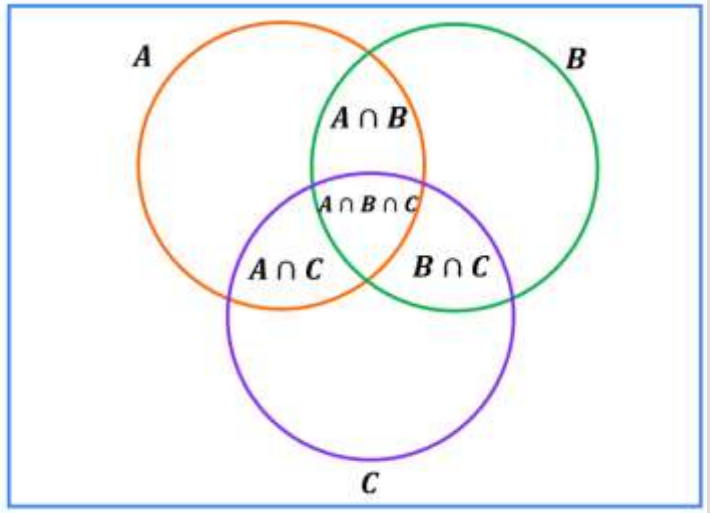
c neither sends a card.

What should the three answers add up to and why?

Introduction to Venn diagrams

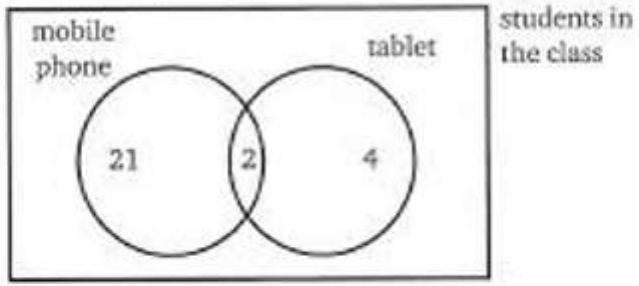
- Venn diagrams can help find the number of times that two events can occur when those events are not mutually exclusive





Exercises

2 The Venn diagram shows how many students in a class of 30 own a mobile phone and/or a tablet.



a How many students do not own either a mobile phone or a tablet?

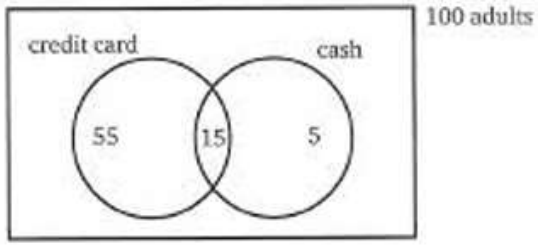
What is the probability that one student chosen at random from the class

b owns a tablet but not a mobile phone

c owns a mobile phone?

Exercises

3 100 adults were asked how they paid for goods bought in a shop. Some said they used a credit card, some said they paid cash and some said they used both. Some adults used other means to pay for their goods.
Some of these results are shown in the Venn diagram.



a Copy and complete the Venn diagram.

b How many adults paid for goods without using a credit card or cash?

c What is the probability that one of these adults chosen at random only used cash?

d What is the probability that one of these adults chosen at random didn't use cash?

thank you

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