Unit 7 Assignments for Prob/Stat/Discrete
Correlation and Regression
and
Confidence Intervals

Day	Date	**Assignment** (Due the next class meeting)
		7.1 Worksheet
		7.2 Part I Worksheet
		7.2 Part II Worksheet
		7.3 Worksheet
		7.4 Worksheet
		7.5 Worksheet
		Unit 7 Review
		Unit 7 Practice Test
		Unit 7 Test

NOTE: You should be prepared for daily quizzes.

HW reminders:

- If you cannot solve a problem, get help **before** the assignment is due.
- Help is available before school, during lunch, or during IC.
- For extra practice, visit www.interactmath.com
- Click ENTER, then scroll down to Larson, Elementary Statistics 4th edition. Pick the assignment you need extra practice with. You can get immediate feedback and hints.
- Don't forget that you can get 24-hour math help from www.smarthinking.com!

7.1: Correlation

This chapter talks about ________________________ between variables that are measured on the same individuals.

Terms to know:

1. Response variable: (y) The ______________________ variable in the study that measures the outcomes.

2. Explanatory variable: (x) The ________________________ variable that influences change in the response variable.

Example 1: For each situation, decide which variable is the explanatory and which is the response.

a) Number of hours studying for an exam and the grade on the exam.

b) The amount of saturated fat in a person's diet and that person's weight.

c) The yield of a crop and the amount of yearly rainfall.

When examining the relationship of variables, use the following principles:

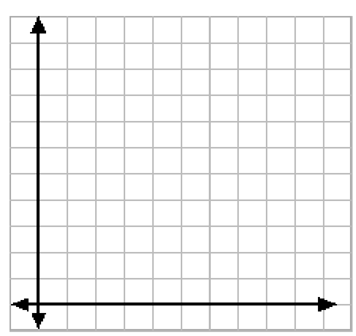
- Plot the data (and find numerical summaries)
- Look for overall patterns and deviations from these patterns
- If the pattern is regular, use a mathematical model to describe it.

To display the relationship between **two quantitative variables**, use a ____________________**.**

- Put the explanatory variable on the x-axis.
- Put the response variable on the y-axis.
- If the relationship cannot be determined, you may choose which variable goes where.

Example 2: Create a scatter plot of the data shown.

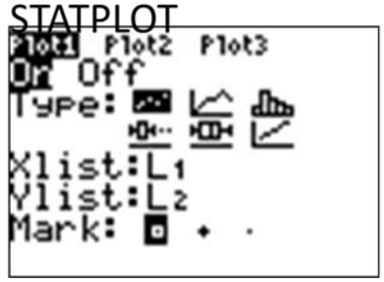
x	1	2	3	7
y	4	5	7	10



On the calculator…

Keystroke	Comments
STAT, EDIT	Put in L1 and L2
2nd STATPLOT	Make sure the plot is ON
Choose the scatter plot icon	
ZOOM 9	To fit your data

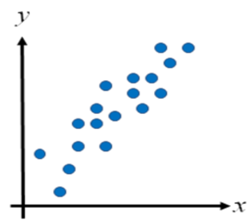
STATPLOT



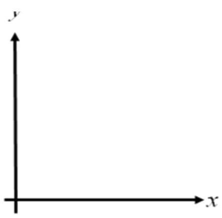
Types of Correlation:

As x ____________________,

y tends to ________________.



____________________ Linear Correlation

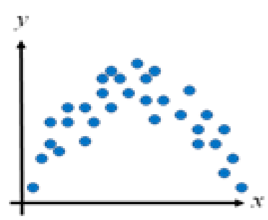


As x ____________________,

y tends to ________________.

____________________ Linear Correlation

The pattern between x and y does not look like a ________________ line.



Nonlinear Correlation

There is no ________________ between the x and y values.

__________ Correlation

Correlation Coefficient (*r*): a numerical value used to measure the ______________________ and ___________________ of linear relationships between 2 quantitative variables.

$$r = \frac{1}{n-1}\sum\left(\frac{x_i - \bar{x}}{s_x}\right)\left(\frac{y_i - \bar{y}}{s_y}\right)$$

where x_i and y_i are individual values, *n* is the # of individuals

(Note: we are using *s* to describe standard deviation because we are not using a population distribution, but are instead using sample data.)

Do you see the similarity with the standardization process for finding z-scores?

r is the AVERAGE of the products of the x and y standardized values.

Important facts about the correlation coefficient (*r*):

1. *r* will not change if we switch ________and _________.
2. Both variables must be quantitative (duh!)
3. $-1 \leq r \leq 1$ (always!)
4. If $r = 1$ or $r = -1$, then the relationship is perfectly linear.
5. Value of $r = 0$ means there is ___________ linear relationship (not the best description of form).
6. The correlation coefficient *r* only measures the strength of a ______________ relationship.

Example 3: Find the correlation coefficient (*r*):

x	1	2	3	7
y	4	5	7	10

Use TI-83: **IMPORTANT:** To calculate ***r***, you must first turn on the ***DiagnosticOn*** command found in the Catalog menu.

