

5.1 The Laws of Probability**5.1.1 The Sum Law** (The *or* means *add* rule)

$$p (A \text{ or } B) = p (A) + p (B)$$

(For Mutually Exclusive events A and B)

5.1.2 The Product Law (The *and* means *multiply* rule)

$$p (A \text{ and } B) = p (A) \times p (B)$$

(For Independent events A and B)

5.2 Probability word sum

Calculate :

$$\frac{3}{11} \text{ and } \frac{4}{5} \text{ or } \frac{5}{11} \text{ and } \frac{3}{5}$$

5.3 Example

One letter is chosen at random from the word B A N A N A S.

It is replaced.

Then a second letter is chosen at random.

Find the probability that;

(i) First an A, *and* then an N is picked.

(ii) The same letter is picked both times.
i.e. B *and* B or A *and* A or N *and* N or S *and* S

5.4 Exercise

Question 1

Remembering that : *or* means *add*
and means *multiply*

Do not cancel answers down

Work out:

(i)

$$\frac{3}{5} \text{ and } \frac{7}{8} \text{ or } \frac{1}{5} \text{ and } \frac{3}{8}$$

(ii)

$$\frac{4}{7} \text{ and } \frac{3}{7} \text{ or } \frac{5}{7} \text{ and } \frac{5}{7}$$

(iii)

$$\frac{6}{11} \text{ and } \frac{3}{7} \text{ or } \frac{9}{11} \text{ and } \frac{5}{7}$$

(iv)

$$\frac{11}{13} \text{ and } \frac{2}{3} \text{ or } \frac{8}{13} \text{ and } \frac{1}{3}$$

Question 2

One letter is chosen at random from the word N O N S E N S E.

It is replaced, then a second letter is chosen at random.

Without cancelling the fractions involved down, find the probability that;

- (i) First an S, and then an O is picked.

- (ii) First an N, then an E is picked.

- (iii) The same letter is picked both times.

Question 3

One letter is chosen at random from the word P O S S I B I L I T I E S.

It is replaced, then a second letter is chosen at random.

Without cancelling the fractions involved down, find the probability that;

- (i) First a P, and then an O is picked.

- (ii) First an S, then an I is picked.

- (iii) First an S, then a letter that is **NOT** S is picked.

Question 4

The probability of a spun coin landing tails is $\frac{1}{2}$

- (i) What is the probability that if the coin is spun twice it will land tails twice ?

HINT : $p(\text{tails})$ and $p(\text{tails})$

HINT : *and* means *multiply*

- (ii) What is the probability that if the coin is spun three times it will land tails three times ?

HINT : $p(\text{tails})$ and $p(\text{tails})$ and $p(\text{tails})$

HINT : *and* means *multiply*

- (iii) What is the probability that if the coin is spun four times it will land tails four times ?

- (iv) Look at answers (i), (ii) and (iii).
Can you spot a pattern ?

Explain any pattern spotted here:

Question 5

Remembering that : or means *add*
and means *multiply*

Do not cancel answers down

Work out:

(i)

$$\frac{1}{11} or \frac{4}{11} or \frac{2}{11} or \frac{3}{11}$$

(ii)

$$\frac{7}{15} and \frac{3}{10} or \frac{11}{15} and \frac{7}{10}$$

(iii)

$$\left(\frac{3}{7}\right)^2 or \left(\frac{4}{7}\right)^2$$

$$**HINT** : \left(\frac{3}{7}\right)^2 = \frac{3}{7} \times \frac{3}{7}$$

(iv)

$$\frac{11}{25} and \frac{5}{8} or \frac{8}{50} and \frac{3}{4}$$

Question 6

Jack's gone crackers !

He spins a coin, (*then does ten press ups*)

before rolling a red die, (*then does ten star jumps*)

and finally rolls a yellow die, (*before doing a hand-stand*).

- (i) What is the probability that the coin lands heads, the red die rolls an EVEN number and the yellow die rolls five ?

- (ii) What is the probability that the coin lands tails, the red die does NOT roll 2, and the yellow die rolls an ODD number.

- (iii) What is the probability that the coin lands heads, the red die does NOT roll 6, and the yellow die does NOT roll 6 ?

Question 7

Complete the following "FIVE FACTS ABOUT PROBABILITIES".

FIVE FACTS ABOUT PROBABILITIES

FACT 1 : Probabilities are numbers between _____ and one.

FACT 2 : An event that can not happen has a probability of _____.

FACT 3 : An event that definitely will happen has a probability of _____.

FACT 4 : The closer a probability is to _____ the less likely it is to happen.

FACT 5 : The closer a probability is to one the _____ likely it is to happen.

Question 8

On the diagram below mark on (roughly) the following probabilities

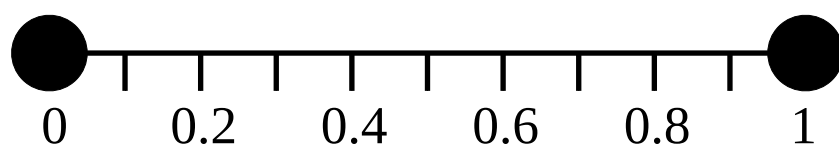
A : The probability of meeting a living, fire-breathing dragon tomorrow.

B : The probability of a spun coin ending up "tails".

C : The probability of a randomly picked day being "Friday".

D : The probability that you will pass your GCSE mathematics examination.

E : The probability that the next person you meet will have two legs.



Question 9

One letter is chosen at random from the words;

S H R E W S B U R Y S C H O O L

It is replaced.

Then a second letter is chosen at random.

Find the probability that;

(i) First a Y, and then a Y is picked.

(ii) First an S, then an H is picked.

(iii) A vowel is NOT picked both times.

Question 10

A test the following marks are obtained,

$$\frac{55}{60} \quad \frac{52}{60} \quad \frac{48}{60} \quad \frac{51}{60} \quad \frac{50}{60}$$

In reporting the marks, the pupils involved are told they have scored,

$$\frac{17}{20} \quad \frac{13}{15} \quad \frac{19}{20} \quad \frac{5}{6} \quad \frac{11}{12} \quad \frac{4}{5}$$

- (i) Explain why reporting the marks in this way is unhelpful.

- (ii) Which mark in the list of reported marks is a mistake ?

- (iii) Explain carefully a situation where it is helpful to cancel a fraction down and a situation, different to the one above, where it's better not to cancel the fractions down.

Question 11

"Coincidences" is a probability amusement.

You might like to try it out on an unsuspecting friend.

To play, you first roll a dice.

Your friend will think this is a bit odd but you then say something like:

That confirms it !

There's something really creepy about this place.

Look - I just rolled a three on this die.

Then I realised I was sitting in a row of three desks, with three chairs.

Look around, each set of shelves in this room has three shelves.

The lights - How many are there in each row ?

Three !

They are in rows of three !

This morning, on my way in, I saw three black cats. (*Naughty - you made that bit up*)

And in the night, I woke up just as the clock struck three. (*Also made up*)

Keep your eyes open.

I tell you, there's something really weird going on with three today.

Make up your own list of "Coincidences" for a number other than three.