Exam

Name_____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Assume that the assumptions and conditions for inference with a two–sample t–test are met. Test the indicated claim about the means of the two populations.

1) The Better Cookie Company claims its chocolate chip cookies have more chips than another chocolate chip cookie. 120 Better Cookies and 100 of the other type of cookie were randomly selected and the number of chips in each cookie was recorded. The results are as follows. 1) _____

	Better	Another
Mean number of chips	7.6	6.9
Standard deviation	1.4	1.7

At the 2% level of significance, test the claim that the population of Better Cookies has a higher mean number of chips.

2) Two types of flares are tested for their burning times (in minutes) and sample results are given below. 2) _____

Brand X	Brand Y
$n = 35$	$n = 40$
$\bar{x} = 19.4$	$\bar{x} = 15.1$
$s = 1.4$	$s = 0.8$

Refer to the sample data to test the claim that the two populations have unequal means. Use a 95% confidence level.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

3) The following display from a TI-84 Plus calculator presents the results of a hypothesis test. 3) _____

Z-Test
$\mu \neq 37$
$z = 1.947543$
$p = 0.051470$
$\bar{x} = 38.80$
$n = 45$

What is the value of the test statistic?
A) 1.947543 B) 0.051470 C) 37 D) 38.80

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Use a two proportion z–test to perform the required hypothesis test. State the conclusion.

4) Use the given sample data to test the claim that $p_1 > p_2$. Use a significance level of 0.01. 4) _____

Sample 1	Sample 2
$n_1 = 85$	$n_2 = 90$
$x_1 = 38$	$x_2 = 23$

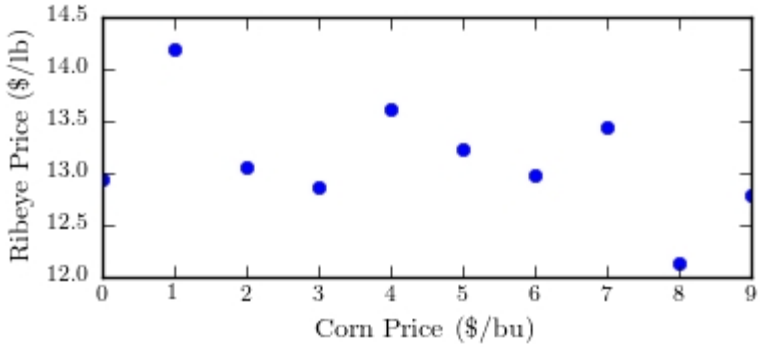
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

5) One of the primary feeds for beef cattle is corn. The following table presents the average price in dollars for a bushel of corn and a pound of ribeye steak for 10 consecutive months. 5) _____

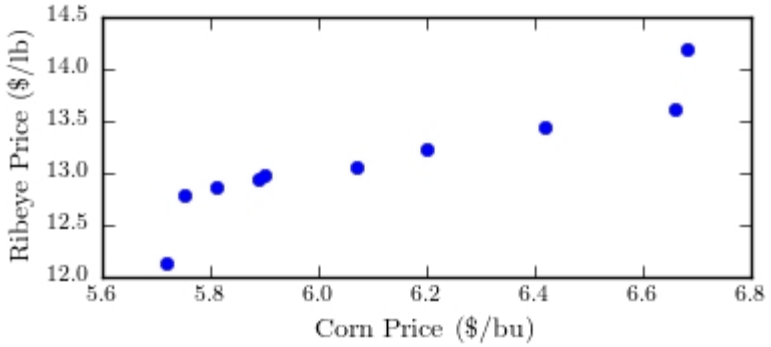
Corn Price ($/bu)	Ribeye Price ($/lb)
5.89	12.94
6.66	14.20
6.07	13.05
5.72	12.86
6.20	13.61
6.42	13.24
5.81	12.98
6.68	13.45
5.75	12.13
5.90	12.79

Construct a scatter plot of the price of ribeye (y) versus the price of corn (x).

