Name_____

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

The owners of a coffee shop conducted a taste test to determine whether its customers preferred a new coffee brand to the current one sold by the shop. Customers who were willing to participate were given small samples of each of the two brands in random order and were asked to select which one they preferred without knowing the brand. Of the 100 participating customers, 90% chose the new brand. Based on these results, the owners determined that a majority of their customers preferred the new brand and therefore switched their coffee supplier.

1) Predicting the preference of all of the coffee shop customers based on the taste test results refers to which aspect of statistics? 1) D

A) Description B) Design C) Investigation D) Inference

A prediction based on results of a survey is in 'Inference'.

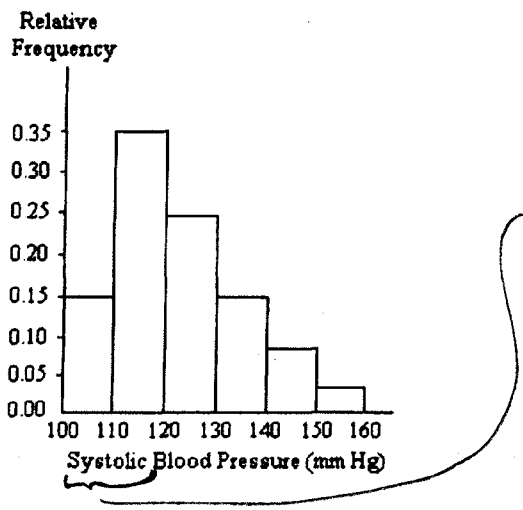
Provide an appropriate response.

2) A survey of 1500 American households found that 33% of the households own a computer. Identify the population. 2) E

A) The 33% of the 1500 households sampled that own a computer
B) 33% of American households
C) The 1500 American households surveyed
D) All American households owning a computer
E) The collection of all American households

We are interested in finding out what percentage of american households own computers.
So the group of interest is all american households.

A nurse measured the blood pressure of each person who visited her clinic. Following is a relative-frequency histogram for the systolic blood pressure readings for those people aged 25 to 40. Use the histogram to answer the question. The blood pressure readings were given to the nearest whole number.



0·35 + 0·15 = 0·5

3) Approximately what percentage of the people aged 25–40 had a systolic blood pressure reading less than 120? 3) B

A) 35% B) 50% C) 3.5% D) 15% E) 5%

Find the median for the given sample data.

4) A store manager kept track of the number of newspapers sold each week over a seven-week period. The results are shown below. 4) D

95, 38, 221, 122, 258, 237, 233 sort → 38, 95, 122, 221, 233, 237, 258

Find the median number of newspapers sold.

A) 122 newspapers
B) 258 newspapers
C) 172 newspapers
D) 221 newspapers
E) 233 newspapers

middle.

Select the most appropriate answer.

5) Which of the following numerical summary measures cannot be negative? 5) C

A) z-score
B) mode
C) standard deviation
D) mean
E) Q3

$s = \sqrt{\frac{\sum (x-\bar{x})^2}{n}}$ ← cannot be negative

Provide an appropriate response.

$z = \frac{2.75 - 3.53}{0.58} = -1.34$ $\left(z = \frac{\text{observation} - \text{mean}}{\text{standard deviation}}\right)$

6) According to the Center for Disease Control growth charts of 2000, the weight at birth of males has a mean value of 3.53 kg with a standard deviation of 0.58. For a male child weighing 2.75 kg at birth, what is the corresponding z-score? (www.cdc.gov/growthcharts/) 6) D

A) -0.78 B) 0.78 C) 1.34 D) -1.34

2.75 3.53 ← mean

The following table summarizes the responses of 1255 adults when asked by the 2006 General Social Survey whether they had ever taken the drug Prozac.

	Male	Female	Total
Yes	36	96	132
No	495	628	1123
Total	531	724	1255

$P(F|Y) = \frac{96}{132} = 0.73$

7) Given that the respondent answered "Yes", what is the probability that the respondent was female? 7) A

A) 0.73 B) 0.13 C) 0.08 D) 0.58

Provide an appropriate response.

8) Almost all of the acidity of soda pop comes from the phosphoric acid which is added to give them a sharper flavor. Is there an association between the pH of the soda and the amount of phosphoric acid (in grams)? The correlation between pH and phosphoric acid is -0.991. Describe the association. 8) C

A) No evidence of association
B) Strong linear association in a positive direction
C) Very strong linear association in a negative direction
D) Weak linear association in a positive direction
E) Weak linear association in a negative direction

since $|r| = 0.991$ is close to 1, we have strong linear association.
the sign of r which is '-' implies that the direction is negative.

