

A survey of the 640 properties on an estate was undertaken. Part of the information collected related to the number of bedrooms and the number of toilets in each property.

This information is shown in the table.

Number of bedrooms	Number of toilets				Total
	1	2	3	4 or more	
	1	46	14	0	60
	2	24	67	23	114
	3	7	72	99	186
	4	0	19	123	142
5 or more	0	0	11	71	82
Total	77	172	256	135	640

(a) A property on the estate is selected at random.

Find, giving your answer to three decimal places, the probability that the property has:

(i) exactly 3 bedrooms; (1 mark)

(ii) at least 2 toilets; (2 marks)

(iii) exactly 3 bedrooms and at least 2 toilets; (2 marks)

(iv) at most 3 bedrooms, given that it has exactly 2 toilets. (3 marks)

(b) Use relevant answers from part (a) to show that the number of toilets is not independent of the number of bedrooms. (2 marks)

(c) Three properties are selected at random from those on the estate which have exactly 3 bedrooms.

Calculate the probability that one property has 2 toilets, one has 3 toilets and the other has at least 4 toilets. Give your answer to three decimal places. (4 marks)

JUNE 2012

Large bags of Luckidips contain exactly 50 chocolates. Each chocolate has the same shape and is wrapped with the same silver foil.

The type of chocolate coating and the type of centre of the 50 chocolates in each bag are as follows.

Centre	Coating		
	Milk	White	Dark
	Soft	22	8
Hard	6	6	8

(a) Munir selects at random a chocolate from a bag of 50 Luckidips.

Calculate the probability that his selected chocolate has:

(i) either a hard centre or a white coating or both;

(ii) either a soft centre or a milk coating but not both;

(iii) a soft centre, given that it has a milk coating.

[4 marks]

(b) Nling selects at random, without replacement, four chocolates from a second bag of 50 Luckidips.

Calculate the probability that in her selected chocolates:

(i) none have both a dark coating and a soft centre;

(ii) exactly two have a milk coating;

(iii) at least one has both a milk coating and a soft centre.

[8 marks]

JUNE 2018

A café serves four types of bread roll, and each roll contains one of four fillings. The combinations offered, together with the number of each combination chosen by 400 customers who purchased rolls, are shown in the table.

Type of bread roll	Filling				Total
	Ham	Chicken	Egg	Cheese	
	Soft white	56	45	32	17
Crusty white	50	25	21	14	110
Soft brown	30	24	17	9	80
Crusty brown	24	26	10	0	60
Total	160	120	80	40	400

(a) A customer is selected at random from these 400 customers. Calculate the probability that this customer chose:

(i) a crusty white roll;

(ii) a soft white roll with ham filling;

(iii) a brown roll with either ham or chicken filling;

(iv) a soft white roll, given that the customer chose chicken filling;

(v) either egg or cheese filling, given that the customer chose a white roll.

[9 marks]

(b) You may assume that the 400 customers represent a random sample of all customers purchasing rolls at this café.

Four customers, not included in the above 400 customers, were selected at random from those customers purchasing rolls at the café.

Estimate, to five decimal places, the probability that two of them chose white rolls with chicken filling and two of them chose brown rolls with ham filling.

[5 marks]

JUNE 2009

A large bookcase contains two types of book: hardback and paperback. The number of books of each type in each of four subject categories is shown in the table.

Type	Subject category				Total
	Crime	Romance	Science fiction	Thriller	
	Hardback	8	16	18	18
Paperback	16	40	14	30	100
Total	24	56	32	48	160

(a) A book is selected at random from the bookcase. Calculate the probability that the book is:

(i) a paperback; (1 mark)

(ii) not science fiction; (2 marks)

(iii) science fiction or a hardback; (2 marks)

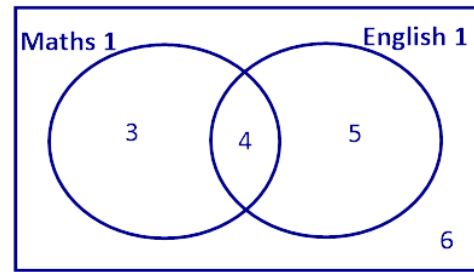
(iv) a thriller, given that it is a paperback. (2 marks)

(b) Three books are selected at random, without replacement, from the bookcase.

Calculate, to three decimal places, the probability that one is crime, one is romance and one is science fiction. (4 marks)

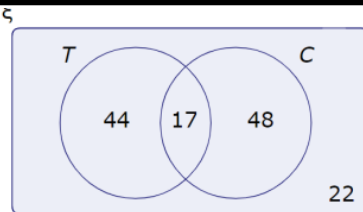
Venn Diagrams

The Venn Diagram shows the number of students in Set 1 for Maths and Set 1 for English



- (a) Calculate the probability that a randomly chosen student is only in Set 1 for English
 (b) Calculate the probability that a randomly chosen student is in Set 1 Maths
 (c) **GIVEN** that the student is in Set 1 for Maths, calculate the probability that they are also in Set 1 for English

The Venn diagram shows the number of people who like tea (T) and who like coffee (C).



You can click on the Venn diagram to help you. It is not marked.

