Math 160
Final Exam Practice
Professor Busken   Name: _____

Directions: You have 120 minutes to complete this 11 question final exam. You may use a calculator. The use of any other electronic devices are strictly prohibited throughout the entire exam. You will not be allowed to leave to use the restroom. Show your work on ALL of the questions, including the multiple choice.

- When rounding, round off to at least four decimal places or four significant digits, whichever is more detailed.

- Round off final z values to two decimal places.

- Round off final t and χ^2 values to three decimal places.

State what calculator you are using. _____

1. ***Hypothesis Test***   The Howie Mandel Modeling Agency claims that the average height of its female models is equal to the average height of women nationwide, which is 63.6 inches. We randomly sample 33 female models with the agency. The average height of the sampled models is 64.8 inches. Use a significance level of 0.10 to test the agencys claim. Assume that the standard deviation of the heights of the agencys models is 2.5 inches, which is the standard deviation among women nationwide (were probably being conservative). Use the p-value method. <u>Do not use</u> the critical value method.

    (a) (1 point)   Write the symbolic form of the claim.

    (b) (2 points)   <u>STEPS 1 & 2</u>: State the null and alternative hypotheses.

    (c) (1 point)   <u>STEP 3</u>: What formula should be used for the test statistic?

    (d) (2 points)   Compute or state the value of the test statistic. If you are stating the value of the test statistic, then also state which test you are using on the calculator.

    (e) (2 points)   <u>STEP 4</u>: $\boxed{p\text{-value method}}$

    (f) (2 points)   <u>STEP 5</u>: State a full sentence conclusion using the statistical language learned in the class.

2. **_Hypothesis Test_** The Windbag Publishing Company claims that the average length of its books is more than 1000 pages. In a study, 20 Windbag books are randomly sampled. The average length within the sample is 1085 pages, and the standard deviation within the sample is 120 pages. Assume that Windbags book lengths in pages are approximately normally distributed. Use a significance level of 0.05 to test Windbags claim. Use the critical value method. <u>Do not use</u> the p-value method.

   (a) (1 point) Write the symbolic form of the claim.

   (b) (2 points) <u>STEPS 1 & 2</u>: State the null and alternative hypotheses.

   (c) (1 point) <u>STEP 3</u>: What formula should be used for the test statistic?

   (d) (2 points) Compute or state the value of the test statistic. If you are stating the value of the test statistic, then also state which test you are using on the calculator.

   (e) (2 points) <u>STEP 4</u>: | critical value method |

   (f) (2 points) <u>STEP 5</u>: State a full sentence conclusion using the statistical language learned in the class.

3. **_Hypothesis Test_**   The Sideshow Bob Fan Club claims that more than 15% of the bits in Krusty-O cereal boxes are, in fact, metal. A consumer watchdog group conducts a study. A random sample of 300 Krusty-O bits is collected, and 57 of them are metal. Use a significance level of 0.01 to test the Sideshow Bob Fan Clubs claim. You may assume that we can use the normal approximation to the binomial distribution.   Use the p-value method. <u>Do not use</u> the critical value method.

(a) (1 point)   Write the symbolic form of the claim.

(b) (2 points)   <u>STEPS 1 & 2</u>:   State the null and alternative hypotheses.

(c) (1 point)   <u>STEP 3</u>:   What formula should be used for the test statistic?

(d) (2 points)   Compute or state the value of the test statistic. If you are stating the value of the test statistic, then also state which test you are using on the calculator.

(e) (2 points)   <u>STEP 4</u>: $\boxed{p\text{-value method}}$

(f) (2 points)   <u>STEP 5</u>:   State a full sentence conclusion using the statistical language learned in the class.

4. **Hypothesis Test** With individual lines at the checkouts, a store manager finds that the standard deviation for the waiting times on Monday mornings is 5.7 minutes. After switching to a single waiting line, he finds that for a random sample of 29 customers, the waiting times have a standard deviation of 4.9 minutes. Use a 0.025 significance level to test the claim that with a single line, waiting times vary less than with individual lines. Assume that the waiting times at the store this year are very close to a normal distribution. Use the critical value method. <u>Do not use</u> the p-value method.

