Precalc14.5

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

Find the standard error of the mean
Predict the true mean with a given level of confidence
Determine probability of a given margin of error

population $\mu \longleftrightarrow \bar{X}$

interval

random sample

inferential statistics

standard error (of the mean)

confidence level 95%

margin of error $\pm (SE)(1.96)$

3 **AUTOMOTIVE ENGINEERING** The number of miles a certain sport utility vehicle can travel on open highway on one gallon of gasoline is normally distributed. You are to take a sample of vehicles, test them, and record the miles per gallon. You wish to have a 1% level of confidence that the interval containing the mean miles per gallon of the sample also contains the true mean.

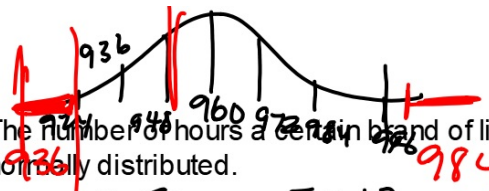
99% $22 \pm \left(\frac{4}{\sqrt{25}}\right)(2.58)$

a. Twenty-five sports utility vehicles are selected and tested. From this sample, the average miles per gallon is 22 with a standard deviation of 4 miles per gallon. Determine the interval about the sample mean that has a 1% level of confidence.

b. Four hundred sports utility vehicles are randomly selected and their miles per gallon are recorded. From this sample, the average miles per gallon is 22 with a standard deviation of 4 miles per gallon. Determine the interval about the sample mean that has a 1% level of confidence.

c. What happens when the number of items in the sample is increased?

2^2 $\left(\pm \frac{4}{\sqrt{400}}\right)(2.58)$



The number of hours a certain brand of light bulb will function is normally distributed.

$n = 50$ $\sigma = 12$

Fifty light bulbs are selected and tested. From this sample, the average life of the bulb is 960 hours with a standard deviation of 12 hours. Determine the interval about the sample mean that has a 1% level of confidence.

99%

$960 \pm (1.70)(2.58)$

960 ± 4.39

$\frac{12}{\sqrt{50}} = 1.70$

960 ± 25

960 ± 24

$955.61 < \mu < 964.39$

$\frac{12}{\sqrt{300}} = 0.69$

Three hundred bulbs are randomly selected and tested. From this sample, the average life is 960 hours and standard deviation is 12 hours. Determine the interval about the mean that has a 1% level of confidence.

$960 \pm (0.69)(2.58)$

960 ± 1.78

$958.22 < \mu < 961.78$

What happens when the number of items in the sample is increased?

You are the vice-president of marketing. What guarantee should be printed on the package? (number of hours?)

guarantee

936

900

≈2%

950 hours

Probability of...

27. The standard deviation of blood pressure of 45 women (ages 40 to 50 years old) is 12. What is the probability that the mean blood pressure of a random sample will differ by more than 3 points from the mean blood pressure reading for all women in that age bracket?

mean ± ( )

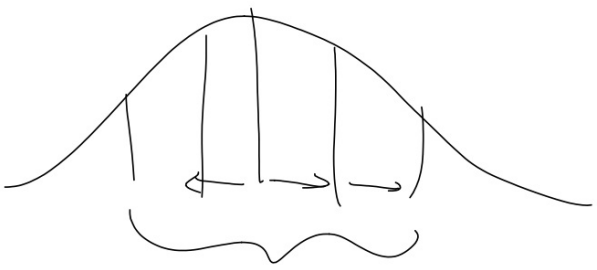
$\frac{12}{\sqrt{45}} \approx 1.79$

$(1.79)(\quad) > 3$

10%

100% − 90 (within

How big is the ±?
How many SE? How likely is that?



WB 14.5