RELATIVE FREQUENCY
Probability

Key Concepts

Experimental probability differs to theoretical probability in that it is based upon the **outcomes from experiments**. It may not reflect the outcomes we expect.

Experimental probability is also known as the **relative frequency** of an event occurring.

Estimating the number of times an event will occur:

Probability × no. of trials

Examples

Colour	red	blue	white	black
Prob	x	0.2	0.3	x

A spinner is spun, it has four colours on it.
The relative frequencies of each colour are recorded.
The relative frequency of red and black are the same.

a)   What is the relative frequency of red?

$$1 - (0.2 + 0.3) = 0.5$$
$$x = \frac{0.5}{2} = 0.25$$

b)   If the spinner is spun 300 times, how many times do you expect it to land on white?

$$0.3 \times 300 = 90$$

Key Words

Experimental
Relative frequency
Fraction
Decimal
Probability
Estimate

Number	1	2	3	4
Prob	x	0.46	0.28	x

A spinner is spun which has 1,2,3,4 on it. The probability that a 1 and a 4 are spun are equal.

a)   What is the probability that a 4 is landed on?

b)   If the spinner is spun 500 times how many times do we expect it to land on a 2?
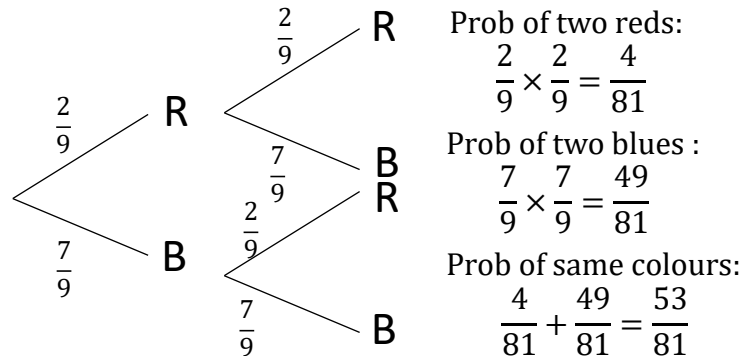
PROBABILITY TREE DIAGRAMS
Probability

Key Concepts

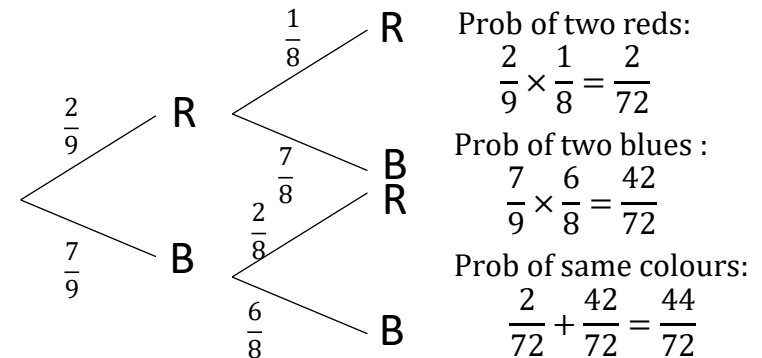**Independent events** are events which do not affect one another.

Dependent events affect one another's probabilities. This is also known as **conditional probability**.

Examples

There are red and blue counters in a bag.

The probability that a red counter is chosen is $\frac{2}{9}$.

A counter is chosen and **replaced**, then a second counter is chosen.

Draw a tree diagram and calculate the probability that two counters of the same colour are chosen.

Prob of two reds:
$$\frac{2}{9} \times \frac{2}{9} = \frac{4}{81}$$

Prob of two blues :
$$\frac{7}{9} \times \frac{7}{9} = \frac{49}{81}$$

Prob of same colours:
$$\frac{4}{81} + \frac{49}{81} = \frac{53}{81}$$

There are red and blue counters in a bag.

The probability that a red counter is chosen is $\frac{2}{9}$.

A counter is chosen and **not replaced**, then a second counter is chosen.

Draw a tree diagram and calculate the probability that two counters of the same colour are chosen.

Prob of two reds:
$$\frac{2}{9} \times \frac{1}{8} = \frac{2}{72}$$

Prob of two blues :
$$\frac{7}{9} \times \frac{6}{8} = \frac{42}{72}$$

Prob of same colours:
$$\frac{2}{72} + \frac{42}{72} = \frac{44}{72}$$

Key Words

Independent
Dependant
Conditional
Probability
Fraction

1) There are blue and green pens in a drawer. There are 4 blues and 7 greens.
A pen is chosen and then **replaced**, then a second pen is chosen.
Draw a tree diagram to show this information and calculate the probability that pens of different colours are chosen.

2) There are blue and green pens in a drawer. There are 4 blues and 7 greens.
A pen is chosen and **not replaced**, then a second pen is chosen.
Draw a tree diagram to show this information and calculate the probability that pens of different colours are chosen.

TWO WAY TABLES AND PROBABILITY TABLES
Probability

Key Concepts

Two way tables are used to tabulate a number of pieces of information.

Probabilities can be formulated easily from two way tables.

Probabilities can be written as a **fraction, decimal or a percentage** however we often work with fractions. You do not need to simplify your fractions in probabilities.

Estimating the number of times an event will occur

Probability × no. of trials

Examples

There are only red counters, blue counters, white counters and black counters in a bag.

Colour	Red	Blue	Black	White
No. of counters	9	$3x$	x-5	$2x$

A counter is chosen at random, the probability it is red is $\frac{9}{100}$. Work out the probability is black.

$$9 + 3x + x - 5 + 2x = 100$$
$$6x + 4 = 100$$
$$x = 16$$

Number of black counters = 16 − 5

= 11

Probability of choosing black = $\frac{11}{100}$

80 children went on a school trip. They went to London or to York.
23 boys and 19 girls went to London. 14 boys went to York.

	London	York	Total
Girls	19	**24**	**43**
Boys	23	14	**37**
Total	**42**	**38**	80

What is the probability that a person is chosen that went to London? $\frac{42}{80}$

If a girl is chosen, what is the probability that she went to York? $\frac{24}{38}$

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Key Words
Two way table
Probability
Fraction
Outcomes
Frequency

	1	2	3
Prob	0.37	$2x$	x

1a) Calculate the probability of choosing a 2 or a 3.
b) Estimate the number of times a 2 will be chosen if the experiment is repeated 300 times.

2a) Complete the two way table:

	Year Group			Total
	9	10	11	
Boys			125	407
Girls		123		
Total	303	256		831

b) What is the probability that a Y10 is chosen, given that they are a girl .

ANSWERS: 1) a) P(2) = 0.42 P(3) = 0.21 b) 0.42×300=126   2b) 123/424