   (a) (1 point) Write the symbolic form of the claim.

   (b) (2 points) <u>STEPS 1 & 2</u>: State the null and alternative hypotheses.

   (c) (1 point) <u>STEP 3</u>: What formula should be used for the test statistic?

   (d) (2 points) Compute or state the value of the test statistic. If you are stating the value of the test statistic, then also state which test you are using on the calculator.

   (e) (2 points) <u>STEP 4</u>: $\boxed{\text{critical value method}}$

   (f) (2 points) <u>STEP 5</u>: State a full sentence conclusion using the statistical language learned in the class.

5. **Hypothesis Test** Use the critical value method. Assume that the two samples are independent simple random samples selected from normally distributed populations. Do not assume that the population standard deviations are equal. Do not use the p-value method. A researcher wishes to determine whether the blood pressure of vegetarians is, on average, lower than the blood pressure of nonvegetarians. Independent simple random samples of 85 vegetarians and 75 nonvegetarians yielded the following sample statistics for systolic blood pressure:

Vegetarians	Nonvegetarians
$n_1 = 85$	$n_2 = 75$
$\bar{x}_1 = 124.1$	$\bar{x}_2 = 138.7$
$s_1 = 38.7$	$s_2 = 39.2$

(a) (1 point) Write the symbolic form of the claim.

(b) (2 points) <u>STEPS 1 & 2</u>: State the null and alternative hypotheses.

(c) (1 point) <u>STEP 3</u>: What formula should be used for the test statistic?

(d) (2 points) Compute or state the value of the test statistic. If you are stating the value of the test statistic, then also state which test you are using on the calculator.

(e) (2 points) <u>STEP 4</u>: $\boxed{\text{critical value method}}$

(f) (2 points) <u>STEP 5</u>: State a full sentence conclusion using the statistical language learned in the class.

6. **_Hypothesis Test_** In a random sample of 360 women, 65% favored stricter gun control laws. In a random sample of 220 men, 60% favored stricter gun control laws. Test the claim that the proportion of women favoring stricter gun control is higher than the proportion of men favoring stricter gun control. Use a significance level of 0.05. Use the p-value method. Do not use the critical value method.

(a) (1 point) Write the symbolic form of the claim.

(b) (2 points) STEPS 1 & 2: State the null and alternative hypotheses.

(c) (1 point) STEP 3: What formula should be used for the test statistic?

(d) (2 points) Compute or state the value of the test statistic. If you are stating the value of the test statistic, then also state which test you are using on the calculator.

(e) (2 points) STEP 4: p-value method

(f) (2 points) STEP 5: State a full sentence conclusion using the statistical language learned in the class.

7. (5 points) Fill in the blanks below.

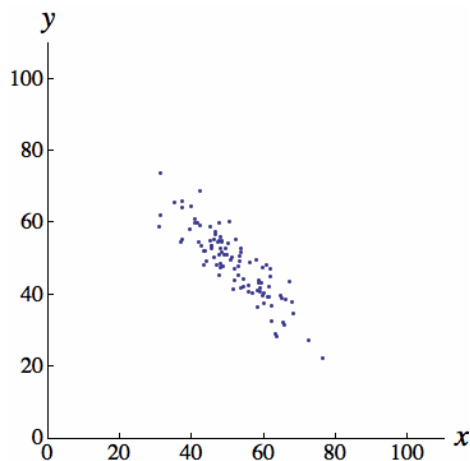For each variable, the average is 50 and the standard deviation is 10.