9) The regression equation relating dexterity scores (x) and productivity scores (y) for the employees of a company is $y = 5.50 + 1.91x$. Ten pairs of data were used to obtain the equation. The same data yield $r = 0.986$ and $\bar{y} = 56.3$. What is the best predicted productivity score for a person whose dexterity score is 20? $y = 5.5 + 1.91(20) = 43.7$ 9) E

A) 56.30 B) 111.91 C) 58.20 D) 38.20 E) 43.7

10) The relationship between the number of games won by a minor league baseball team and the average attendance at their home games is analyzed. A regression to predict the average attendance from the number of games won has an $r^2 = 0.255$. The residuals plot indicated that a linear model is appropriate. Interpret r^2. 10) A

A) The prediction error using the regression line to predict attendance is 25.5% smaller than the prediction error using $\bar{y}$ to predict it.

B) The prediction error for predicting attendance is about the same when using the regression line and $\bar{y}$.

C) The prediction error using the regression line to predict attendance is 74.5% larger than the prediction error using $\bar{y}$ to predict it.

D) The prediction error using the regression line to predict attendance is 25.5% larger than the prediction error using $\bar{y}$ to predict it.

E) The prediction error using the regression line to predict attendance is 74.5% smaller than the prediction error using $\bar{y}$ to predict it.

r^2 give a measure as to how better using regression line is compared to using $\bar{y}$ to predict y.

Find the indicated probability.

11) In 2006, the General Social Survey asked subjects whether they favored or opposed the death penalty for persons convicted of murder and whether they favored or opposed a law requiring a person to obtain a permit before he or she could buy a gun. The results are summarized in the table below: 11) D

Frequency Distribution

		GUNLAW		
		1 Favor	2 Oppose	TOTAL
DEATH PENALTY	1 Favor	979	280	1259
	2 Oppose	500	99	599
	TOTAL	1479	379	1858

P(oppose death penalty) $= \frac{599}{1858}$

What is the probability that a randomly selected respondent opposes the death penalty for persons convicted of murder?

A) 0.053 B) 0.678 C) 0.204 D) 0.322 E) 0.269

	H	N	
M	20		78
W	21		83
	41		

12) A group of volunteers for a clinical trial consists of 83 women and 78 men. 21 of the women and 20 of the men have high blood pressure. If one of the volunteers is selected at random find the probability that the person is a man given that they have high blood pressure. 12) B

A) 0.256 B) 0.488 C) 0.255 D) 0.512 E) 0.124

$P(M|H) = \frac{20}{41} = 0.488$

(20 are men out of 41 who has high blood pressure)

Find the probability of the given event.

13) A lottery game has balls numbered 1 through 15. A randomly selected ball has an even number or a 6. 13) B

A) $\frac{10}{3}$ B) $\frac{7}{15}$ C) $\frac{8}{15}$ D) $\frac{3}{10}$ E) 7

2, 4, 6, 8, 10, 12, 14

(Do not count the same element twice).

Find the probability using complements.

14) The age distribution of students at a community college is given below. 14) B

Age (years)	Number of students (f)
Under 21	416
21-24	419
25-28	263
29-32	151
33-36	93
37-40	59
Over 40	85
	1486

1342

$\frac{1342}{1486} = 0.903$ (or $1 - \frac{(59+85)}{1486}$)

A student from the community college is selected at random. Find the probability that the student is under 37 years old. Give your answer as a decimal rounded to three decimal places.

A) 0.063 B) 0.903 C) 0.960 D) 0.040 E) 0.097

Provide an appropriate response.

$P(M \cup O) = P(M) + P(O) - P(M \cap O) = 0.50$

Male - M
Oppose - O
$P(M) = 0.44$
$P(O) = 1 - 0.89 = 0.11$
$P(M \cap O) = P(M) \cdot P(O)$
↑ since M and O are independent.

15) In 2006, the General Social Survey asked respondents whether they favored or opposed sex education in public schools. According to the survey results, 44% of the respondents were male and 89% favored sex education in public schools. If the events "respondent is male" and "respondent favors sex education in public schools" are independent, what is the probability that a randomly selected respondent was male or oppposed sex education in public schools? 15) B

A) 0 B) 0.50 C) 0.55 D) 0.11

16) In 2006, the General Social Survey asked respondents whether they favored or opposed sex education in public schools. According to the survey results, 44% of the respondents were male and 89% favored sex education in public schools. The probability that a respondent is male and favors sex education in public schools is 39%. Are the events "respondent is male" and "respondent favors sex education in public schools" independent? 16) D

$P(A \cap B) = 0.39$

A) No, because P(A or B) ≠ P(A)
B) No, because P(A and B) ≠ P(A)P(B)
C) Yes, because P(A and B) ≠ 0
D) Yes, because P(A and B) = P(A)P(B)

$P(A) \cdot P(B) = 0.39$
$(0.44)(0.89)$

Find the mean of the given probability distribution.

