FREE RESPONSE
EXAM 2

4. Based on results from a random sample of 35 individuals, a company advertises that individuals who use its diet supplement lose an average of 4.6 lb with a standard deviation of 1.2 lb during the first week of dieting.

   a. A graph of the data reveals no strong skew or outliers. Does this provide evidence of a significant weight loss?

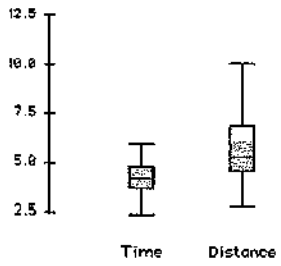
   b. The advertisement fails to mention that these results were part of a double-blind experiment to compare the supplement with a placebo. In the control group, the weight loss was 3.7 lb with a standard deviation of 2.3 lb in the first week of dieting. The control group consisted of a random sample of 32 individuals. A graph of the data for the control group reveals no strong skew or outliers. Is there evidence to show that the group taking the diet supplement lost more weight than the control group in the first week?

Part B

Suggested time: 25 minutes

6. A hiker records distances (in miles) and times (in hours) for a random sample of 25 of her hikes, resulting in the following information.

Summary of No Selector	Distance	Summary of No Selector	Time
Count	25	**Count**	25
Mean	5.952	**Mean**	3.7
Median	5.7	**Median**	3.5
StdDev	2.71356	**StdDev**	1.54448
IntQRange	2.975	**IntQRange**	2.0625



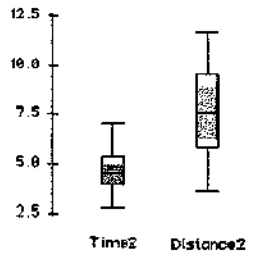
Dependent variable is: **Time**
No Selector
R squared = 77.3% R squared (adjusted) = 76.3%
s = 0.7515 with 25 − 2 = 23 degrees of freedom

Source	**Sum of Squares**	**df**	**Mean Square**	**F-ratio**
Regression	44.2594	1	44.2594	78.4
Residual	12.9906	23	0.564807	

Variable	**Coefficient**	**s.e. of Coeff**	**t-ratio**	**prob**
Constant	0.721346	0.3685	1.96	0.0625
Distance	0.500446	0.05653	8.85	≤ 0.0001

A friend also records distances (in miles) and times (in hours) for a random sample of 20 of his hikes, resulting in the following information.

Summary of No Selector	Distance2	Summary of No Selector	Time2
Count	20	**Count**	20
Mean	7.585	**Mean**	4.5875
Median	7.65	**Median**	4.5
StdDev	2.4577	**StdDev**	1.2677
IntQRange	3.7	**IntQRange**	1.375



Dependent variable is: **Time2**
No Selector
R squared = 85.5% R squared (adjusted) = 84.7%
s = 0.4952 with 20 − 2 = 18 degrees of freedom

Source	**Sum of Squares**	**df**	**Mean Square**	**F-ratio**
Regression	26.1202	1	26.1202	107
Residual	4.41416	18	0.245231	

Variable	**Coefficient**	**s.e. of Coeff**	**t-ratio**	**prob**
Constant	0.968919	0.3677	2.64	0.0168
Distance2	0.477071	0.04623	10.3	≤ 0.0001

These friends are trying to determine whether or not they would be well suited to hike together.

a. One of the friends believes that hiking distances are important to determining compatibility. Is there any evidence of a significant difference in hiking distances between the two hikers?

b. The other friend believes it is the length of the hike in time that best determines compatibility. Is there any evidence of a significant difference in hiking times between the two hikers?

c. Should the two friends hike together? Use your results from parts (a) and (b) to support your answer.

d. Rather than look at the choice of hikes, which would be reflected in the distances and times of the hikes reported, a mutual friend suggests that the two should instead look at their hiking rate. This friend conjectures that hikers with rates of speed within 0.1 mph of one another make compatible hikers. Record the speed at which these friends hike. Would your answer to part (c) change if their mutual friend is correct in his conjecture?

MULTIPLE CHOICE
EXAM 2

NAME_____

2. A magazine claims that 25.1% of all women enjoy gardening. A researcher believes the percentage is higher and performs a test of H_0: $p = 0.251$ versus H_a: $p > 0.251$. A random sample of 100 women yields significant results at the $\alpha = 0.05$ level. Which of the following statements about the confidence interval used to estimate the true population proportion of women who enjoy gardening must be true?

   (A) A 90% confidence interval contains the proportion 0.251.

