



MM104/ MM106/ BM110

Topic 4: Normal Distribution
Converting the Normal Distribution

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Recap

In the previous set of slides we learned that a standard normal distribution has population mean μ , where $\mu = 0$ and population standard deviation σ , where $\sigma = 1$ i.e. $Z \sim N(\mu, \sigma) \Rightarrow Z \sim N(0, 1)$

Conversion to the Standard Normal

X stands for a Normal random variable which **does not** have mean 0 and standard deviation 1.

To transform from X to Z we use the following formula

$$Z = \frac{X - \mu}{\sigma}$$

where μ is the population mean and σ is the population standard deviation

Example 1

The random variable X is Normally distributed with mean 33.0 and standard deviation 16.0. The probability $P(-1.1 < Z < 1.8)$ is the same as the probability $P(x_1 < X < x_2)$ where Z is the standard Normal random variable corresponding to X . What is the value of x_1 ?

$$Z = \frac{X - \mu}{\sigma}, \text{ From the question: } \mu = 33, \sigma = 16, z_1 = -1.1$$

$$\text{Therefore: } -1.1 = \frac{x_1 - 33}{16} \Rightarrow -1.1 \times 16 = x_1 - 33$$

$$\Rightarrow -17.6 = x_1 - 33 \Rightarrow x_1 = -17.6 + 33$$

$$\Rightarrow \underline{\underline{x_1 = 15.4}}$$