Answer on Question # 41404, Math, Statistics and Probability

A random sample of 700 units from a large consignment showed that 200 were damaged. Find 95 % confidence interval for the proportion of damaged unit in the consignment

Solution

The confidence interval is:

$$\left(\hat{p} - z_{1-\frac{\alpha}{2}}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}, \hat{p} + z_{1-\frac{\alpha}{2}}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}\right),$$

where $\hat{p} = \frac{200}{700} = 0.286$ is the proportion of successes, $(1-\hat{p}) = 1 - 0.286 = 0.714$, $z_{1-\frac{\alpha}{2}}$ is the $1-\frac{\alpha}{2}$ percentile of a standard normal distribution, α is the error percentile, for a 95% confidence level the error (α) is 5%, so $1-\frac{\alpha}{2} = 0.975$ and $z_{0.975} = 1.96$, $n = 700$ is the sample size.

So confidence interval

$$C.I. = \left(0.286 - 1.96\sqrt{\frac{0.286 \cdot 0.714}{700}}, 0.286 + 1.96\sqrt{\frac{0.286 \cdot 0.714}{700}}\right) = (0.253; 0.319).$$

Answer: $(\mathbf{0.253}; \mathbf{0.319})$.