17) The random variable X is the number of siblings of a student selected at random from a particular secondary school. Its probability distribution is given in the table. 17) A

x	0	1	2	3	4	5
P(X = x)	7/24	13/48	3/16	7/48	1/16	1/24

$\mu = 0\left(\frac{7}{24}\right) + 1\left(\frac{13}{48}\right) + 2\left(\frac{3}{16}\right) + 3\left(\frac{7}{48}\right) + 4\left(\frac{1}{16}\right) + 5\left(\frac{1}{24}\right)$
$= 1.542$

A) 1.542 B) 2.5 C) 1.833 D) 1.438

Use a table of areas to find the specified area under the standard normal curve.

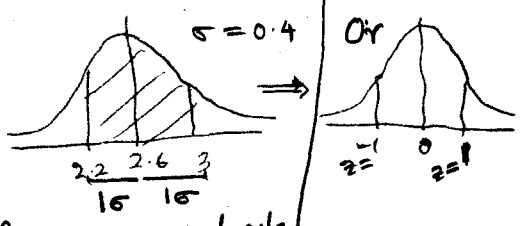
18) The area that lies to the left of 1.13 18) B

A) 0.1292 B) 0.8708 C) 0.8485 D) 0.8907 E) 0.4354

Use the empirical rule to solve the problem.

19) At one college, GPAs are normally distributed with a mean of 2.6 and a standard deviation of 0.4. What percentage of students at the college have a GPA between 2.2 and 3? 19) A

A) 68% B) 84.13% C) 99.7% D) 89% E) 95%



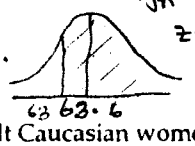
$z = 1 \Rightarrow .8413$
$z = -1 \Rightarrow .1587$
$.6826$

Therefore from emperical rule this is 68%

$se = \frac{s}{\sqrt{n}} = \frac{2.5}{\sqrt{100}}$

$z = \frac{63 - 63.6}{2.5/\sqrt{100}} = \frac{63 - 63.6}{0.25} = -2.4$

Area to the right $= 1 - 0.0082 = 0.9918$



Provide an appropriate response.

20) Assume that the heights of adult Caucasian women have a mean of 63.6 inches and a standard deviation of 2.5 inches. If 100 women are randomly selected, find the probability that they have a mean height greater than 63.0 inches. 20) A

A) 0.9918 B) 0.8989 C) 0.0082 D) 0.2881

21) Which of the following is affected by a change in the sample size, n? 21) C

I) the population distribution ← not affected by the sample selected.

II) the mean of the sampling distribution of $\bar{x}$ ← is always equal to population mean.

III) the standard error of the sampling distribution of $\bar{x}$ $se = \frac{s}{\sqrt{n}}$. yes

A) I only B) both II and III C) III only D) II only

$se = \sqrt{\frac{p_0(1-p_0)}{n}}$

$\hat{p} = 0.65$ $p_0 = 0.7$

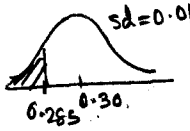
$= \sqrt{\frac{0.7(0.3)}{1393}} = 0.012$

22) According to a CNN opinion poll (http://www.pollingreport.com/politics.htm), 905 of 1393 American adults polled believe that America is ready for a woman president. If the population proportion of American adults who believe that America is ready for a woman president is 0.70, would the CNN sample result be unusual? 22) B

A) No, z = -3.94 B) Yes, z = -4.10 C) Yes, z = -3.94 D) No, z = -4.10

$z = \frac{\hat{p} - p_0}{se} = \frac{0.65 - 0.7}{0.012} = -4.16$ Yes, because out of (-3, 3)

Find the indicated probability for the normally distributed variable.



23) The diameters of pencils produced by a certain machine are normally distributed with a mean of 0.30 inches and a standard deviation of 0.01 inches. What is the probability that the diameter of a randomly selected pencil will be less than 0.285 inches? 23) A

A) 0.0668 B) 0.0596 C) 0.9332 D) 0.4332 E) 0.1336

$z = -1.5$ table → 0.0668.

$z = \frac{\text{observation} - \text{mean}}{\text{standard deviation}} = \frac{0.285 - 0.3}{0.01}$

Find the mean of the binomial random variable.

24) The probability that a person has immunity to a particular disease is 0.6. Find the mean for the random variable X, the number who have immunity in samples of size 26. 24) E

A) 13.0 B) 12.8 C) 10.4 D) 0.6 E) 15.6

$0.6 \times 26 = 15.6$

$\mu = n \cdot p$

Find the standard deviation of the binomial random variable.

25) The probability that a radish seed will germinate is 0.7. A gardener plants seeds in batches of 11. Find the standard deviation for the random variable X, the number of seeds germinating in each batch. 25) B

A) 2.77 B) 1.52 C) 1.502 D) 2.31 E) 1.25

$\sigma = \sqrt{n p (1-p)} = \sqrt{11 \times 0.7 \times 0.3} = 1.519$

Find the indicated probability.

