Out of 80 customers surveyed, 25 ordered cheese pizza. What is the 99% confidence interval for the true proportion of customers who ordered a cheese pizza?

Solution

A sample mean is

$\bar{x} = \frac{25}{80} = 0.3125.$

A sample variance is

$$Var(x) = \sqrt{\frac{\left[\left(\frac{25}{80}\right) * \left(\frac{80-25}{80}\right)\right]}{80}} = 0.05182.$$

$$The\ confidence\ interval = sample\ mean \pm z_{\alpha/2} * (sample\ variance).$$

Level of confidence $= 1 - \alpha$.

In our case:

Level of confidence $= 1 - \alpha = 99\% \rightarrow \alpha = 1\%$.

A standard error:

$$z_{\alpha/2} = z_{.005} = 2.576.$$

$The\ 99\%\ confidence\ interval = sample\ mean \pm 2.576 * (sample\ variance).$

$99\%\ C.I. = 0.3125 \pm 2.576 * 0.05182 = 0.3125 \pm 0.1335.$

$99\%\ C.I = (0.179;\ 0.446).$

Answer: $(\mathbf{0.179};\ \mathbf{0.446})$**.**