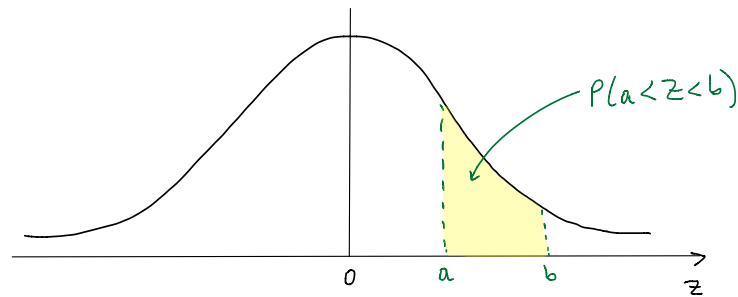


SI - Chapter 9 - Normal distribution - Summary



- * The normal distribution is an example of a continuous distribution
- * Probabilities are given by areas under the graph
- * $P(Z=z) = 0$ (the area under the curve at a specific point is 0).
- * The normal distribution is a bell-shaped curve which is symmetric about its mean (in the case of Z , the mean is zero).
- * The parameters of the normal distribution are μ and σ .
We write $X \sim N(\mu, \sigma^2)$ to indicate that a random variable is normally distributed with mean μ and variance σ^2 (or standard deviation σ).
- * The standard normal random variable is $Z \sim N(0, 1)$.
- * Standardisation of normal variables: if $X \sim N(\mu, \sigma^2)$ then $\frac{X - \mu}{\sigma} \sim N(0, 1)$.
- * To find probabilities you can use one of the two statistical tables provided.
 - ① The big table gives you $P(Z < z)$ for positive values of z .
 - ② The small table gives you z such that $P(Z > z) = \text{some "nice" small probability}$

* You can manipulate probabilities to enable you to use one of the two tables, by always applying two of the changes below:

- ① Change inequality direction ($>$ to $<$ and vice-versa)
- ② Change sign of z-value ($+$ to $-$ and vice-versa)
- ③ Consider 1-probability

$$P(Z < 0.75) = 0.7734$$

↑ inequality direction
↑ z-value
↑ probability

eg. $P(Z < 0.75) = 0.7734$ is the same as

$$P(Z > 0.75) = 1 - 0.7734$$

$$P(Z < -0.75) = 1 - 0.7734$$

$$P(Z > -0.75) = 0.7734$$

*** Do not confuse z-values and probabilities**

* $P(a < X < b) = P(X < b) - P(X < a)$

* Bear in mind that the symmetry of the normal distribution can be used to simplify things

eg. Find z such that $P(-z < Z < z) = 0.90$



Hence, $P(Z > z) = 0.05$

$z = 1.6449$

* Remember that if the question is set in a way that allows you to use the small table then you should use that and not the big table.

* In verbal problems always read the question carefully to understand it fully and always define your random variable ($X = \dots$).