26) Police estimate that 25% of drivers drive without their seat belts. If they stop 6 drivers at random, find the probability that all of them are wearing their seat belts. 26) B

A) 0.0002 B) 0.178 C) 0.356 D) 0.45 E) 0.15

$n = 6$ $p = 0.75$

$P(x=6) = \frac{6!}{6!0!}(0.75)^6(0.25)^0 = 0.178$

(0.25 does not wear seat belts, therefore $p = 0.75$)

Select the most appropriate answer.

27) In a survey of 500 residents, 300 were opposed to the use of the photo-cop for issuing traffic tickets. What is the best point estimate for the proportion of all residents opposed to the photo-cop use? 27) B

A) 300 B) 60% C) 40% D) 500 E) 50%

$300/500 = 0.6$

point estimate for a population proportion is the sample proportion.

Find the standard error

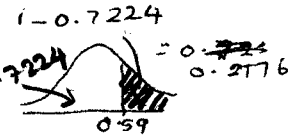
28) In a survey of 550 T.V. viewers, 20% said they watch network news programs. Find the standard error for the sample proportion. 28) B

A) 0.0342 B) 0.0171 C) 0.0003 D) 0.0122 E) 0.0139

$\hat{p} = 0.2$

$se = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = \sqrt{\frac{(0.2)(0.8)}{550}} = 0.01705$.

Use a table of areas to find the specified area under the standard normal curve.



29) The area that lies to the right of 0.59 — 29) C

A) 0.7224 B) 0.2224 C) 0.2776 D) 0.2190 E) 0.5552

Provide an appropriate response.

30) In a Quinnipiac University Poll of registered voters nationwide taken in June of 2007, 43% of those polled blamed oil companies the most for the recent increase in gasoline prices. The margin of error at the 95% confidence level for this point estimate is 2.4%. Construct a 95% confidence level for the population proportion who blame oil companies for the recent increase in gasoline prices. — 30) D

A) (0.383, 0.477) B) (0.382, 0.478) C) (0.368, 0.492) D) (0.406, 0.454)

$\hat{p} \pm me = 0.43 \pm 0.024 = (0.406, 0.454)$

Select the most appropriate answer.

31) The width of a confidence interval estimate for a proportion is — 31) C

A) narrower for a sample size of 50 than for a sample size of 100.

B) wider for 90% confidence than for 95% confidence. (Done at the end)

C) narrower when the sample proportion is 0.10 than when the sample proportion is 0.45.

D) narrowest when the sample proportion is 0.5.

E) wider when the sample proportion is 0.95 than when the sample proportion is 0.55.

Construct the requested confidence interval from the supplied information.

32) A laboratory tested twelve chicken eggs and found that the mean amount of cholesterol was 246 milligrams with s = 11.7 milligrams. Construct a 95% confidence interval for the true mean cholesterol content of all such eggs. — 32) B

A) (238.6, 254.0)
B) (238.6, 253.4)
C) (238.0, 253.9)
D) (239.9, 252.1)
E) (239.9, 253.4)

$n = 12$

$\bar{x} \pm t(se)$

$246 \pm (2.201)\left(\frac{11.7}{\sqrt{12}}\right)$

$\bar{x} = 246$

246 ± 7.484

$se = \frac{s}{\sqrt{n}}$

$(238.6, 253.4)$

$df = 11$ $t = 2.201$

Interpret the confidence interval.

33) How many unpopped kernels are left when you pop a bag of microwave popcorn? The quality control personnel at a company that manufactures microwave popcorn take a random sample of 50 bags of popcorn. They pop each bag in a microwave and then count the number of unpopped kernels. The following interval is produced: — 33) C

t-interval for μ: with 99% Confidence,

$11 < \mu < 25$

(A) is close too.

A) We are 99% confident that the average number of unpopped kernels in microwave popcorn bags is between 11 and 25.

B) The average number of unpopped kernels in a bag of this popcorn brand is between 11 and 25 kernels.

C) We are 99% confident that the average number of unpopped kernels in a bag of this popcorn brand is between 11 and 25 kernels.

D) About 99% of the sampled bags had between 11 and 25 unpopped kernels.

E) 99% of all samples of this popcorn brand will produce this confidence interval.

Determine the margin of error in estimating the population parameter.

34) How tall is your average English classmate? To determine this, you measure the height of a random sample of 15 of your 100 fellow students, finding a 95% confidence interval for the mean height of 67.25 to 69.75 inches. — 34) B

A) 0.75 inches B) 1.25 inches C) 1.5 inches D) 1.06 inches

67.25 ⟷ 69.75 $= \frac{2.5}{2} = 1.25$

6

$\frac{69.75 - 67.25}{2}$

Using the t-tables, software, or a calculator, report the t-score for the given confidence interval and degrees of freedom.

35) 95% confidence interval with df = 15 35) B

A) 1.753 B) 2.131 C) 2.145 D) 1.960 E) 2.120

Since df is given do not subtract 1.

