

**Discussion - Week 6****Example 1** (Sample Sum and Sample Mean)

A sample of size 50 is taken from a distribution with mean 38 and standard deviation 0.5.

- (a) Find the expected value and standard error of the sample sum.
- (b) What is the distribution of the sample sum?
- (c) Find the expected value and standard error of the sample mean.
- (d) What is the distribution of the sample mean?
- (e) What is the probability that the sample sum is less than 1890?
- (f) What is the probability that the sample mean is larger than 40?

**Example 2** (Estimated Standard Error of the sample mean)

In each case, estimate the standard error of the sample mean  $\bar{x}$

- (a)  $n = 15, s^2 = 1$
- (b)  $n = 100, s^2 = 1$
- (c)  $n = 15, s^2 = 5$
- (d)  $n = 100, s^2 = 5$
- (e) How does the estimated standard error change when  $n$  increases?
- (f) How does the estimated standard error change when  $s^2$  increases?

**Example 3** (Using the t Table)

Find  $t_\alpha$  given the values of  $\alpha$  and degrees of freedom below. If the given degrees of freedom are not in the table, round down.

- (a)  $\alpha = 0.005$ , 13 degrees of freedom
- (b)  $\alpha = 0.05$ , 28 degrees of freedom
- (c)  $\alpha = 0.025$ , 4 degrees of freedom
- (d)  $\alpha = 0.005$ , 67 degrees of freedom
- (e)  $\alpha = 0.01$ , 58 degrees of freedom
- (f)  $\alpha = 0.05$ , 33 degrees of freedom

**Example 4**

A random sample of size  $n = 49$  from a population yielded a sample mean  $\bar{x} = 29$  and sample variance  $s^2 = 4$ .

- (a) Estimate the standard error of  $\bar{x}$ .
- (b) Compute a 95% confidence interval for the population mean ( $\mu$ ).
- (c) Interpret the interval. What does "95% confident" mean?

**Example 5**

Find a  $(1 - \alpha)100\%$  confidence interval for a population mean  $\mu$  for the following values.

- (a)  $\alpha = 0.10$ ,  $n = 38$ ,  $\bar{x} = 54$ ,  $\sigma^2 = 11$
- (b)  $\alpha = 0.01$ ,  $n = 38$ ,  $\bar{x} = 54$ ,  $\sigma^2 = 11$
- (c)  $\alpha = 0.01$ ,  $n = 80$ ,  $\bar{x} = 54$ ,  $\sigma^2 = 11$