

The normal distribution and the 68–95–99.7% rule

Thursday, 21 February 2019 6:18 pm

★ By the end of the lesson I would hope that you have an understanding and be able to apply to questions the following concepts:

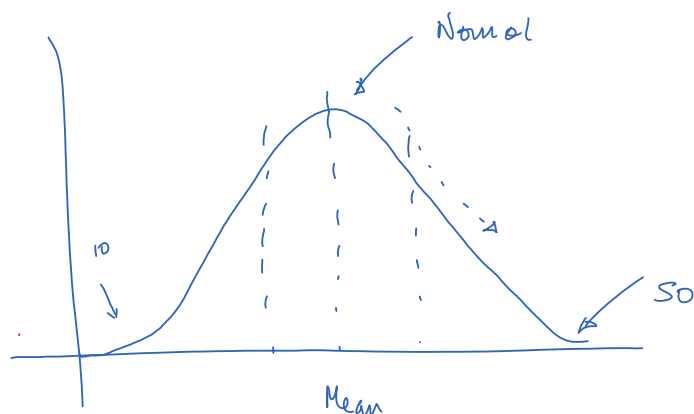
- Know what the normal distribution is
- Know what it means by the 68-95-99.7% rule
- Know how to apply the 68-95-99.7% rule
- Know how to draw normal distribution graphs centred around the mean
- Know how to split a normal distribution graph into standard deviations.
- Know what percentages fall between each standard deviation

RECAP

We continue our exciting journey though the land of statistics.
In the last lesson we looked at the idea of standard deviation.
This is measure of the spread of data around some sort of mean value.

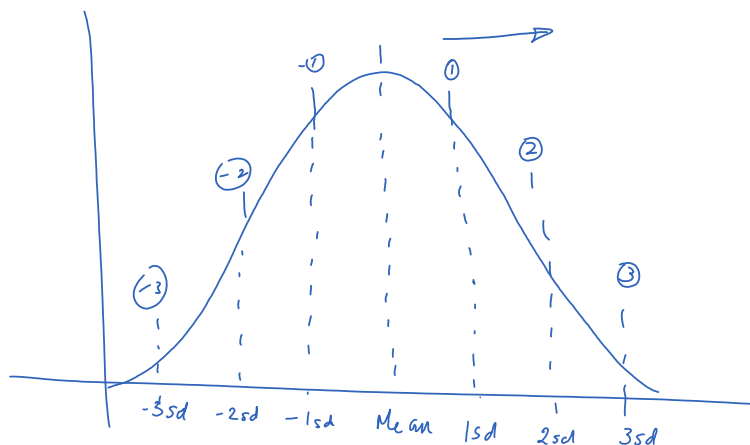
We can show this graphically using something called the normal distribution.

VCE Scores and the Normal Distribution



The Normal Distribution and Standard Deviations

We can split the normal distribution into sections.
We do this using standard deviations.



What percentage of people fit into each standard deviation?

This is where we have come up with the ~~68~~-95-99.7% rule

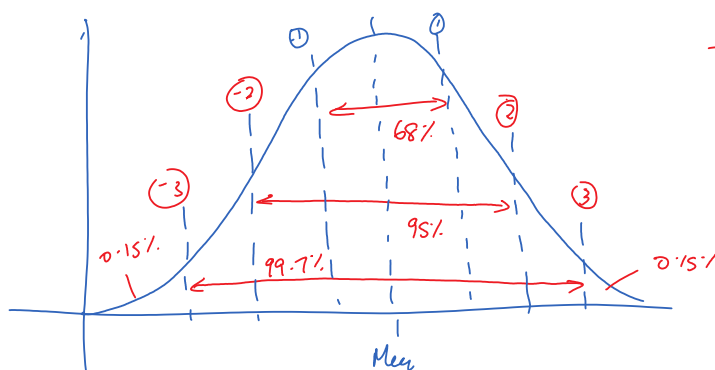
One way of thinking about a normal distribution is to look at the percentage of people who fall between the same standard deviations from the mean.