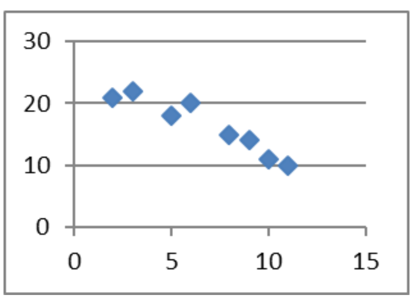
TI-83/84

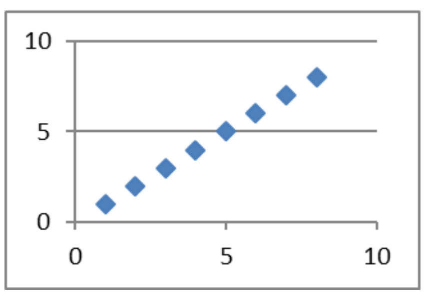
Keystroke	Comments
STAT, EDIT	To put in L1 and L2
2nd CATALOG	Scroll down to DiagnosticOn
ENTER, ENTER	Your screen should say "DONE" You only need to do this once (unless your calculator is reset.)
STAT, CALC, 4: LinReg (ax + b)	The value of r is the 4th one down.

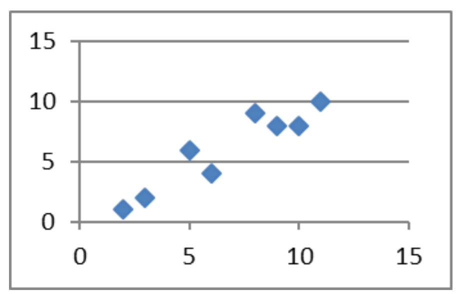
a) What is the value of *r*?

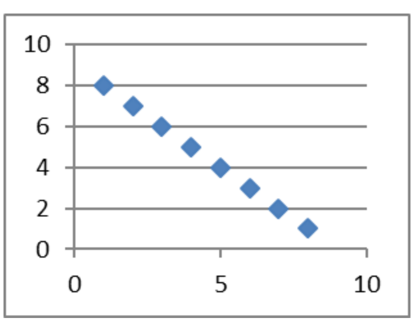
b) Make a conclusion about the type of correlation.

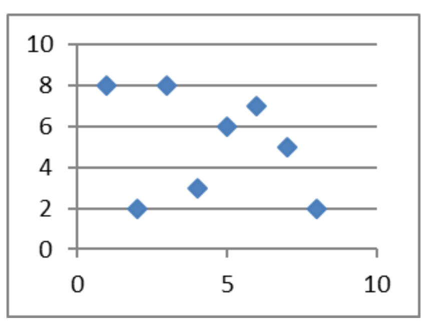
Example 4: **Match** the value of *r* to each scatter plot. Choices for *r*: -1, -.8, 0, 0.8, 1











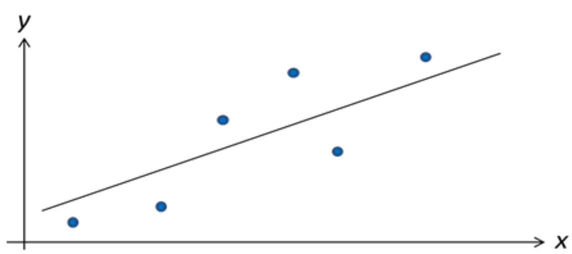
Example 5: a) display the data in a scatter plot on your calc; b) find the value of r;
c) make a conclusion about the type of correlation.

The number of hours 13 students spent studying for a test and their scores on the test.

Hours, x	0	1	2	4	4	5	5	5	6	6	7	7	8
Score, y	40	41	51	48	64	70	73	75	68	93	84	90	95

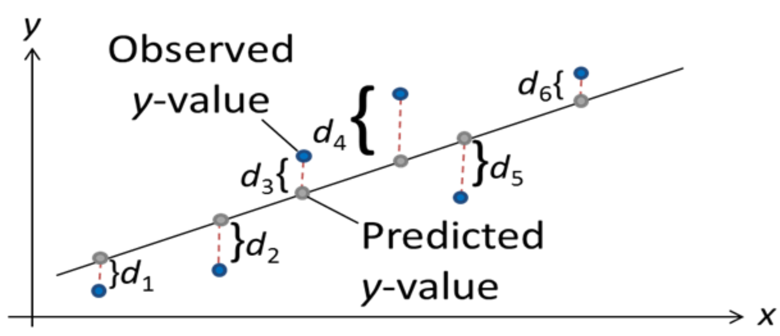
7.2: Regression Lines

A **regression line** is a ________________________ line that describes how a response variable changes as an explanatory variable changes. We can use a regression line to _______________ the value of y for a given value of x (or to predict a value of x when given a value for y.)



