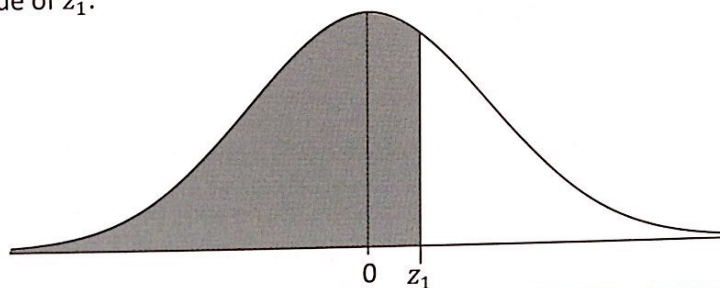


(25 marks)

Question 2

- (a) The diagram shows the standard normal curve. The shaded area represents 67% of the data. Find the value of z_1 .



$$P(Z < z_1) = 0.67$$

$$\Rightarrow z = 0.44$$

- (b) The percentage results in a Maths exam for a class had a mean mark of 70 with a standard deviation of 15. The percentage results in an English exam for the same class had a mean mark of 72 with a standard deviation of 10. The results in both exams were normally distributed.
- (i) Mary got 65 in Maths and 68 in English. In which exam did Mary do better relative to the other students in the class? Justify your answer.

$$\text{Maths: } z = \frac{x - \mu}{\sigma} = \frac{65 - 70}{15} = -0.33$$

$$\text{English: } z = \frac{68 - 72}{10} = -0.4$$

Answer: Maths

Justification: She got a result in maths that was fewer standard deviations below the mean than she did in English.

- (ii) In English the top 15% of students were awarded an A grade.
Find the least whole number mark that merited the award of an A grade in English.

$$P(Z < z_1) = 0.85$$

$$\Rightarrow Z = 1.04 = \frac{x - 72}{10}$$

$$\therefore x = 10(1.04) + 72 = 82.4 \Rightarrow \boxed{83}$$

- (iii) Using the empirical rule, or otherwise, estimate the percentage of students in the class who scored between 52 and 82 in the English test.

$$82 \text{ is } 1 \sigma \text{ above mean} \Rightarrow \frac{68}{2} = 34\% \text{ above}$$

$$52 \text{ is } 2 \sigma \text{ below mean} \Rightarrow \frac{95}{2} = 47.5\% \text{ below}$$

$$34 + 47.5 = \boxed{81.5\%}$$