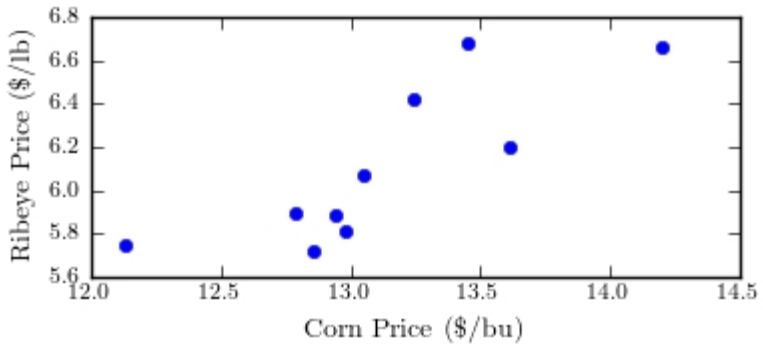
A)



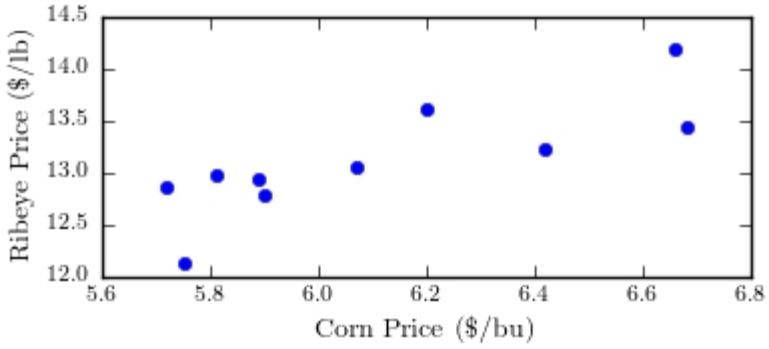
B)



C)



D)



6) One of the primary feeds for beef cattle is corn. The following table presents the average price in dollars for a bushel of corn and a pound of ribeye steak for 10 consecutive months. 6) _____

Corn Price ($/bu)	Ribeye Price ($/lb)
5.82	13.01
5.70	12.24
5.80	13.01
5.84	12.94
6.56	13.89
6.21	13.04
6.39	13.01
6.61	13.76
6.06	12.53
5.84	12.95

The correlation coefficient between the corn price and the ribeye price is 0.773. Which of the following is the best interpretation of the correlation coefficient?

A) Increasing corn prices cause ribeye prices to increase.
B) The changes in corn price and ribeye price tend to go up and down together.
C) The price of ribeye tends to go down and the price of corn goes up.
D) There is no correlation between the price of corn and the price of ribeye.

Provide an appropriate response.

7) A researcher is interested in the academic performance differences between individuals using an optimistic versus a pessimistic approach to their studies. If the researcher fails to find a significant difference, when in fact one exists in the population: 7) _____

A) a Type 1 error has been made.
B) the null hypothesis was correctly accepted.
C) the research hypothesis was correctly accepted.
D) the null hypothesis was correctly rejected.
E) a Type 2 error has been made.

8) A state university wants to increase its retention rate of 4% for graduating students from the previous year. After implementing several new programs during the last two years, the university reevaluated its retention rate using a random sample of 352 students and retained 18 students. Should the university continue its new programs? Test an appropriate hypothesis using $\alpha = 0.10$ and state your conclusion. Be sure the appropriate assumptions and conditions are satisfied before you proceed. 8) _____

A) z = 1.07; P–value = 0.8577. The change is statistically significant. A 90% confidence interval is (3.4%, 6.8%). This is clearly higher than 4%. The chance of observing 18 or more retained students of 352 is only 85.77% if the dropout rate is really 4%.

B) z = –1.07; P–value = 0.8577. The university should continue with the new programs. There is an 85.77% chance of having 18 or more of 352 students in a random sample be retained if in fact 4% are retained.

