Answer on Question #72330, Math / Statistics and Probability

The mean value of land and buildings per acre from a sample of farms is $1800, with a standard deviation of $300. The data set has a bell-shaped distribution. Assume the number of farms in the sample is 71.

(a) Use the empirical rule to estimate the number of farms whose land and building values per acre are between $1500 and $2100

(b) If 30 additional farms were sampled, about how many of these farms would you expect to have land and building values between $1500 and $2100 per acre?

Solution

(a) $\mu = 1800, \sigma = 300$

Empirical rule holds only for normal populations.

Let $X =$ value of lands and buildings of farm per acre. Use normal tables

$P(1500 < X < 2100)$

Normal Distribution, $\mu = 1800, \sigma = 300$, we convert this to standard normal using

$$z = \frac{x - \mu}{\sigma}$$

$$z_1 = \frac{1500 - 1800}{300} = -1$$

$$z_2 = \frac{2100 - 1800}{300} = 1$$

$P(-1.00 < Z < 1.00) =$ Area in between -1.00 and 1.00

$P(1500 < X < 2100) = P(-1.00 < Z < 1.00) =$

$= P(Z < 1.00) - P(Z < -1.00) = 0.8413 - 0.1587 = 0.6826 = 68.26\%$

Multiply this percentage by the sample size 71

$$71 \cdot 0.6826 \approx 48 (\text{farms})$$

(b) Number of additional farms whose land and building values per acre are between $1500 and $2100

$$30 \cdot 0.6826 \approx 20 \text{ (farms)}$$