Construct the requested confidence interval from the supplied information.

36) How tall is your average English classmate? To determine this, you measure the height of a random sample of 15 of your 200 fellow students, finding a mean height of 68 inches and a standard deviation of 2.3 inches. Construct a 90% confidence interval for the mean height of your classmates. 36) B

A) (67.023, 68.977) Similar to (32)

B) (66.954, 69.046) $n = 15$ $68 \pm 1.761 \times 2.3/\sqrt{15}$

C) (65.908, 70.092) $68 \pm 1.046 = (66.954, 69.046)$

D) (66.992, 69.008)

E) (67.730, 68.270)

Determine the null and alternative hypotheses.

37) In the past, the mean running time for a certain type of radio battery has been 9.6 hours. The manufacturer has introduced a change in the production method and wants to perform a hypothesis test to determine whether the mean running time has changed as a result. 37) D

A) $H_0: \mu > 9.6$hours
$H_a: \mu > 9.6$ hours

B) $H_0: \mu \neq 9.6$ hours
$H_a: \mu = 9.6$hours

C) $H_0: \mu = 9.6$hours
$H_a: \mu > 9.6$ hours

D) $H_0: \mu = 9.6$ hours
$H_a: \mu \neq 9.6$ hours

38) An automobile manufacturer claims that its new sedan will average better than 25 miles per gallon in the city. Let μ represent the true average mileage of the new sedan. 38) A or B

A) $H_0: \mu = 25$
$H_a: \mu < 25$

B) $H_0: \mu = 25$
$H_a: \mu > 25$

C) $H_0: \mu = 25$
$H_a: \mu \leq 25$

D) $H_0: \mu = 25$
$H_a: \mu \geq 25$

E) $H_0: \mu = 25$
$H_a: \mu \neq 25$

Depends on whether you want to support or oppose the claim.

Select the most appropriate answer.

39) Which of the following statements is false? 39) B

A) The P-value represents the probability of obtaining the observed value or one even more extreme.

B) The P-value assumes H_a is true. ✗ it assumes H_0 is true

C) The smaller the P-value, the stronger the evidence is against H_0.

D) The P-value is between 0 and 1.

Find the P-value for the indicated hypothesis test.

40) In a sample of 47 adults randomly selected from one town, it is found that 9 of them have been exposed to a particular strain of the flu. Find the P-value for a test of the claim that the proportion of all adults in the town that have been exposed to this strain of the flu is 8%. 40) B

A) 0.03 B) 0.005 C) 0.08 D) 0.05 E) 0.002

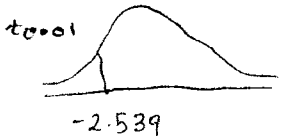
(Done at the end)

Provide an appropriate response.

41) A t test for a mean uses a sample of 20 observations. Find the t test statistic value that has a P-value of 0.01 when the alternative hypothesis is $H_a: \mu < 0$. 41) A

A) -2.54 B) 2.20 C) -2.86 D) -2.20 E) 2.54

left tail



$df = 20 - 1 = 19$

Since $H_a: \mu < 0$ this is one sided (Left tail)

$t_{0.01}$

19 ——— 2.539

Therefore $|t| = 2.539$

Since left tail t should be negative

Therefore $t = -2.539$

74/.

Explain what the P-value means in the given context.

42) 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 reevaluates its retention rate and comes up with a P-value of 0.075. Using $\alpha = 0.05$, what can we conclude? 42) E

H_0: rate = 4%. H_a: rate > 4%.

since $P > \alpha$ Do not reject H_0

A) There is a 7.5% chance that the observed effects on retention that are due to the new programs are a result of natural sampling variation. We conclude the new programs are more effective.

B) If the retention rate is truly 4%, there is a 7.5% chance that the new programs have no effect on the retention rate.

C) If the retention rate is truly 4%, there is a 7.5% chance of obtaining the retention rates seen over the past two years due to chance variation. With $\alpha = 0.05$, there is sufficient evidence to conclude that the new programs effect the retention rate for graduating students.

D) If the retention rate is truly 4%, there is a 92.5% chance that the new programs have no effect on the retention rate.

E) If the retention rate is truly 4%, there is a 7.5% chance of obtaining the retention rates seen over the past two years due to chance variation. With $\alpha = 0.05$, there is not enough evidence to conclude that the new programs effect the retention rate for graduating students.