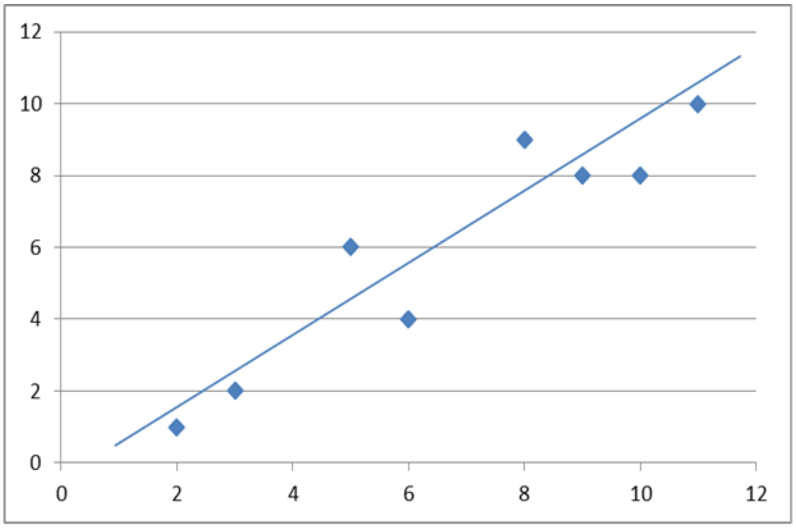
Residual (d)

- The _______________________ between the observed y-value and the predicted y-value for a given x-value on the line.



Residual: observed value – predicted value

Example 1: Use the scatter plot and regression line shown to estimate the residual for x = 6.



Because different people draw different regression lines through data that appears to be linear, we will use a **least squares regression line** to make the sum of the squares of the residuals of the data points as small as possible.

The equation of a least squares regression line will be written as $\hat{y} = ax + b$

with slope $a = r\dfrac{s_y}{s_x}$ and y-intercept $b = \bar{y} - a\bar{x}$

(Note: $\hat{y}$ is read "y ______")

Example 2: We will usually use our TI-83s to calculate $\hat{y}$. This time we will calculate it by hand:

x	1	2	3	7
y	4	5	7	10

Step 1: Make a scatterplot using your TI-83.
Step 2: Verify that the pattern is linear.
Step 3: Find *r*. (We did this in the 7.1 notes.)
Step 4: Find $\hat{y}$ using the formula on the previous page.

Example 3: Now use your TI-83 to find the least squares regression line.

x	1	2	3	7
y	4	5	7	10

TI-83/84

Keystroke	Comments
STAT, EDIT	Put in your data for L_1 and L_2
STAT	
CALC	
4: LinReg (ax + b)	a = slope, b = y-intercept

Write down the equation here:

Graph this line as y_1 in your TI-83.

Facts about least-squares regression

1. Deciding which variable is independent and which is dependent is essential. You will get a different equation if these are exchanged.

2. There is a close connection between the slope of the regression line and *r*.

3. The line will always pass through the point $(\bar{x}, \bar{y})$.

4. The square of the correlation, r^2, is the fraction of the variation in the values of y that is explained by the least squared regression line. In other words, r^2 tells us the ____________________________ of the data that fits the line well.

What does r^2 tell us in Example 3?

Example 4: Use the data shown.

Advertising expenses, ($1000), x	Company sales ($1000), y
2.4	225
1.6	184
2.0	220
2.6	240
1.4	180
1.6	184
2.0	186
2.2	215

a) Find the equation of the regression line.

b) Use your regression line to predict the sales when the company spends \$3000 on advertising.

c) Use your regression line to predict the amount of advertising money spent when the sales are equal to \$200,000.

Example 5: A collection of a set of data (x) has a mean 12 with a standard deviation of 1.3. Another variable (y) has a mean of 30 with a standard deviation of 4. The correlation coefficient is 0.91. Find the equation of the linear regression line.

$$\boxed{a = r\frac{s_y}{s_x} \qquad b = \bar{y} - a\bar{x}}$$

7.3 Notes: Confidence Intervals for the Mean (Large Samples)

Objectives:
- **Can you find a point estimate and a margin of error?**
- **Can you construct and interpret confidence intervals for the population mean?**
- **Can you determine the minimum sample size required when estimating μ?**

Essential Idea: Can we estimate the value of the population mean by using sample data?

Point Estimate
- A single value estimate for a ____________________ parameter
- Most unbiased point estimate of the population mean μ is the ______________ ________ $\bar{x}$.

Example 1: Market researchers use the number of sentences per advertisement as a measure of readability for magazine advertisements. The following represents a random sample of the number of sentences found in 50 advertisements. Find a point estimate of the population mean, μ. *(Source: Journal of Advertising Research)*

9	20	18	16	9	9	11	13	22	16	5	18	6	6	5	12	25
17	23	7	10	9	10	10	5	11	18	18	9	9	17	13	11	7
14	6	11	12	11	6	12	14	11	9	18	12	12	17	11	20	

The point estimate for the mean length of all magazine advertisements is _________ sentences.

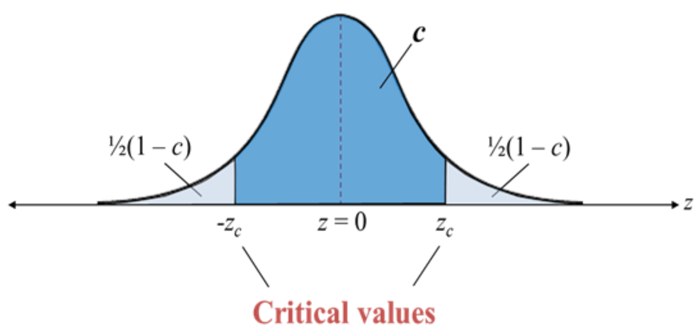
What would the probability be that the population mean is **exactly the same** as the point estimate?

