Learning Journal Unit 8

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MATH 1280: Introduction to Statistics

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Use the following information to answer the next three questions. An unknown distribution has the following parameters: $\mu_x = 45$ and $\sigma_x = 8$. A sample size of 50 is drawn randomly from the population.

1. **Find $\mathbf{P}(\sum \boldsymbol{X} > \mathbf{2,400})$.**

If you draw random samples of size n, then as n increases, the random variable ΣX consisting of sums tends to be normally distributed and $\Sigma X \sim N((n)(\mu_x), (\sqrt{n}\,)(\sigma_x))$.

Let X = one value from the original unknown population. The probability requires to find a probability for the sum (or total of) 50 values.

ΣX = the sum or total of 50 values. Since $\mu_x = 45$, $\sigma_x = 8$, and n = 50, so:

$\Sigma X \sim N((50)(45), (50)(8))$

$mean\ of\ the\ sums\ =\ (n)(\mu_x)\ =\ (50)(45)\ =\ 2{,}250$

$standard\ deviation\ of\ the\ sums\ =\ (\sqrt{50})(\sigma_x)\ =\ (\sqrt{50})\ (8)$

$sum\ of\ 50\ values\ =\ \Sigma x\ =\ 2{,}400$

$P(\sum X > 2{,}400) = normalcdf(lower, upper, (n)(\mu_x), (\sqrt{n}\,)(\sigma_x))$.

$P(\sum X > 2{,}400) = normalcdf(2{,}400{,}1E99, (50)(45), (\sqrt{50}\,)(8)) \approx 0.0040$

2. **Find $\sum \boldsymbol{X}$ where $\boldsymbol{z} = \mathbf{-2}$.**

$z = \frac{\sum x-(n)(\mu_x)}{(\sqrt{n}\,)(\sigma_x)}$

$\sum X = z(\sqrt{n}\,)(\sigma_x) + (n)(\mu_x)$

$\sum X = (-2)(\sqrt{50}\,)(8) + (50)(45) \approx 2{,}136.9$

3. **Find the 80th percentile for the sum of the 50 values of x.**

$k\ =\ invNorm\ (area\ to\ the\ left\ of\ k, (n)(mean), (\sqrt{n})\ (standard\ deviation))$

where:

- ✓ k is the kth percentile

- ✓ mean is the mean of the original distribution
- ✓ standard deviation is the standard deviation of the original distribution
- ✓ sample size = n

Let k = the 80th percentile.

$k = invNorm(0.80, (50)(45), (\sqrt{50})\ (8)) \approx 2{,}297.6$