C) z = –1.07; P–value = 0.1423. The change is statistically significant. A 98% confidence interval is (2.7%, 7.5%). This is clearly lower than 4%. The chance of observing 18 or more retained students of 352 is only 14.23% if the dropout rate is really 4%.

D) z = 1.07; P–value = 0.2846. The change is statistically significant. A 95% confidence interval is (3.1%, 67.2%). This is clearly lower than 4%. The chance of observing 18 or more retained students of 352 is only 28.46% if the dropout rate is really 4%.

E) z = 1.07; P–value = 0.1423. The university should not continue with the new programs. There is a 14.23% chance of having 18 or more of 352 students in a random sample be retained if in fact 4% are retained. The P–value of 0.1423 is greater than the alpha level of 0.10.

9) The U.S. Department of Labor and Statistics released the current unemployment rate of 5.3% for the month in the U.S. and claims the unemployment has not changed in the last two months. However, the states statistics reveal that there is a decrease in the U.S. unemployment rate. A test on unemployment was done on a random sample size of 1000 and found unemployment at 3.8%. Test an appropriate hypothesis and state your conclusion. Be sure the appropriate assumptions and conditions are satisfied before you proceed. Test at 95% confidence. 9) _____

A) H_0: p = 0.053; H_A: p > 0.053; z = 2.12; P–value = 0.983. This data shows that the unemployment rate has decreased in the last two months.

B) H_0: p = 0.053; H_A: p > 0.053; z = –2.12; P–value = 0.983. This data does not show that the unemployment rate has decreased in the last two months.

C) H_0: p = 0.053; H_A: p ≠ 0.053; z = –2.12; P–value = 0.034. This data shows that the unemployment rate has decreased in the last two months.

D) H_0: p = 0.053; H_A: p < 0.053; z = –2.12; P–value = 0.017. This data shows that the unemployment rate has decreased in the last two months.

E) H_0: p = 0.053; H_A: p < 0.053; z = 2.12; P–value = 0.017. This data does not show that the unemployment rate has decreased in the last two months.

10) When we fail to reject the null hypothesis, we 10) _____

A) have committed a Type I error.

B) have obtained a t–value greater than our critical t–value.

C) claim that a significant difference exists between groups.

D) have committed a Type II error.

E) conclude that sampling variability is responsible for our obtained difference.

11) A test is made of $H_0: \mu = 63$ versus $H_1: \mu > 63$. A sample of size $n = 68$ is drawn, and $\bar{x} = 62$. The population standard deviation is $\sigma = 20$. Compute the value of the test statistic z. 11) _____

A) 0.34 B) -0.41 C) -0.05 D) -1.84

12) A test of $H_0: \mu = 42$ versus $H_1: \mu \neq 42$ is performed using a significance level of $\alpha = 0.01$. The value of the test statistic is $z = -2.71$. Is H_0 rejected? 12) _____

A) No
B) It cannot be determined.
C) Yes

13) The following display from a TI-84 Plus calculator presents the results of a hypothesis test. 13) _____

Z-Test
μ ≠ 59
z = 1.61
p = 0.386072
$\bar{x}$ =57.39
n = 39

What are the null and alternate hypotheses?

A) $H_0: \mu = 59$, $H_1: \mu \neq 59$ B) $H_0: \mu = 59$, $H_1: \mu = 57.39$
C) $H_0: \mu \neq 57.39$ $H_1: \mu = 57.39$ D) $H_0: \mu \neq 59$, $H_1: \mu = 59$

14) A test of $H_0: \mu = 44$ versus $H_1: \mu < 44$ is performed using a significance level of $\alpha = 0.01$. The value of the test statistic is $z = -2.19$. 14) _____

If the true value of μ is 44, does the conclusion result in a Type I error, a Type II error, or a correct decision?