_________ .

Therefore, we will estimate that μ lies in an interval.

How confident do we want to be that the interval estimate contains the population mean μ?

Level of confidence *c*: The ________________ that the interval estimate contains the population parameter.



Example 2: Find the critical values z_c for the following confidence levels.

a) $c = 90\%$ b) $c = 94\%$ c) $c = 97\%$

Sampling error : The _________________ between the point estimate and the actual population mean.

- $\bar{x} - \mu$
- (varies from sample to sample)

Margin of error

- The ________________ possible distance between the ___________ ______________and the population mean for a given level of confidence, *c*.
- Denoted by *E*.

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

→ When $n \geq 30$, the sample standard deviation, s, can be used for σ.

Example 3: Use the magazine advertisement data and a 95% confidence level to find the margin of error for the mean number of sentences in all magazine advertisements. Assume the sample standard deviation is about 5.0. (Recall that $\bar{x} = 12.4$.)

A *c*-confidence interval for the population mean μ :

The _________________________ that the confidence interval contains μ is *c*.

c-confidence interval: $\bar{x} - E < \mu < \bar{x} + E$ where $E = z_c \frac{\sigma}{\sqrt{n}}$

Example 4: Construct a 95% confidence interval for the mean number of sentences in all magazine advertisements. See #3 for *E*.

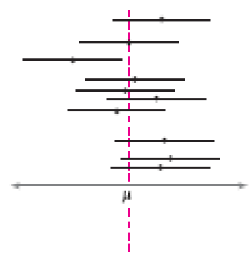
With 95% confidence, you can say that the population mean μ number of sentences is between ______ and ________.

Example 5: A college admissions director wishes to estimate the mean age of all students currently enrolled. In a random sample of 20 students, the mean age is found to be 22.9 years. From past studies, the standard deviation is known to be 1.5 years, and the population is normally distributed. Construct a 90% confidence interval of the population mean age.

***When rounding, round off to the same number of decimal places given for the sample mean. ***

Interpreting Results for Confidence Intervals:

- μ is a fixed number. It is either in the confidence interval or not.
- Incorrect: "There is a 90% probability that the actual mean is in the interval (______, ______)."
- Correct: "If a large number of samples is collected and a confidence interval is created for each sample, approximately 90% of these intervals will contain μ.



Using a graphing calculator to find a confidence interval:

1. STAT, EDIT (put in the list if actual data is given)
2. STAT: TESTS
3. 7: Z-Interval
4. Select Data (if you have entered the actual data) OR select Stats if you entered descriptive statistics.
5. Enter the appropriate values (if needed), and select CALCULATE.

Example 6: Find the 95% confidence interval of the population mean from the following sample:

9 20 18 16 9 9 11 13 22 16 5 18 6 6 5

Example 7: A college admissions director wishes to estimate the mean age of all students currently enrolled. In a random sample of 20 students, the mean age is found to be 22.9 years. From past studies, the standard deviation is known to be 1.5 years, and the population is normally distributed. Construct a 90% confidence interval of the population mean age.

Finding the minimum sample size:

Given a c-confidence level and a margin of error E, the minimum sample size n needed to estimate the population mean μ is

$$n = \left(\frac{z_c \sigma}{E}\right)^2$$

(ALWAYS ROUND ________!)

If σ is unknown, you can estimate it using s provided you have a preliminary sample with at least 30 members.

Example 8: You want to estimate the mean number of sentences in a magazine advertisement. How many magazine advertisements must be included in the sample if you want to be 95% confident that the sample mean is within one sentence of the population mean? Assume the sample standard deviation is about 5.0.

7.4 Notes: Confidence Intervals of the Mean (Small Samples)

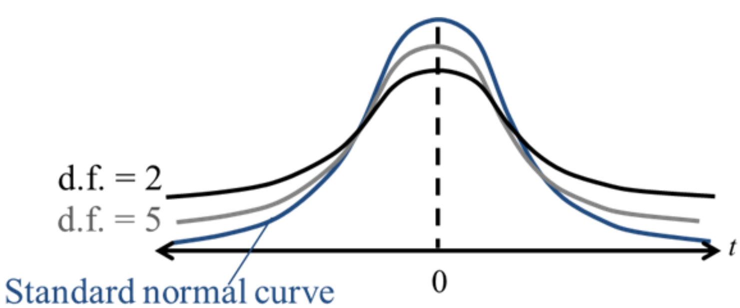
Objectives:

- Can you interpret the t-distribution and use a t-distribution table?
- Can you construct confidence intervals when $n < 30$, the population is normally distributed, and σ is unknown?

The *t*-distribution: When the population standard deviation is ________________, the sample size is less than _____________, and the random variable x is approximately normally distributed, it follows a t-distribution.

Critical values of t are denoted by t_c.

$$t = \frac{\overline{x} - \mu}{\frac{s}{\sqrt{n}}}$$



The tails in the t-distribution are "thicker" than those in the standard normal distribution.