For the given sample data and null hypothesis, compute the value of the test statistic, z

43) In a school district with 10,000 high school students, 1200 randomly selected students completed a class designed to improve their math skills. 708 of these students scored better than the district-wide median on a standardized math exam. The district would like to know whether the class improves the students' math skills. The hypotheses are H_0: p = 0.5, H_a: p > 0.5, where p is the proportion of all those taking the special class who score better than the district-wide median. 43) A

(Done at the end)

A) 6.23 B) 4.68 C) 708 D) 9.98 E) 13.09

State conclusion to significance test in terms of the null hypothesis

44) In a random sample of 88 adults from a particular town, it is found that 6 of them have been exposed to a certain flu strain. At the 0.01 significance level, test the claim that the proportion of all adults in the town that have been exposed to this flu strain differs from the nationwide percentage of 8%. 44) B

H_0: p = 0.08 H_a: p ≠ 0.08.

$\alpha = 0.01$

Test statistic: z = −0.41. P-Value = 0.6828

$P > 0.01$ fail to reject H_0

State your conclusion in terms of H_0.

A) Do not reject H_a since the P-value is larger than α.

B) Do not reject H_0 since the P-value is larger than α.

C) Since the P-value is larger than α, we conclude that the proportion of adults in this particular town that have been exposed to this flu strain differs from the nationwide percentage of 8%.

D) Reject H_a since the P-value is larger than α.

E) Reject H_0 since the P-value is larger than α.

Classify the significance test as two-tailed, left-tailed, or right-tailed.

45) At one school, the average amount of time ninth-graders spend watching television each week is 21.6 hours. The principal introduces a campaign to encourage the students to watch less television. One year later, the principal wants to perform a significance test to determine whether the average amount of time spent watching television per week has decreased from the previous mean of 21.6 hours. 45) D

A) Two-tailed B) Middle-tailed C) Right-tailed D) Left-tailed

Assume that a simple random sample has been selected from a normally distributed population. State the final conclusion.

46) Test the claim that the mean lifetime of a particular car engine is greater than 220,000 miles. Sample data are summarized as n = 23, $\bar{x}$ = 226,450 miles, and s = 11,500 miles. Use a significance level of $\alpha = 0.01$. 46) A

H_0: $\mu = 220{,}000$ H_a: $\mu > 220{,}000$

State your conclusion about H_0.

A) t = 2.69, reject H_0

B) z = -2.69, reject H_0

C) t = -2.69, reject H_0

D) t = 12.9, reject H_0

(Done at the end)

Determine whether the samples are independent or dependent.

47) The effectiveness of a headache medicine is tested by measuring the intensity of a headache in patients before and after drug treatment. The data consist of before and after intensities for each patient. 47) C

A) Cannot be determined from the information given

B) Independent samples

C) Dependent samples

Before sample and after sample are dependent because even for the same patient after intensity depends on the initial intensity of the headache.

From the sample statistics, find the value of $\hat{p}_1 - \hat{p}_2$, the point estimate of the difference of proportions.

48) $n_1 = 418$ $n_2 = 36$ 48) D

$x_1 = 132$ $x_2 = 7$

$\hat{p}_1 = \frac{132}{418} = 0.316$ $\hat{p}_2 = \frac{7}{36} = 0.194$ $\hat{p}_1 - \hat{p}_2 = 0.316 - 0.194 = 0.122$

A) 0.275 B) 0.327 C) -0.121 D) 0.121

Interpret the given confidence interval.

49) Assume the proportion of students retained at a certain university in 2003 is p_{03} and the proportion of students retained in 2004 is p_{04}. Based on a recent study, a 90% confidence interval for $p_{03} - p_{04}$ is (-0.0398, 0.0262). Give an interpretation of this confidence interval. 49) A

A) We are 90% confident that the proportion of students retained in 2003 is between 3.98% less and 2.62% more than the proportion of students retained in 2004.

B) There is a 90% probability that the proportion of students retained in 2003 is between 3.98% less and 2.62% more than the proportion of students retained in 2004.

C) We are 90% confident that the proportion of students retained in 2004 is between 3.98% less and 2.62% more than the proportion of students retained in 2003.

50) A researcher wishes to determine whether people with high blood pressure can reduce their blood pressure by following a particular diet. Subjects were randomly assigned to either a treatment group or a control group. The mean blood pressure was determined for each group, and a 95% confidence interval for the difference in the means for the treatment group versus the control group, $\mu_t - \mu_c$, was found to be (-21, -6). 50) D

A) We are 95% confident that the average blood pressure of those who follow the diet is between 6 and 21 points higher than the average for those who do not follow the diet.

B) The probability that the mean blood pressure for those on the diet is higher than for those not on the diet is 0.95.

C) The probability that the mean blood pressure for those on the diet is lower than for those not on the diet is 0.95.

D) We are 95% confident that the average blood pressure of those who follow the diet is between 6 and 21 points lower than the average for those who do not follow the diet.

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

Fill in the blank.

51) Extrapolation refers to using a regression line to predict y-values for x-values outside the observed range of data. 51) _____

Provide an appropriate response.

