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Probability and Statistics B

1. Determine the Z-test score for the 4th student ($x = 65$) of based on the marks scored by the students out of 100: 55, 67, 84, 65, 59, 68, 77, 95, 88, 78, 53, 81, 73, 66, 65, 52, 54, 83, 86, 94, 85, 72, 62, 64, 74, 82, 58, 57, 51, 91. What is the percentage of students scored less than the 4th student as per the Z- score table?

D_1 : $X = 65$

$N = 30$

$$N = \frac{\Sigma X}{N} = \frac{65}{30} = \frac{2137}{30}$$

$$= 71,23$$

$$\sigma = \sqrt{\frac{\sum_{i=1}^{N} (x_i - N)^2}{N}}$$

$$= 13,21$$

D_2 : Percentage scored less than 4th student

D_3 : $z_{score} = \frac{x - N}{6} = \frac{65 - 71,23}{13,21} = -0,47$

z score of $-0,47$ is $0,3921$

So, the percentage is 39,21 %.

2. From 100 randomly taken samples, the average proportion (μ) of a normal distribution of sucrose concentrations is found to be 85 mg / 50 ml with a standard deviation of 25 mg / 50 ml. Calculate the 90%, 95%, 99% confidence interval for μ.

D_1 : $N = 100$, $\bar{X} = 85/50 = 1,7$ mg/mL

$\sigma = 25/50 = 0,5$ mg/mL

D_2 : Confidence interval, for ν 90%, 95%, 99%

D_3 : → 90%

$\alpha = (100 - 90)\% = 10\% = 0,1$

$z_{\alpha/2} = z_{0,05} = 1,645$

$$\bar{x} - z_{\alpha/2} \frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

$$1,7 - 1,645 \frac{0,5}{\sqrt{100}} < \mu < 1,7 + 1,645 \frac{0,5}{\sqrt{100}}$$

$$1,61775 < M < 1,78225$$

→ 95%.

$\alpha = (100 - 95)\% = 5\% = 0,5$

$z_{\alpha/2} = z_{0,5/2} = z_{0,025} = 1,96$

$$\bar{x} - z_{\alpha/2} \frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

$$1,7 - 1,96 \frac{0,5}{\sqrt{100}} < \mu < 1,7 + 1,96 \frac{0,5}{\sqrt{100}}$$

$$1,602 < \mu < 1,798$$

→ 99%

$\alpha = (100 - 99)\% = 1\% = 0,01$

$z_{\alpha/2} = z_{0,1/2} = z_{0,005} = 2,575$

$$\bar{x} - z_{\alpha/2} \frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

$$1,7 - 2,575 \frac{0,5}{\sqrt{100}} < \mu < 1,7 + 2,575 \frac{0,5}{\sqrt{100}}$$

$$1,57125 < \mu < 1,82875$$