Normal Distribution

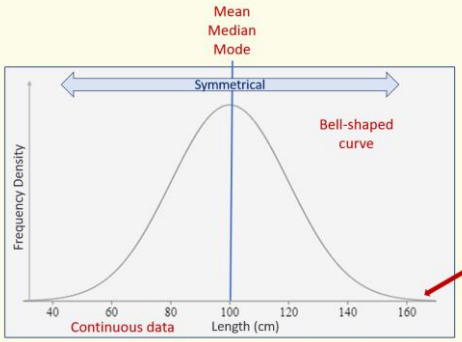
A **normal distribution** is a bell-shaped, symmetrical curve where the mean, median and mode are all equal. Data is continuous.

$N(\mu,\sigma^2)$

μ = mean (*for population*)

σ^2 = variance

σ = standard deviation (*for population*)



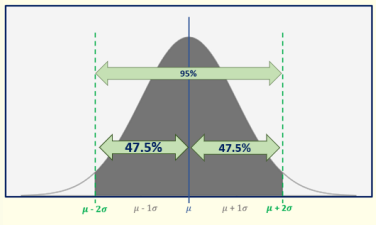
Number of standard deviations from mean $= \dfrac{\textbf{value} - \textbf{mean}}{\textbf{standard deviation}}$

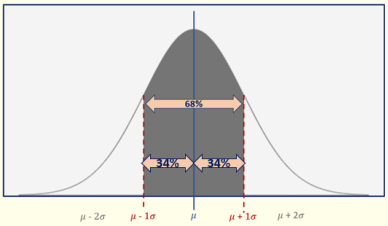
Variance $= \sqrt{\sigma^2}$

→ a measure of how spread out the data is

→ calculated as the standard deviation squared

95% of observations lie within ± 2 standard deviations of the mean





68% of observations lie within ± 1 standard deviation of the mean

A group of students completed the same puzzle individually.

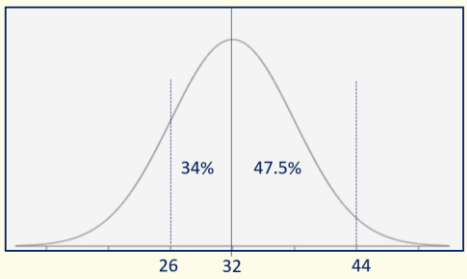
The times taken to complete the puzzle by the students have a mean of 32 minutes and a standard deviation of 6 minutes. These times can be modelled by a normal distribution.

Nathaniel concludes that more than 95% of the students completed the puzzle between 26 and 44 minutes.

Use statistical calculations to assess Nathaniel's conclusion.

$\frac{26-32}{6} = -1$

$\frac{44-32}{6} = 2$



You don't have to draw a sketch to gain full marks but it can help you as you answer the question.

26 minutes is 1 standard deviation below the mean so 34% (68% ÷ 2) between 26 and 32 minutes

44 minutes is 2 standard deviations above the mean so 47.5% (95% ÷ 2) between 32 and 44 minutes

47.5% + 34% = 81.5% lies between 26 and 44 minutes

Nathaniel is incorrect that more than 95% completed in the puzzle within 26 and 44 minutes.

(5 marks)