A) Type I error B) Type II error C) Correct decision

15) In a simple random sample of size 73, there were 44 individuals in the category of interest. It is desired to test $H_0: p = 0.78$ versus $H_1: p < 0.78$. Compute the test statistic z. 15) _____

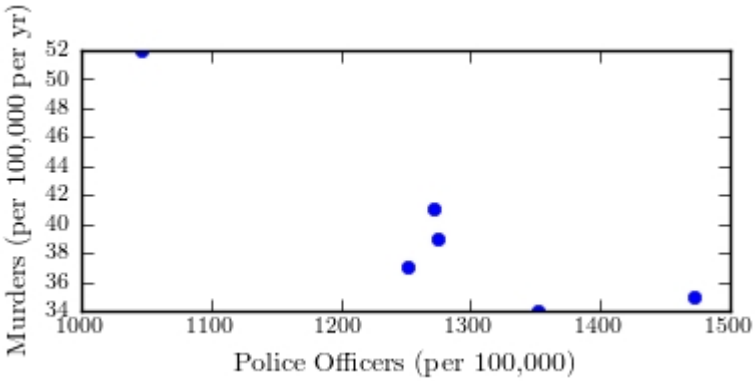
A) -3.65 B) 0.05 C) 0.60 D) 8.68

16) The following table presents the number of police officers (per 100,000 citizens) and the annual murder rate (per 100,000 citizens) for a sample of cities. 16) _____

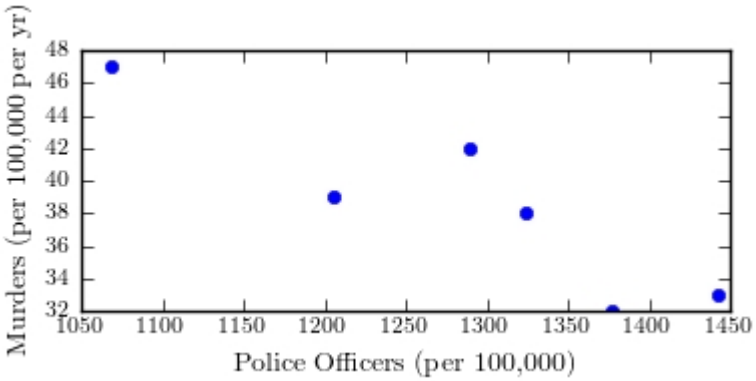
Police Officers (per 100,000)	Murders (per 100,000 per yr)
1196	38
1351	36
1250	40
1500	27
1319	33
1483	35

Construct a scatter plot of the per capita murder rate (y) versus the per capita number of police officers (x).

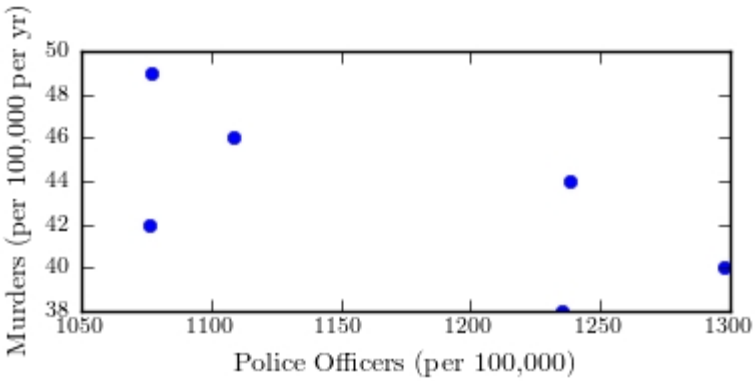
A)