For one of the graphs below, $r = -0.90$.
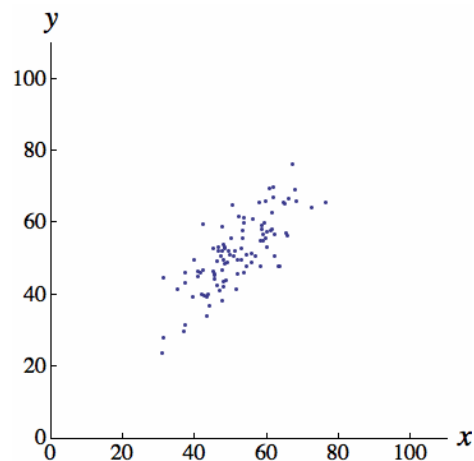For one of the graphs below, $r = 0.00$.
For one of the graphs below, $r = 0.80$.
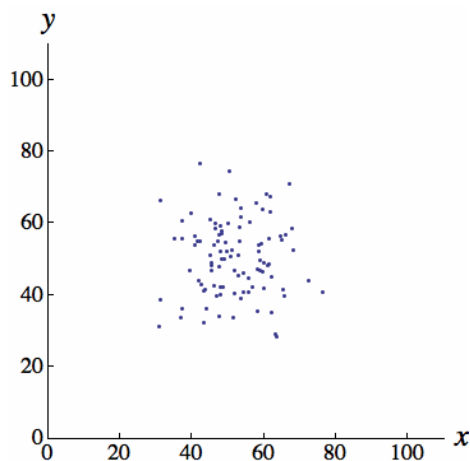For one of the graphs below, $r = 0.95$.
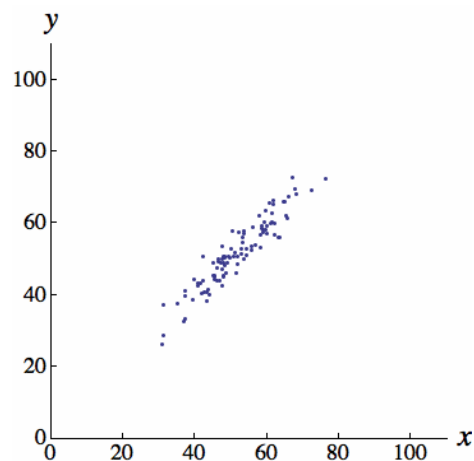
a) r for the graph below is _____

b) r for the graph below is _____

c) r for the graph below is _____

d) r for the graph below is _____

8. (5 points)   Fill in the blank: If a regression line for sample data is given by $\hat{y} = 13 + 4x$, then, along the regression line, for every increase of 1 unit in x, there is an increase of _____ units in y.

9. **Hypothesis Test**   Concerns about global warming have led to studies of the relationship between global temperature and the concentration of carbon dioxide (CO_2). Listed below are concentrations (in parts per million) of CO_2 and temperatures (in °C) for different years (based on the Earth Policy Institute). Test the claim that the global temperature and the concentration of carbon dioxide **are not** linearly correlated.

CO_2	314	317	320	326	331	339	346	354	361	369
Temperature	13.9	14	13.9	14.1	14	14.3	14.1	14.5	14.5	14.4

(a) (1 point)   Write the symbolic form of the claim.

(b) (2 points)   <u>STEPS 1 & 2</u>: State the null and alternative hypotheses.

(c) (3 points)   <u>STEP 3</u>: Use r for the test statistic. What is the value of r? (Round to 3 decimal places.)

(d) (2 points)   <u>STEP 4</u>: What is the critical value if $\alpha = 0.01$?

(e) (2 points)   <u>STEP 5</u>: Conclusion. Is there a linear correlation?

10. (5 points)   Based on the data from six students, the regression equation relating number of hours of preparation (x) and test score (y) is $\hat{y} = 67.3 + 1.07x$. The same data yield $r = 0.224$ and $\bar{y} = 75.2$ What is the best predicted test score for a student who spent 10 hours preparing for the test?

10. _____

11. (5 points)   Use the given data to find the equation of the regression line. Round the final values to three significant digits, if necessary.

11. _____

x	0	3	4	5	12
y	8	2	6	9	12