   (B) A 90% confidence interval does not contain the proportion 0.251, because the value of 0.251 is above the upper limit of the interval.

   (C) A 90% confidence interval does not contain the proportion 0.251, because the value of 0.251 is below the lower limit of the interval.

   (D) A 95% confidence interval does not contain the proportion 0.251, because the value of 0.251 is above the upper limit of the interval.

   (E) A 95% confidence interval does not contain the proportion 0.251, because the value of 0.251 is below the lower limit of the interval.

3. Executives from a music label believe they are losing money from the number of CDs that individuals burn illegally. They would like to determine the number of CDs the average computer owner burns in a month. What size sample would they need to take to estimate this number with a margin of error of 0.5 with 95% confidence, if they assume the standard deviation is 3?

   (A) 10

   (B) 17

   (C) 24

   (D) 98

   (E) 139

4. As part of a statistics project, a student decides to find a 95% confidence interval for the difference in average ages of students and faculty. The student, through diligent research, is able to record the age of all faculty members and all students and then calculates the 95% confidence interval using the t-distribution. Which of the following is a consideration the student failed to take into account?

   (A) The group of teachers and students are not independent. Therefore, the assumptions for using the two-sample t-interval are not valid.

   (B) The ages of teachers and students are not likely to be normally distributed. Therefore, the assumptions for using the two-sample t-interval are not valid.

   (C) The distribution of student ages is likely to have a few large outliers. Therefore, the assumptions for using the two-sample t-interval are not valid.

   (D) In both cases, the student had data for the entire population. Therefore, the actual difference in average ages can be computed, and a confidence interval is not valid.

   (E) Because there are most likely 40 or more students and 40 or more faculty members, there is nothing the student failed to take into account, and the confidence interval is valid.

5. Randomly selected individuals were asked about their physical activity. Of 75 randomly selected men, 30 had walked for exercise in the preceding two weeks. Of 75 randomly selected women, 36 had walked for exercise in the preceding two weeks. Assume independence between the samples. Is there evidence to show a significant difference in the proportion of men and the proportion of women who walk for exercise?

   (A) Because the proportions are different, there is evidence to show a significant difference in the proportions of men and women who walk for exercise.

   (B) With $p = 0.162$, there is insufficient evidence to show a significant difference in the proportions of men and women who walk for exercise.

   (C) With $p = 0.324$, there is insufficient evidence to show a significant difference in the proportions of men and women who walk for exercise.

   (D) With $p = 0.838$, there is insufficient evidence to show a significant difference in the proportions of men and women who walk for exercise.

   (E) The conditions necessary to perform a significance test have not been met; therefore, a conclusion cannot be drawn.

8. A large fast-food chain is changing vendors for its children's meal toys. The vendor claims that equal quantities of the four types of toys have been manufactured and will be distributed randomly among the restaurants. One restaurant received 89 of one type of toy, 95 of a second type, 106 of a third type, and 110 of the fourth type of toy in a shipment of 400 toys. If we consider this shipment to be a random sample of toys, does this shipment provide sufficient evidence to contradict the vendor's claim?

   (A) Yes, since the store did not receive 100 of each type of toy.

   (B) Yes, since a test of significance yields significant results at the 0.10 but not at the 0.05 level.

   (C) Yes, since a test of significance yields significant results at the 0.05 but not at the 0.01 level.

   (D) Yes, since a test of significance yields significant results at the 0.01 but not at the 0.001 level.

   (E) No, since a test of significance yielded results that were not significant at even the 0.10 level.

10. A congressman mails a questionnaire to his constituents asking if the United States should use military force to overthrow violent dictators in controversial areas of the world. Of the 500 people who respond, 35% believe the United States should use military force in this situation. On a talk show, the politician claims that only 35% of his constituents (with a 4% margin of error) believe in using military force. Which assumption for constructing a confidence interval is violated?

   (A) The population is ten times as large as the sample.

   (B) The data constitute a simple random sample from the population of interest.

   (C) The count of successes, $n\hat{p}$, is 10 or more.

   (D) The count of failures, $n(1 - \hat{p})$, is 10 or more.

   (E) There are no violations for constructing a confidence interval.

11. Owners of a day-care chain wish to determine the proportion of families in need of day care for the town of Bockville. Bockville is estimated to have 1000 families. The owners of the day-care chain randomly sample 50 families and find that 60% of them have a need for day-care services. Which of the following is a condition necessary for constructing a confidence interval for a **proportion** that has *not* been met?