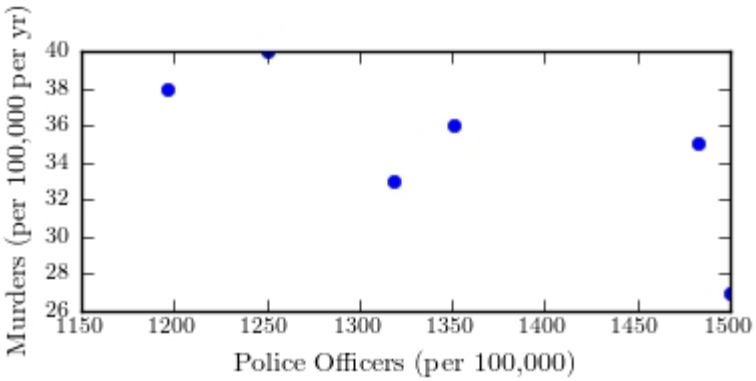
B)



C)



D)



17) The following display from a TI-84 Plus calculator presents the results of a hypothesis test for the difference between two proportions. The sample sizes are $n_1 = 95$ and $n_2 = 104$. 17) _____

2-PropZTest
p1 > p2
z = 1.074153
p = 0.141377
$\hat{p}_1 = 0.547368$
$\hat{p}_2 = 0.471154$
$\downarrow\hat{p} = 0.507538$

What is the *P*-value?

A) 0.507538 B) 1.074153 C) 0.141377 D) 0.547368

18) A test is made of H_0: $\mu = 44$ versus H_1: $\mu > 44$. A sample of size $n = 66$ is drawn, and $\bar{x} = 48$. The population standard deviation is $\sigma = 25$. Compute the value of the test statistic z and determine if H_0 is rejected at the $\alpha = 0.01$ level. 18) _____

A) 0.16, H_0 not rejected
B) 1.30, H_0 not rejected
C) 0.16, H_0 rejected
D) 1.30, H_0 rejected

19) The following table presents the number of police officers (per 100,000 citizens) and the annual murder rate (per 100,000 citizens) for a sample of cities. 19) _____

Police Officers (per 100,000)	Murders (per 100,000 per yr)
1109	46
1238	44
1235	38
1298	40
1077	49
1076	42

The correlation coefficient between the per capita number of police officers and the per capita murder rates -0.666. Which of the following is the best interpretation of the correlation coefficient?

A) The per capita number of police officers and the per capita murder rates are positively associated.
B) Higher murder rates make it more difficult for cities to hire police officers.
C) The per capita murder rate tends to go down as the per capita number of police officers goes up.
D) More per capita police officers results in fewer per capita murders.

20) In a simple random sample of size 77, there were 37 individuals in the category of interest. Compute the sample proportion $\hat{p}$. 20) _____

A) 114 B) 0.925 C) 0.481 D) 0.519

21) The following display from a TI-84 Plus calculator presents the results of a hypothesis test for the difference between two proportions. The sample sizes are $n_1 = 108$ and $n_2 = 75$. 21) _____

2-PropZTest
p1 > p2
z = 0.396573
p = 0.345841
$\hat{p}_1 = 0.388889$
$\hat{p}_2 = 0.36$
$\downarrow\hat{p} = 0.377049$

Is this a left-tailed test, a right-tailed test, or a two-tailed test?
A) Left-tailed test B) Two-tailed test C) Right-tailed test

22) The following display from a TI-84 Plus calculator presents the results of a hypothesis test for the difference between two means. The sample sizes are $n_1 = 7$ and $n_2 = 15$. 22) _____

2-SampTTest
μ1 > μ2
t = 1.528999
p = 0.923906
df = 11.245211
$\bar{x}1 = 134.833$
$\downarrow\bar{x}2 = 117.879$

Can you reject H_0 rejected at the $\alpha = 0.05$ level?
A) Yes B) No

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

23) Are low-fat diets or low-carb diets more effective for weight loss? A sample of 80 subjects went on a low-carbohydrate diet for six months. At the end of that time, the sample mean weight loss was 11.5 pounds with a sample standard deviation of 7.17 pounds. A second sample of 75 subjects went on a low-fat diet. Their sample mean weight loss was 17.9 with a standard deviation of 6.75. Can you conclude that the mean weight loss differed between the two diets? Use the $\alpha = 0.05$ level. 23) _____

i). State the appropriate null and alternate hypotheses.
ii). Compute the test statistic.
iii). How many degrees of freedom are there, using the simple method?
iv). Do you reject H_0? State a conclusion.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