We can see that between the first standard deviations there are 68% of the population

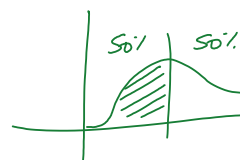
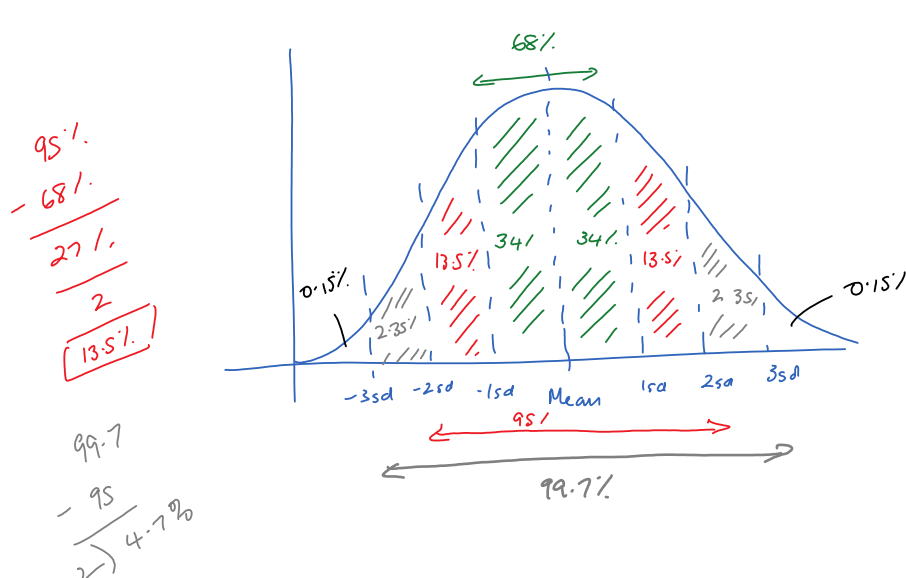
We can see that between the second standard deviations there are 95% of the population

We can see that between the third standard deviations there are 99.7% of the population

This looks like:



Whilst that is useful, it's sometimes better to know what percentages fall into each section of the normal distribution.



How do I use a normal distribution to answer questions?

Being able to read the data from a normal distribution and understand what it is telling me is very important. The most important thing is that we know what percentages lie between each standard deviation.

Example:

Extracted from the Cambridge Further Mathematics Textbook Series.

The distribution of delivery times for pizzas made by House of Pizza is approximately normal, with a mean of 25

Example:

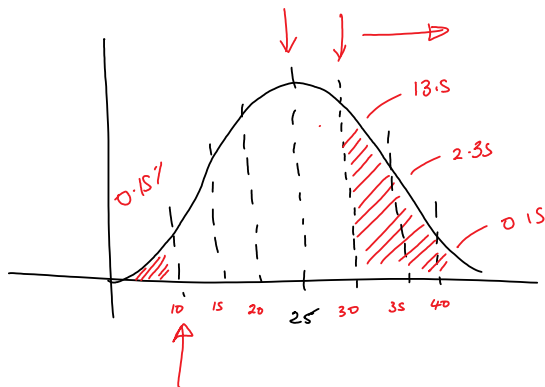
Extracted from the Cambridge Further Mathematics Textbook Series.

The distribution of delivery times for pizzas made by House of Pizza is approximately normal, with a mean of 25 minutes and a standard deviation of 5 minutes.

- What percentage of pizzas have delivery times of between 15 and 35 minutes? *95%*
- What percentage of pizzas have delivery times of greater than 30 minutes? *16%*
- In 1 month, House of Pizza delivers 2000 pizzas. How many of these pizzas are delivered in less than 10 minutes?

With all questions:

- Draw a diagram of a normal curve
- Mark on the mean
- Split it into standard deviations
- Write the numbers below each of the standard deviations
- Answer the questions!



$$68 - 95 = 99.7\%$$

3 pizzas

$$13.5$$

$$2.35$$

$$0.15$$

$$\frac{13.5}{1} = 13.5$$

$$\frac{2000}{100}$$

$$0.15\% \text{ of } 2000$$

$$0.15 \div 100 \times 2000 = 3$$