   (A) The data constitute a representative random sample from the population of interest.

   (B) The sample size is less than 10% of the population size.

   (C) The counts of those who need day care and those who don't need day care are 10 or more.

   (D) The distribution of sample values is approximately normally distributed.

   (E) All conditions necessary for constructing a confidence interval for the proportion seem to be met.

14. Two different Internet sites claim to offer the Web's lowest hotel rates for major U. S. cities. To test the claim, a consumer group randomly selects 50 hotels, and checks the rate charged for these hotels on both sites. To determine if there is a significant difference in rates between these two sites, which significance test is appropriate?

(A) Two-sample z-test
(B) Two-sample t-test
(C) Matched-pairs test
(D) χ^2 test of independence
(E) Linear regression t-test

17. The following table shows the preferred exercise for a random sample of 223 men of various ages.

Physical Activity/Age	18–31	32–45	46–59	60–73	Over 74
Jogging	23	14	9	1	0
Cycling	19	19	14	11	8
Swimming	10	8	5	3	1
Weight Lifting	34	21	12	6	5

If the type of exercise is independent of age, how many men over the age of 74 would we expect to prefer cycling?

(A) 3
(B) 4
(C) 8
(D) 11
(E) 14

28. Which of the following is *not* a characteristic for t-distributions?

(A) The t-distributions are mound-shaped.
(B) The t-distributions are centered at 0.
(C) The t-distributions have more area in the tails than a normal distribution.
(D) The t-distributions use s as an estimate of σ.
(E) As the number of degrees of freedom decreases, the t-distribution approaches the normal distribution.

31. The average life expectancy for a male in eastern Africa is 45 years. Ten years ago, a major health organization opened a health clinic in a large village located in eastern Africa. The organizers believe the life expectancy for this village has increased as a result of the health care. What are the appropriate hypotheses for a significance test?

(A) $H_0: \mu = 45; H_a: \mu \neq 45$

(B) $H_0: \mu = 45; H_a: \mu > 45$

(C) $H_0: \mu = 45; H_a: \mu < 45$

(D) $H_0: \mu \neq 45; H_a: \mu = 45$

(E) $H_0: \mu > 45; H_a: \mu = 45$

36. The weights of women are approximately normally distributed. This week, the z-score of weight for a member of a weight-watching group is 1.25. Which of the following is a correct interpretation of this z-score?

(A) This week the member weighs 1.25 lb more than last week.

(B) This week the member weighs 1.25 lb less than last week.

(C) This week the member weighs 1.25 lb more than the average woman.

(D) This week the member weighs 1.25 standard deviations more than she did last week.

(E) This week the member weighs 1.25 standard deviations more than the average woman.

37. In a city, 13.5% of the labor force are members of a union. If a random sample of 75 adults is taken from this city, what is the probability that between 15% and 20% of them are union members?

(A) $P\left(\frac{0.15 - 0.135}{\sqrt{\frac{0.135(1 - 0.135)}{75}}} < z < \frac{0.20 - 0.135}{\sqrt{\frac{0.135(1 - 0.135)}{75}}}\right)$

(B) $P\left(\frac{0.15 - 0.135}{\sqrt{\frac{0.15(1 - 0.15)}{75}}} < z < \frac{0.20 - 0.135}{\sqrt{\frac{0.15(1 - 0.15)}{75}}}\right)$

(C) $P\left(\frac{0.15 - 0.135}{\sqrt{\frac{0.15(1 - 0.15)}{75}}} < z < \frac{0.20 - 0.135}{\sqrt{\frac{0.2(1 - 0.2)}{75}}}\right)$

(D) $P\left(\frac{0.15 - 0.135}{\sqrt{\frac{0.2(1 - 0.2)}{75}}} < z < \frac{0.20 - 0.135}{\sqrt{\frac{0.2(1 - 0.2)}{75}}}\right)$

(E) $P\left(\frac{0.135 - 0.15}{\sqrt{\frac{0.15(1 - 0.15)}{75}}} < z < \frac{0.135 - 0.2}{\sqrt{\frac{0.2(1 - 0.2)}{75}}}\right)$

40. Data have been collected, and a statistician conducts a test of significance using the data. The statistician is considering the effects associated with Type I and Type II errors under these circumstances. Which of the following is true?

I. Reducing the probability of a Type I error increases power.
II. Reducing power increases the probability of a Type II error.
III. Reducing the probability of a Type I error increases the probability of a Type II error.

(A) I only
(B) II only
(C) III only
(D) I and II only
(E) II and III only