

Probability

The aim of today's revision session is to make sure that you can calculate the probability of an event and make practical use of probabilities.

Calculating the probability of an event

If an event is impossible it has a probability of zero. If an event will definitely happen it has a probability of one. Everything else is in between. In school maths we commonly use fractions for probabilities, but you **must** remember to simplify them. Sometimes it is helpful to change the fractions into decimals for comparison. Percentages are often used in weather forecasts e.g. there is a 25% chance of rain tomorrow.

Example

In a car park there are 8 grey cars, 6 silver cars, 4 white cars and 2 red cars. What is the probability that the next car to leave is white?

$$P(\text{white}) = \frac{\text{number of white cars}}{\text{total number of cars}} = \frac{4}{8+6+4+2} = \frac{4}{20} = \frac{1}{5}$$

Now try these questions: -

1) In a class there are 12 pupils from Balmossie, 10 pupils from Dalhousie and 8 pupils from Panmure.

If a pupil is picked at random, calculate the probability that they are: -

- a) from Balmossie
- b) from Dalhousie
- c) from Panmure
- d) **not** from Panmure

2) A number is picked at random from the list below: -

1 2 3 4 5 6 7 8 9 10

Calculate the probability that the number is: -

- a) even
- b) odd
- c) more than 8
- d) less than 6
- e) a prime number

Continue below ↓

Using probabilities

About 5 million people live in Scotland so it is impossible to survey everyone. Sometimes a small group (sample) are asked a question and it is assumed that, in the whole population of Scotland, the probability is the same.

For example: -

A manufacturer asks 20 people if they would buy a new type of toothbrush. 10 say yes so: -

$$P(\text{Buying new toothbrush}) = \frac{10}{20} = \frac{1}{2}$$

Scotland has a population of 5 million so the manufacturer might be tempted to assume they could sell

$$\frac{1}{2} \text{ of } 5\,000\,000 = 2\,500\,000 \text{ toothbrushes}$$

England has a population of 56 million so the manufacturer might be tempted to assume they could sell: -

$$\frac{1}{2} \text{ of } 56\,000\,000 = 28\,000\,000 \text{ toothbrushes}$$

There are number of problems here. Twenty people is a very small sample. The sample could not have included old people and young people, rich people and poor people, males and females and people from every part of Scotland and England. Also, there is a difference between saying you will buy a product and parting with your hard-earned cash.

If we are to use this approach to calculate the number of people in a whole population we need to be aware that the sample must be large and carefully chosen and, even then, the answer is only and approximation.

Now copy and complete this table: -

	Probability	Number of people in Scotland (Population 5 000 000)
1	P(afraid of spiders) = 0.05	
2	P(freckles) = $\frac{1}{6}$	
3	P(afraid of clowns) = 12%	
4	P(blue eyes) = 0.5	

5	$P(\text{dislike going to dentist}) = \frac{1}{5}$	
6	$P(\text{brown eyes}) = 0.14$	
7	$P(\text{between 16 and 64}) = 64\%$	
8	$P(\text{65 and over}) = 20\%$	