52) How does one determine whether or not two events, say A and B, are independent? 52) _____

If $P(A \cap B) = P(A) \cdot P(B)$ or

$P(A|B) = P(A)$ or $P(B|A) = P(B)$

53) If the proportion of American adults who feel that increases in gasoline prices have caused financial hardship for their family is 63%, what are the mean and standard deviation for the number of people who feel that increases in gasoline prices have caused their family financial hardship for a random sample of 100? 53) _____

Mean $= 0.63 = 63\%$

Stdev $= \sqrt{\frac{(0.63)(1-0.63)}{100}} = 0.0483 = 4.8\%$

54) A large manufacturer hires many handicapped workers and keeps track of both their type of handicap and their level of performance. 54) _____

a. Identify the two variables.

Type of handicap

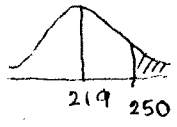
Level of performance

b. Identify the response variable and the explanatory variable.

Explanatory variable - Type of handicap and

Level of performance - Responce variable

55) Serum cholesterol is an important risk factor for coronary disease. The level of serum cholesterol is approximately normally distributed with a mean of 219 mg/dL and a standard deviation of 50 mg/dL. If serum cholesterol levels of over 250 mg/dL indicate a high-enough risk for heart disease to warrant treatment, what is the probability that a randomly selected person will need treatment? 55) _____



$\longrightarrow$ $z = \frac{250-219}{50} = 0.62$

$\Leftrightarrow 1 - 0.7324 = .2676$

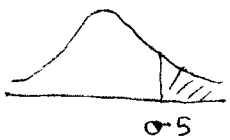
56) Suppose that property taxes on homes in Columbus, Ohio, are approximately normal in distribution, with a mean of $3000 and a standard deviation of $1000. The property tax for one particular home is $3500. 56) _____

a. Find the z-score for that property tax value.

b. What proportion of the property taxes exceeds $3500?

a) $z = \frac{3500-3000}{1000} = 0.5$

b)



$1 - 0.6915 = 0.3085$

Part B

1)

0	3 4 4 4 7
1	1 1 2 4 4 5
2	1 1 2 4 4 5
3	1 2 3 5
4	4 5
5	2 5 6
6	1 2 5 6

2) $-3, 4, -2, -4, -9, 0, 9, 1$

mean $= -1/8 = -0.5$

Std dev.

x	$(x-\bar{x})$	$(x-\bar{x})^2$	
-3	-2.5	49	6.25
4	4.5	0	20.25
-2	-1.5	36	2.25
-4	-3.5	64	12.25
-9	-8.5	25	72.25
0	0.5	16	0.25
9	9.5	25	90.25
1	1.5	25	2.25

$$\sqrt{206/7} = 5.425 //$$

Box plot.

$-9 \quad -4 \quad -3 \quad -2 \quad 0 \quad 1 \quad 4 \quad 9$

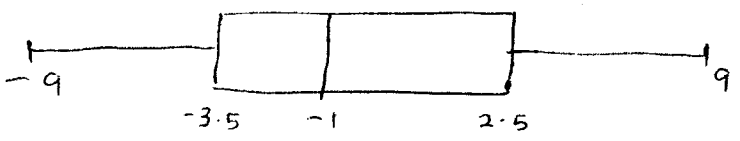
$Q_1 = -3.5 \qquad Q_3 = 2.5 \qquad Q_2 = -1$

$IQR = Q_3 - Q_1 = 2.5 - (-3.5) = 2.5 + 3.5 = 6$

$1.5 * IQR = 9$

upper bound for o/l $= Q_3 + 9 = 2.5 + 9 = 11.5$ no o/l

lower " " o/l $= Q_1 - 9 = -3.5 - 9 = -12.5$ no o/l



4)

$$\bar{x} = \frac{5.9 + 7 + 2.8 + 4.8}{4} = 5.125$$

	x	$(x-\bar{x})$	$(x-\bar{x})^2$
$S =$	5.9	0.175	0.6
	7	1.875	3.52
	2.8	−2.325	5.41
	4.8	−0.325	0.1055

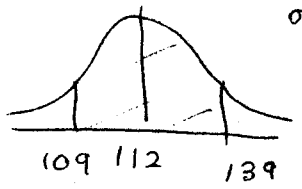
$$\sqrt{9.535/3} = 1.792$$

$$S/\sqrt{n} = \frac{1.792}{\sqrt{4}} = 0.8955$$

$$5.125 \pm 3.182(0.8955)$$

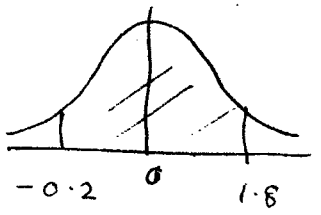
$$5.125 \pm 2.849 \quad (2.276, 7.974)$$ //

5)



$\sigma = 15$

=



$= 0.9641 - 0.4207$

$= 0.5434$ //

6) 1st

X	$P(x)$
250	2/6
−80	4/6

$$\mu = 250\left(\frac{2}{6}\right) - 80\left(\frac{4}{6}\right)$$

$= \$30$

2st

X	$P(x)$
310	1/2
−150	1/2

$$\mu = 310 \times \frac{1}{2} + 150 \times \frac{1}{2} = \$80$$

2nd better.