Properties of *t*-distributions:

1. The *t*-distribution is ____________________ and ____________________ about the mean.

2. The *t*-distribution is a family of curves, each determined by a parameter called the degrees of freedom. The degrees of freedom are the number of _____ choices left after a sample statistic such as ___ is calculated. When you use a *t*-distribution to estimate a population mean, the degrees of freedom are equal to one less than the sample size.

   d.f. $= n - 1$ Degrees of freedom

3. The total area under a *t*-curve is 1 or 100%.

4. The mean, median, and mode of the *t*-distribution are equal to _______________.

5. As the degrees of freedom increase, the *t*-distribution approaches the normal distribution. After 30 d.f., the *t*-distribution is very close to the standard normal *z*-distribution.

Example 1: Find the critical value t_c for a 95% confidence when the sample size is 15. Use Table 5.

Table 5: *t*-Distribution

	Level of confidence, *c*	0.50	0.80	0.90	0.95	0.98	0.99
	One tail, α	0.25	0.10	0.05	0.025	0.01	0.005
d.f.	Two tails, α	0.50	0.20	0.10	0.05	0.02	0.01
1		1.000	3.078	6.314	12.706	31.821	63.657
2		.816	1.886	2.920	4.303	6.965	9.925
3		.765	1.638	2.353	3.182	4.541	5.841
13		.694	1.350	1.771	2.160	2.650	3.012
14		.692	1.345	1.761	2.145	2.624	2.977
15		.691	1.341	1.753	2.131	2.602	2.947
16		.690	1.337	1.746	2.120	2.583	2.921
28		.683	1.313	1.701	2.048	2.467	2.763
29		.683	1.311	1.699	2.045	2.462	2.756
∞		.674	1.282	1.645	1.960	2.326	2.576

<u>Draw a diagram of what this means:</u>

A *c*-confidence interval for the population mean μ: $\bar{x} - E < \mu < \bar{x} + E$ where $E = t_c \dfrac{s}{\sqrt{n}}$

- The ____________________ that the confidence interval contains μ is c.
  (Very similar to constructing a confidence interval using the normal distribution)

Example 2: You randomly select 16 coffee shops and measure the temperature of the coffee sold at each. The sample mean temperature is 162.0ºF with a sample standard deviation of 10.0ºF. Find the 95% confidence interval for the mean temperature. Assume the temperatures are approximately normally distributed.

Note: Should we use a *t*-distribution or a normal distribution?

With 95% confidence, you can say that the mean temperature of coffee sold is between _______ and _______.

Using the graphing calculator to find the confidence interval with a *t*-distribution:

1. STAT, EDIT, enter list (if the actual data is given)
2. STAT: TESTS
3. 8: TInterval
4. Select Data (if you have entered the original data) OR select Stats if you entered descriptive statistics.
5. Enter the appropriate values

Example 3: You randomly select 16 coffee shops and measure the temperature of the coffee sold at each. The sample mean temperature is 162.0ºF with a sample standard deviation of 10.0ºF. Find the 95% confidence interval for the mean temperature. Assume the temperatures are approximately normally distributed**.**

Example 4: A random sample of the body temperature of 9 adults is taken (in degrees F). The results are below. Find the 98% confidence interval for the population mean body temperature. Assume the temperatures are approximately normally distributed.

99 99.2 98.4 97.8 98.3 99.2 100.1 97.4 98.6

Example 5: You randomly select 25 newly constructed houses. The sample mean construction cost is $181,000 and the population standard deviation is known to be $28,000. Assuming construction costs are normally distributed, should you use the normal distribution, the *t*-distribution, or neither to construct a 95% confidence interval for the population mean construction cost?

Section 7.5: Confidence Intervals for Population Proportions

Section 7.5 Objectives:

- Find a point estimate for the population proportion
- Construct a confidence interval for a population proportion
- Determine the minimum sample size required when estimating a population proportion

Point Estimate for Population *p*

Population Proportion

- The probability of ___________________in a single trial of a binomial experiment.
- Denoted by ***p***

Point Estimate for *p*

- The proportion of successes in a sample.
- Denoted by
  - $\hat{p} = \frac{x}{n} = \frac{\text{number of successes in sample}}{\text{number of items in sample}}$
  - read as "*p* hat"

Estimate Population Parameter…	with Sample Statistic
Proportion: p	$\hat{p}$

Point Estimate for *q*, the proportion of failures

- Denoted by $\hat{q} = 1 - \hat{p}$
- Read as "*q* hat"

Example: Point Estimate for *p*

In a survey of 1219 U.S. adults, 354 said that their favorite sport to watch is football. Find a point estimate for the population proportion of U.S. adults who say their favorite sport to watch is football. *(Adapted from The Harris Poll)*

Solution: $n =$ and $x =$

Confidence Intervals for *p*

A *c*-confidence interval for the population proportion *p*

- $\hat{p} - E < p < \hat{p} + E \quad \text{where } E = z_c\sqrt{\frac{\hat{p}\hat{q}}{n}}$
- The probability that the confidence interval contains p is c.

Constructing Confidence Intervals for *p*

1. Identify the sample statistics n and x.
2. Find the point estimate $\hat{p}$. $\hat{p} = \frac{x}{n}$
3. Verify that the sampling distribution of $\hat{p}$ can be approximated by the normal distribution.