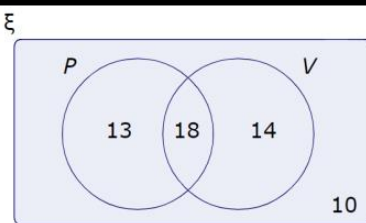
A person is selected at random. What is the probability that...

they like tea? [2] they only like coffee? [2]

A person who likes coffee is selected. What is the probability that...

they like tea too? [2] they only like coffee? [2]

The Venn diagram shows the number of students who play the piano (P) and the violin (V).



A student is selected at random.

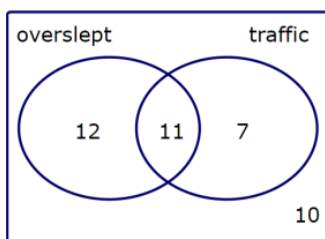
The student selected plays the violin.

What is the probability that they also play the piano? What is the probability that they do not play the piano?

The student selected does not play the violin.

What is the probability that they also play the piano? What is the probability that they don't play any instruments?

A school receptionist keeps a record of the reasons students give for being late - usually oversleeping or traffic. Her results for one day are shown in the Venn diagram.



One of these students is chosen at random.

Write down the probability that they:

got stuck in traffic [2]

got stuck in traffic but didn't oversleep [2]

didn't oversleep [2]

A student who overslept is chosen at random.

Write down the probability that they also got stuck in traffic. [3]

The Given Rule

$P(A | B)$ means the probability of A happening _____ that B has already happened

CONDITIONAL PROBABILITY Revision Mat

Tree Diagrams

At its 40,000 mile service, the probability of a car needing new brake pads is 0.2. If it does need brake pads, the probability of it also needing new discs is 0.6. If not, the probability of it needing new discs is 0.1.

(a) Complete a tree diagram for the probabilities of all possible outcomes for this

(b) Calculate the probability that a car will need new discs

(c) **GIVEN** that the car needs new discs, calculate the probability that it had new brake pads

Sample Space Diagrams

E.G. The table shows the number of various MPs in different parts of the country

	Conservative	Labour	Lib Dem	Other
North	15	8	0	14
South	19	12	2	9
East	13	15	1	7
West	15	9	0	9
Midlands	12	10	1	8

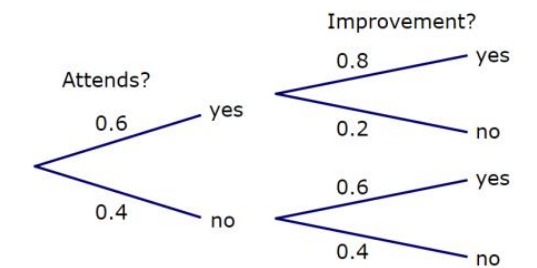
(a) Calculate the probability that an MP chosen at random is a Labour MP

(b) Calculate the probability that an MP chosen at random is from the Midlands

(c) Calculate the probability that an MP chosen at random is Conservative **GIVEN** that they are from the North

A teacher runs revision lessons for her GCSE stats class.

The tree diagram shows the probability that a student attends the revision lessons, and the probability that their grade improves between the mock and the actual exam.



Find the probability that:

A student chosen at random does not attend the revision lesson but improves their grade. [2]

A student chosen at random improves their grade. [2]

A student improves their grade.

What is the probability that they attended the revision lessons? (2 d.p.) [3]

This table shows the number of students who use different types of pen.

	blue	black	total
fountain	27	32	59
ballpoint	31	29	60
fibre tip	39	37	76
total	97	98	195

Now suppose we are only interested in the students who use a ballpoint pen

What is the number of students who use a ballpoint?

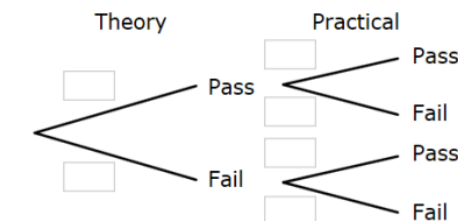
Given that the selected student uses a ballpoint pen, what is the probability that they use a black one?

To get a driving licence, you have to pass a theory test and a practical.

The probability that Joe passes his theory test is 0.7.

If he passes the theory test, he has a 0.5 chance of passing his practical. Otherwise his chance of passing the practical is only 0.2.

Fill in the tree diagram.



Give your answers correct to 2 d.p.

Find the probability that he gets his driving licence. probability = [2]

Given that he fails to get his driving licence, find the probability that he failed because of his practical only. probability = [3]

The table shows the types of paper available for a giveaway. m and n are unknown.

	lined	unlined	total
journal	59	n	<input type="text"/>
binder	41	43	84
notebook	m	35	<input type="text"/>
total	<input type="text"/>	<input type="text"/>	<input type="text"/>

Complete the table.

Suppose $n = 57$ and $m = 38$ and some paper is selected at random.

What is the probability it is lined paper? [2] What is the probability it is in a notebook? [2]

Given that it is unlined paper, what is the probability that it is in a binder? [2] Given that it is a journal, what is the probability that it is lined? [2]

Alan has two squash partners, Steve and Connor.

If he plays Steve he has a 55% chance of winning the match.

If he plays Connor he has a 80% chance of winning the match.

He plays Steve 70% of the time and Connor the rest of the time.

What is the probability of Alan winning a match? [2]

Given that Alan doesn't win, what is the probability that he was playing Connor? [3]

Give your answers as decimals to 3 d.p.