LISTING OUTCOMES AND SAMPLE SPACE Probability

Key Concepts

When there are a number of different possible outcomes in a situation we need a **logical** and **systematic** way in which to view them all.

We can be asked to **list** all possible outcomes e.g. choices from a menu, order in which people finish a race.

We can also use a **sample space diagram**. This records the possible outcomes of two different events happening.

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58, 69, 126

Examples

Starter	Main
Fishcake Melon	Lasagne Beef Salmon

List all of the combinations possible when one starter and one main are chosen.

F, L	M, L
F, B	M, B
F, S	M, S

Note: You can write the initials of each option in a test. You do not need to write out the full word.

Two dice are thrown and the possible outcomes are shown in the sample space diagram below:

	1	2	3	4	5	6
1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
2	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
3	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
4	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
5	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
6	(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

1) What is the probability that 2 numbers which are the same are rolled?

$$\frac{6}{36} = \frac{outcomes\ where\ numbers\ are\ the\ same}{total\ number\ of\ outcomes}$$

2) What is the probability that two even numbers are rolled?

$$\frac{9}{36} = \frac{outcomes\ where\ numbers\ are\ both\ even}{total\ number\ of\ outcomes}$$

Key Words

List
Outcome
Sample space
Probability

1) Abe, Ben and Carl have a race. List all of the options for the order that the boys can end the race.

		Spinner		
Coin		Red	Green	Blue
	Heads	H,R	H,G	H,B
	Tails	T,R	T,G	T,B

2a) What is the probability that a head is landed on?
b) What is the probability that a head and a green are landed on?

ANSWERS: 1) ABC, ACB, BAC, BCA, CAB, CBA 2a) $\frac{3}{6}$ b) $\frac{1}{6}$

PROBABILITY TREE DIAGRAMS
Probability

Key Concepts

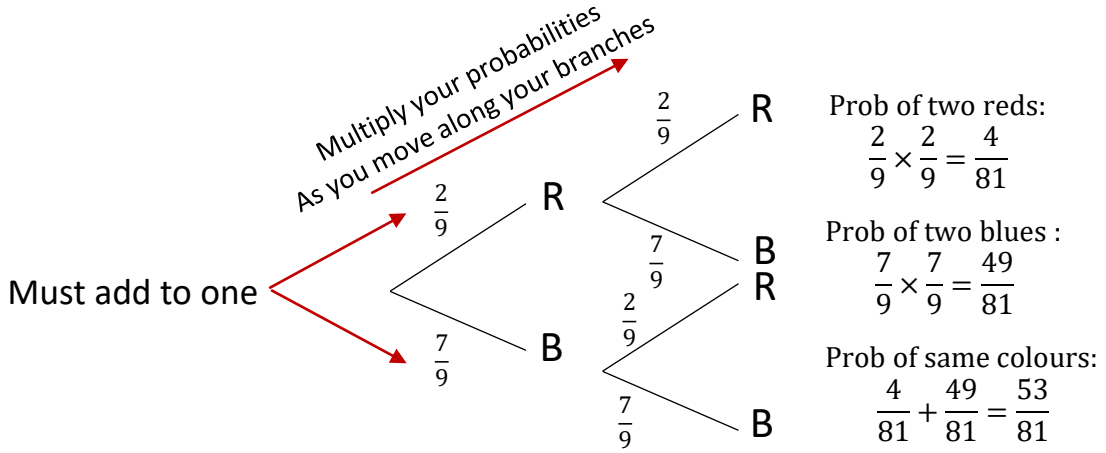
Independent events are events which do not affect one another.

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

We **multiply** two probabilities when one event follows another.

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:
$\frac{4}{81} + \frac{49}{81} = \frac{53}{81}$

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151, 175

Key Words
Independent
Dependant
Conditional
Probability
Fraction
Multiply

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.

ANSWERS: 56/121

THEORETICAL PROBABILITY

Probability

Key Concepts

Probabilities can be described using **words** and **numerically**.

We can use **fractions, decimals or percentages** to represent a probability.

Theoretical probability is what should happen if all variables were fair.

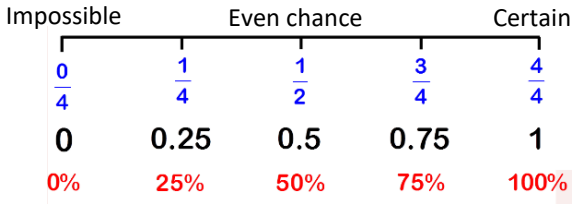
All probabilities must **add to 1**.

The probability of something **NOT** happening equals:

$1 - (probability\ of\ it\ happening)$

Examples

Probability scale:



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

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

1) What is the probability that a blue counter is chosen? $\frac{3}{19} = \frac{number\ of\ blue}{total\ number\ of\ counters}$

2) What is the probability that red is **not** chosen?

$$\frac{10}{19} = \frac{number\ of\ all\ other\ colours}{total\ number\ of\ counters}$$

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 = $\frac{11}{100}$

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14, 59

Key Words

Theoretical
Probability
Fraction
Decimal
Percentage
Certain
Impossible
Even chance

	1	2	3
Prob	5	4	9

1a) Calculate the probability of choosing a 2.
b) Calculate the probability of not choosing a 3.

	1	2	3
Prob	0.37	$2x$	x

2) Calculate the probability of choosing a 2 or a 3.

ANSWERS: 1a) $\frac{4}{18}$ b) $\frac{9}{18}$ 2) P(2) = 0.42 P(3) = 0.21