   $n\hat{p} \geq 5 \qquad n\hat{q} \geq 5$

4. Find the critical value z_c that corresponds to the given level of confidence c. Use the Standard Normal Table.
5. Find the margin of error E. $E = Z_c\sqrt{\frac{\hat{p}\hat{q}}{n}}$
6. Find the left and right endpoints and form the confidence interval.

   Left endpoint: $\hat{p} - E$
   Right endpoint: Interval: $\hat{p} + E$
   Interval: $\hat{p} - E < p < \hat{p} + E$

Example 1: Confidence Interval for *p*

In a survey of 1219 U.S. adults, 354 said that their favorite sport to watch is football. Construct a 95% confidence interval for the proportion of adults in the United States who say that their favorite sport to watch is football.

Solution: Recall $\hat{p} \approx 0.290402$

$\hat{q} =$

Solution: Confidence Interval for *p*

- Verify the sampling distribution of $\hat{p}$ can be approximated by the normal distribution

$n\hat{p} \approx$

$n\hat{q} \approx$

- Margin of error:

$$E = Z_c\sqrt{\frac{\hat{p}\hat{q}}{n}} =$$

- Confidence interval:
- Left Endpoint: $\hat{p} - E$ Right Endpoint: $\hat{p} + E$

With 95% confidence, you can say that the proportion of adults who say football is their favorite sport is

between ______% and _______%.

Sample Size

- Given a c-confidence level and a margin of error E, the minimum sample size n needed to estimate p is $n = \hat{p}\hat{q}\left(\frac{z_c}{E}\right)^2$
- This formula assumes you have an estimate for $\hat{p}$ and $\hat{q}$.
- If not, use $\hat{p} = 0.5$ and $\hat{q} = 0.5$

Example 2: Sample Size

You are running a political campaign and wish to estimate, with 95% confidence, the proportion of registered voters who will vote for your candidate. Your estimate must be accurate within 3% of the true population. Find the minimum sample size needed if no preliminary estimate is available.

Solution:

Because you do not have a preliminary estimate for $\hat{p}$ use $\hat{p} =$ ___ and $\hat{q} =$ _____.

c = ____ z_c = _______ E = ____

$n = \hat{p}\hat{q}\left(\frac{z_c}{E}\right)^2 =$

Round up to the nearest whole number.

With no preliminary estimate, the minimum sample size should be **at least _______ voters**.

Example 3: Sample Size

You are running a political campaign and wish to estimate, with 95% confidence, the proportion of registered voters who will vote for your candidate. Your estimate must be accurate within 3% of the true population. Find the minimum sample size needed if a preliminary estimate gives $\hat{p} = 0.31.$.

Solution:

Use the preliminary estimate _________

$\hat{q} =$

Solution: Sample Size

c = _____ z_c = _______ E = _______

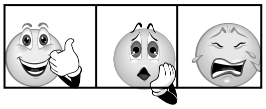
$n = \hat{p}\hat{q}\left(\frac{z_c}{E}\right)^2 =$

Round up to the nearest whole number.

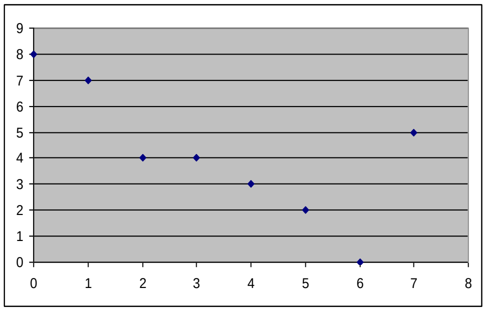
With a preliminary estimate of $\hat{p} =$ _____, the minimum sample size should be **at least _______ voters**.

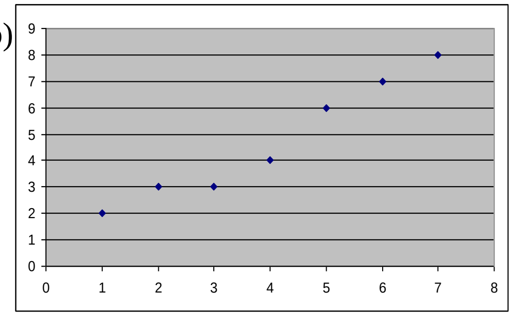
Need a larger sample size if no preliminary estimate is available.

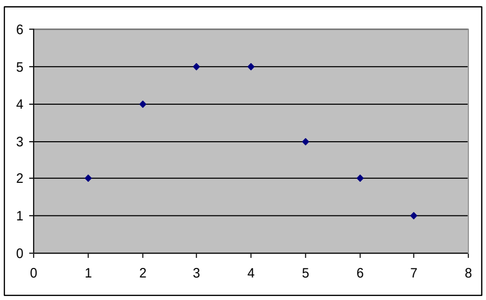
Prob/Stat/Discrete **Name**____
Unit 7 Objectives