24) Mercury is a heavy metal that can cause severe health problems in even small concentrations. Fish and shellfish efficiently concentrate mercury into their flesh, so it is important to monitor seafood for its mercury content. 24) _____

An extensive study conducted in 1980 concluded that the mean mercury level in oysters from the White Bear estuary was 0.020 parts per million (ppm) with a standard deviation $\sigma = 0.036$ ppm. In 2012, a sample of 44 oysters from the same estuary exhibited a mean mercury concentration of 0.017 ppm.

Can you conclude that the 2012 mercury concentration is lower than in 1980? Use the $\alpha = 0.05$ level of significance.

A) No. There is insufficient evidence to conclude that the mercury concentration has decreased from 1980 to 2012.
B) Yes. The mercury concentration appears to be lower in 2012.
C) There is not enough information to reach a conclusion.

25) In a simple random sample of size 95, there were 66 individuals in the category of interest. It is desired to test $H_0: p = 0.78$ versus $H_1: p < 0.78$. Do you reject H_0 at the 0.05 level? 25) _____

A) No B) Yes

26) The Golden Comet is a hybrid chicken that is prized for its high egg production rate and gentle disposition. According to recent studies, the mean rate of egg production for 1-year-old Golden Comets is 5.9 eggs/week. 26) _____

Sarah has 43 1-year-old hens that are fed exclusively on natural scratch feed: insects, seeds, and plants that the hens obtain as they range freely around the farm. Her hens exhibit a mean egg-laying rate of 6.8 eggs/day.

Sarah wants to determine whether the mean laying rate μ for her hens is higher than the mean rate for all Golden Comets. State the appropriate null and alternate hypotheses.

A) $H_0: \mu > 5.9$, $H_1: \mu = 5.9$ B) $H_0: \mu < 6.8$, $H_1: \mu = 6.8$

C) $H_0: \mu = 5.9$, $H_1: \mu > 5.9$ D) $H_0: \mu = 6.8$, $H_1: \mu \neq 6.8$

27) Compute the correlation coefficient. 27) _____

x	3	4	5	6	7	8
y	86	77	113	119	133	128

A) 0.809 B) 48.99 C) 0.101 D) 0.899

1) $H_0: \mu_1 - \mu_2 = 0$ $H_A: \mu_1 - \mu_2 > 0$
   Test statistic t = 3.291, P–value = 5.94×10^{-4}, DF = 191.61
   Reject the null hypothesis. There is sufficient evidence to support the claim that the population of Better Cookies has a higher mean number of chips.
2) $H_0: \mu_1 - \mu_2 = 0$ $H_A: \mu_1 - \mu_2 \neq 0$
   Test statistic t = 16.025, P–value = 7.35×10^{-22}, DF = 52.5
   Reject the null hypothesis. There is strong evidence that the two types of flares have differnt mean burn times. Based on these data, it appears that Brand X flares have longer burning times than Brand Y flares.
3) A
4) $H_0: p_1 - p_2 = 0$ $H_A: p_1 - p_2 > 0$
   Test statistic: z = 2.66
   P–value = 0.0039
   Reject the null hypothesis. There is sufficient evidence to support the claim that $p_1 > p_2$.
5) D
6) B
7) E
8) E
9) D
10) E
11) B
12) C
13) A
14) C
15) A
16) D
17) C
18) B
19) C
20) C
21) C
22) B
23) i). $H_0: \mu_1 = \mu_2$ versus $H_1: \mu_1 \neq \mu_2$
    ii). -5.724
    iii). 74
    iv). Yes. There appears to be a difference in the mean weight losses.
24) A
25) B
26) C
27) D