7.) $P(A \cup B) = 0.88 \quad P(A) = 0.3 \quad P(A \cap B) = 0.2$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ use addition rule

$0.88 = 0.3 + P(B) - 0.2$

$P(B) = 0.88 - 0.3 + 0.2$

$= 0.78$ //

8)

$H_0 \ \mu = 6.5 \quad Vs \quad \mu < 6.5 \quad \alpha = 0.01$

$\bar{x} = 4.667$

$S =$	x	$(x-\bar{x})$	$(x-\bar{x})^2$
	3	-1.667	2.779
	4	-0.667	0.445
	2	-2.667	7.113
	8	3.333	11.109
	4	-0.667	0.445
	7	2.333	5.443
			27.334/5

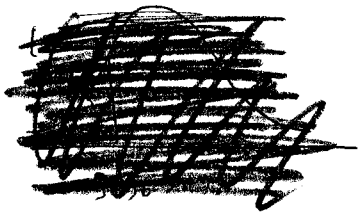
$= \sqrt{5.4668} = 2.338$

$t = \dfrac{4.667 - 6.5}{2.338/\sqrt{6}} = -1.921$

$|t| = 1.921$

$1.476 < |t| < 2.015$

$0.05 < P < 0.1$



left tail

fail to reject H_0

No enough evidence to conclude $\mu < 6.5$ at 0.0

31) $n \uparrow$ me $\downarrow$ width $\downarrow$

confidence level $\uparrow$ (CL) me $\uparrow$ width $\uparrow$

A) $n_1 = 50$

$n_2 = 100$ me $\downarrow$ comparatively $\Rightarrow$ narrower.

✗

B) $CL = 90\%$

$CL = 95\%$ me $\uparrow$ comparatively $\Rightarrow$ wider

✗

C) $p_1 = 0.1$ $\quad se_1 = \sqrt{\frac{p_1(1-p_1)}{n}} = \sqrt{\frac{0.1(0.9)}{n}} = \sqrt{\frac{0.09}{n}}$

$p_2 = 0.45$ $\quad se_2 = \sqrt{\frac{p_2(1-p_2)}{n}} = \sqrt{\frac{0.45(0.55)}{n}} = \sqrt{\frac{0.2475}{n}}$

$se_1 < se_2$

$me_1 < me_2$

① narrower

✓

D) $p_3 = 0.5$ $\quad se_3 = \sqrt{\frac{0.5(0.5)}{n}} = \sqrt{\frac{0.25}{n}}$

$se_1 < se_3$

$me_1 < me_3$

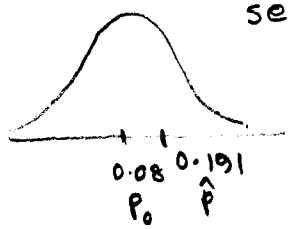
narrower ✗

E) Same calculation as (C) shows that this is wrong.

40) $H_0: p = 0.08$ $\quad n = 47$

$H_a: p \neq 0.08$

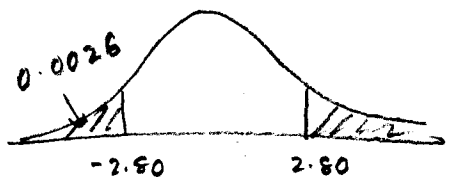
$\hat{p} = \frac{9}{47} = 0.191$



$$se = \sqrt{\frac{p_0(1-p_0)}{n}} = \sqrt{\frac{0.08(0.92)}{47}} = 0.0396$$

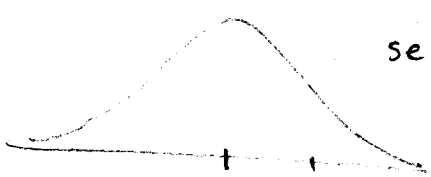
double tail

$$z = \frac{\hat{p} - p_0}{se} = \frac{0.191 - 0.08}{0.0396} = 2.80$$



Therefore $P = 2(0.0026) = 0.0052$

43) $n = 1200$ $\quad \hat{p} = \frac{708}{1200} = 0.59$



$$se = \sqrt{\frac{p_0(1-p_0)}{n}} = \sqrt{\frac{0.5(0.5)}{1200}} = 0.0144$$

$$z = \frac{\hat{p} - p_0}{se} = \frac{0.59 - 0.5}{0.0144}$$

$$= 6.25$$

46) $se = \frac{s}{\sqrt{n}} = \frac{11500}{\sqrt{23}} = 2397.9$

$$t = \frac{\bar{x} - \mu}{se} = \frac{226450 - 220000}{2397.9} = 2.69$$

(A)