6.5 CENTRAL LIMIT THEOREM

An Experiment:

Each student generates a set of 40 random numbers from 0-9, entering the numbers in a list. The mean and standard deviation of the set of 40 numbers are calculated. The results are then recorded on a master sheet. The class totals for numbers 0...9 will be plotted and μ and σ calculated. The Averages will also be plotted and $\mu_{\overline{x}}$ and $\sigma_{\overline{x}}$ calculated. The histogram of the class totals will be compared to the histogram of the sample means.

"As the sample size increases, the sampling distributions of sample means approaches a normal distribution."

See example on page 289 Table 6-6.

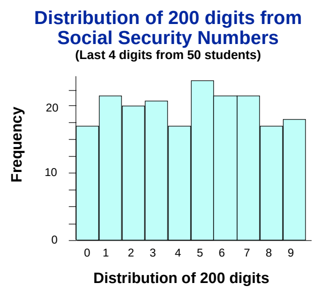


Figure 5-19

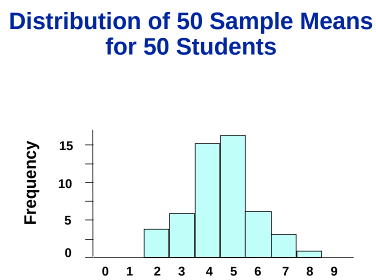


Figure 5-20

SAMPLING DISTRIBUTION OF THE MEAN: The probability distribution of sample means, with all samples having the same size n.

NOTATION

Mean of the Sample Means $\mu_{\overline{x}} = \mu$

Standard Deviation of the Sample Means $\sigma_{\overline{x}} = \frac{\sigma}{\sqrt{n}}$

often called STANDARD ERROR OF MEAN

RULES WHEN USING THE CENTRAL LIMIT THEOREM:

- If you are working with a random sample of size $n > 30$, or if the original population is normally distributed, treat the distribution of sample means as a normal distribution.

- The distribution of the sample means has mean μ.

- The distribution of the sample means has standard deviation $\frac{\sigma}{\sqrt{n}}$.

ANOTHER EXPERIMENT (In class K300 experiment Spring 2009)

32 Students were given 50 m&m's. They were asked to count the red M&M's. The results are as follows:

8	10	7	11
11	4	4	9
9	8	7	4
6	3	7	6
9	10	8	6
4	10	9	8
8	9	5	4
6	8	7	8

The mean is 7.3 with standard deviation 2.2

Now fill in the column below with the mean of each row.

Mean	Mean^2

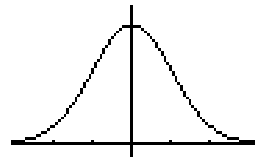
What is the mean and standard deviation of those eight numbers?

How does this support Central Limit Theorem?

Will it always work out exactly like this in an experiment?
(This is the first time in 22 trials that it worked out exactly for me!)

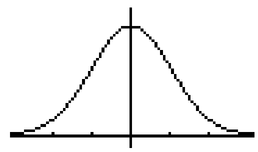
Examples:

***#6, pg. 296 a)A single individual



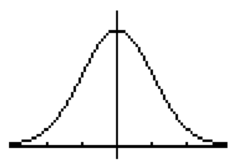
$P(\text{x} > 1600)$

b) Selecting a SAMPLE of 64 (Central Limit Theorem)

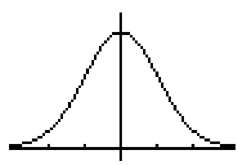


$P(\overline{x} > 1600)$

***#12, pg.297 a) P(x)



b) $P($ $)$



RARE EVENT RULE: If, under a given assumption, the probability of a particular observed event is exceptionally small, we conclude that the assumption is probably not correct.

Example:

***#12 c, pg. 297