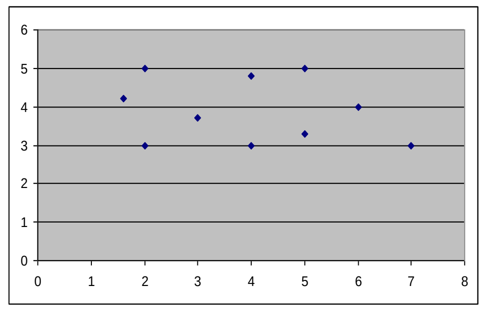


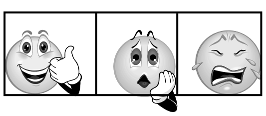
Objective #1: Can you describe types of correlation?

a)


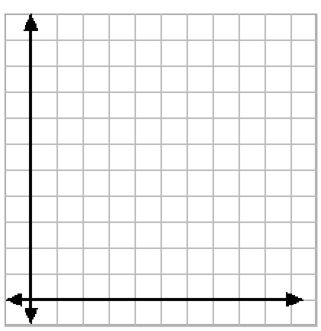
b)


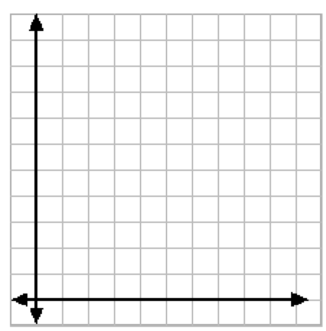
c)


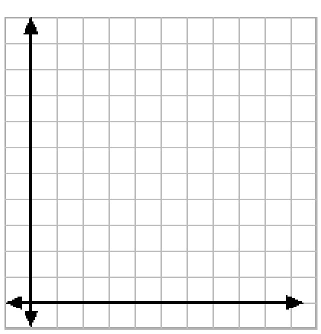
d)


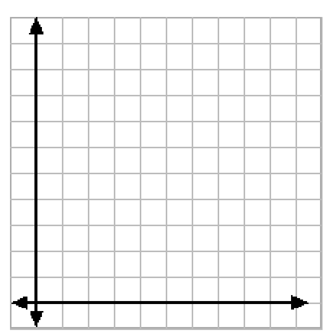


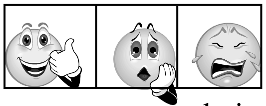
Objective #2: Can you create scatter plots, given the correlation coefficient?

a) $r = 1$


b) $r = -1$


c) $r = -0.8$


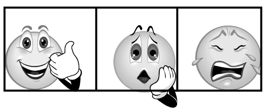
d) $r = 0$




Objective #3: Can you identify explanatory and response variables?

a) A college student conducts an experiment to determine whether or not there is a linear relationship between an individual's weight (in pounds) and daily sugar consumption (in ounces). Which variable is the explanatory variable? Which is the response variable?

b) Andrea collects information from 24 students. She wants to know the number of days absent from school and also the GPA for each student. What variable is explanatory variable? What is response variable?



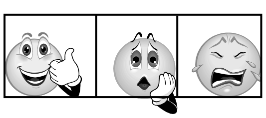
Objective #4: Can you find the correlation coefficient AND make a conclusion about the type of correlation?

a) The number of hours per week spent exercising and the amount of weight lost in one month (in pounds).

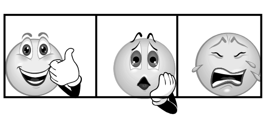
Hours *x*	2	0	3	5	4	7	10
Weight lost *y*	4	1	5	5	6	10	15

b) The shoes sizes and heights (in inches) for 14 men.

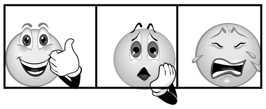
Shoe size, *x*	8.5	9.0	9.0	9.5	10.0	10.0	10.5	10.5	11.0	11.0	11.0	12.0	12.0	12.5
Height, *y*	66	68.5	67.5	70	70	72	71.5	69.5	71.5	72	73	73.5	74	74



Objective #5: Can you explain how to find a residual?



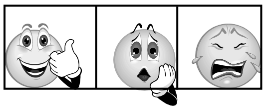
Objective #6: Can you create a scatter plot that shows a negative residual?



Objective #7: Can you interpret values of r^2?

a) What percentage of the data can be explained by the regression line in Obj 4a?

b) What percentage of the data can be explained by the regression line in Obj 4b?



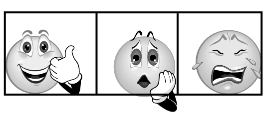
Objective #8: Can you find the equation of a regression line, when appropriate?

a) Use the data from Obj 4a.

b) Use the data from Obj 4b.

c) The ounces of water a person drinks each day and the systolic blood pressures

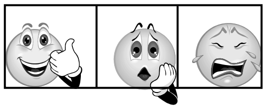
Water *x*	64	80	50	70	60	75	58	68	85
Blood Pressure *y*	110	150	125	109	162	133	170	120	145



Objective #9: Can you predict values by using a regression line?

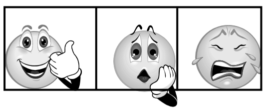
a) Using the equation from Obj 8a, predict the number of pounds lost if a person exercises for 8 hours each week.

b) Using the equation from Obj 8a, find out how many hours per week a person should exercise in order to lose 20 pounds per month.



