

## Answer to Question #92175 – Math – Statistics and Probability

### Question

A random sample of 25 with a mean 80 is taken from a population of 1000 that is a normally distributed with a standard deviation of 30. Find a) the 90%, b) the 95%, and c) the 99% confidence interval for the unknown population mean.

### Solution

Given,

Sample size= $n=25$ .

Sample mean= $80$ .

Population standard deviation= $30$ .

We know that,

Margin of error= $z \times \text{population standard deviation}/\sqrt{\text{sample size}}$ .

Confidence interval= $(\text{sample mean}-\text{margin of error}, \text{sample mean} + \text{margin of error})$ .

Now for confidence interval of 90%.

We know that  $z=1.645$ (for 90% confidence interval).

Therefore

Margin of error= $1.645 \times 30/\sqrt{25}$ .

Margin of error= $1.645 \times 6 = 9.87$ .

Therefore 90% confidence interval is  $(80-9.87,80+9.87)$ .

90% confidence is  $(70.13,89.87)$ .

Now for confidence interval of 95%

we know that  $z=1.96$ (for 95% confidence interval).

Therefore

Margin of error= $1.96 \times 30/\sqrt{25}$ .

Margin of error= $1.96 \times 6 = 11.76$ .

Therefore 95% confidence interval is  $(80-11.76, 80+11.76)$ .

95% confidence is  $(68.24, 91.76)$ .

Now for confidence interval of 99%

we know that  $z=2.576$  (for 90% confidence interval).

Therefore

Margin of error  $= 2.576 \times 30 / \sqrt{25}$ .

Margin of error  $= 2.576 \times 6 = 15.46$ .

Therefore 99% confidence interval is  $(80-15.46, 80+15.46)$ .

99% confidence is  $(64.54, 95.46)$ .

**Answer: a)**  $(70.13, 89.87)$ ; **b)**  $(68.24, 91.76)$ ; **c)**  $(64.54, 95.46)$ .