Objective #10: Can you derive the equation of a linear regression line when given the means, standard deviations, and correlation coefficient of two variables?

The hours (x) spent studying in one weekend by 20 students has a mean of 2.5 hours with a standard deviation of 0.3. The test scores (y) of those same students have a mean of 71.4 with a standard deviation of 12.4. The correlation coefficient between the hours and the test scores is 0.79.

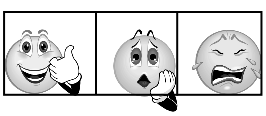


Objective #11: Can you find a point estimate?
The stem and leaf plots show the shoulder heights (in cm) of the 40 male bears. Find a point estimate for the male bears.

Shoulder Heights (in cm) of Male Bears

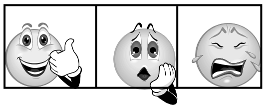
Key: 4 | 9 = 49

4	9
5	7
6	8 9
7	1 1 2 2 2 2 2 3 3 3 4 4 5 5 6 6 7 8 8
8	1 2 3 4 4 5 6 7 9
9	0 0 3 6 7 9
10	2
11	4



Objective #12: Can you find the z-scores given the level of confidence?

a) 92% b) 99% c) 96%



Objective #13: Can you find error?

a) Can you find the sampling error?

i) $\bar{x} = 0.7$, $\mu = 1.3$

ii) $\bar{x} = 24.67$, $\mu = 26.43$

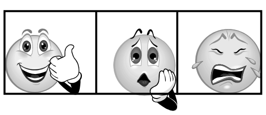
b) Can you find a margin of error? (for the given values of c, s, and n)

i) $c = 0.90$, $s = 2.5$, $n = 36$

ii) $c = 0.80$, $s = 1.3$, $n = 75$

c) Can you find a margin of error for Objective 11a?
(Use a 95% confidence interval)

male bears:

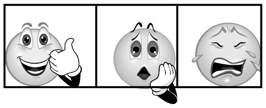


Objective #14: Can you construct confidence intervals for the population mean?

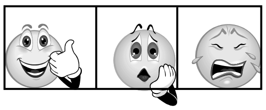
a) $c = 0.90$, $\bar{x} = 15.2$, $s = 2.0$, $n = 60$

b) $c = 0.88$, $\bar{x} = 57.2$, $s = 7.1$, $n = 50$

c) Construct the **95%** confidence interval for the population mean: A random sample of 32 gas grills has a mean price of \$630.90 and a standard deviation of \$56.70.



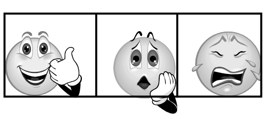
Objective #15: Can you interpret confidence intervals for the population mean?
Which would have a wider interval, a 95% confidence interval or a 99% confidence interval? Explain your reasoning.



Objective #16: Can you determine the minimum sample size required when estimating μ?
Find the minimum sample size n to estimate μ for the given values of c, s, and E.

a) $c = 0.90$, $s = 6.8$, $E = 1$

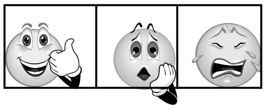
b) b) $c = 0.98$, $s = 10.1$, $E = 2$



Objective #17: Can you interpret the *t*-distribution and use a *t*-distribution table?
Find the critical value t_c for the given confidence level c and sample size n. Then interpret the results.

a) $c = 0.90$, $n = 10$

b) $c = 0.95$, $n = 12$



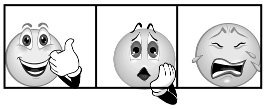
Objective #18: Can you construct confidence intervals when $n < 30$, the population is normally distributed?

a) c = 0.90, $\bar{x} = 12.5$, $s = 2.0$, $n = 6$

b) c = 0.98, $\bar{x} = 4.3$, $s = 0.34$, $n = 14$

c) The monthly incomes for 10 randomly selected people, each with a bachelor's degree in biology are listed below. Use a 99% confidence interval:

4625.68	4289.72	4461.22	4519.46	4714.27
4408.73	4391.45	4318.54	4576.12	4296.41

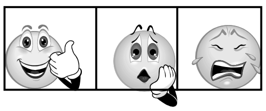


Objective #19: Can you find a point estimate for the population proportion?

Find the point estimates for *p* and *q*.

a) In a survey of 1002 US adults, 752 say they recycle.

b) A study of 4431 US Adults found that 2938 were obese or overweight.

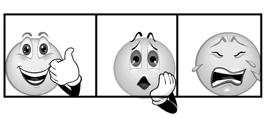


Objective #20: Can you construct a confidence interval for a population proportion?

Construct the 95% and 99% confidence intervals for the population proportion *p* using the indicated sample statistics.

a) Use the statistics from objective 19a.

b) Use the statistics from Objective 19b.



Objective #21: Can you determine the minimum sample size required when estimating a population proportion?

You are a travel agent and wish to estimate, with 85% confidence, the proportion of vacationers who plan to travel outside the US in the next 12 months. Your estimate must be accurate within 3% of the true proportion.

a) No preliminary estimate is available. Find the minimum sample size needed.

b) Find the minimum sample size needed, using a prior study that found that 26% of the respondents said they planned to travel outside the US in the next 12 months.