

PART I. MULTIPLE CHOICE

Determine whether the given value is a statistic or a parameter.

- 1) After inspecting all of 55,000 kg of meat stored at the Wurst Sausage Company, it was found that 45,000 kg of the meat was spoiled.
A) Parameter B) Statistic
- 2) A sample of 120 employees of a company is selected, and the average age is found to be 37 years.
A) Parameter B) Statistic

Determine whether the described data is qualitative or quantitative.

- 3) An usher records the number of unoccupied seats in a movie theater during each viewing of a film. Identify the type of data collected.
A) quantitative B) qualitative
- 4) A fan observes the numbers on the shirts of a girl's soccer team. Identify the type of data collected.
A) qualitative B) quantitative

Determine whether the given value is from a discrete or continuous data set.

- 5) The weight of Bill's pack as he sets off on a backpacking trip is 48.3 lb.
A) Discrete B) Continuous
- 6) The number of stories in a Manhattan building is 22.
A) Continuous B) Discrete

Determine whether the given description corresponds to an observational study or an experiment.

- 7) A sample of fish is taken from a lake to measure the effect of pollution from a nearby factory on the fish.
A) Observational study
B) Experiment

- 8) A quality control specialist compares the output from a machine with a new lubricant to the output of machines with the old lubricant.
A) Experiment
B) Observational study

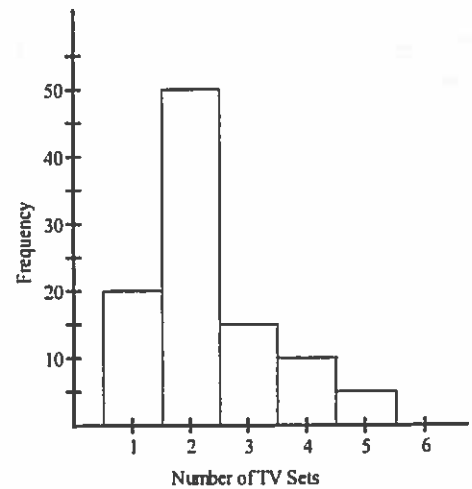
Provide an appropriate response.

- 9) The frequency distribution below summarizes employee years of service for Alpha Corporation. Determine the width of each class.

Years of service	Frequency
1-5	5
6-10	20
11-15	25
16-20	10
21-25	5
26-30	3

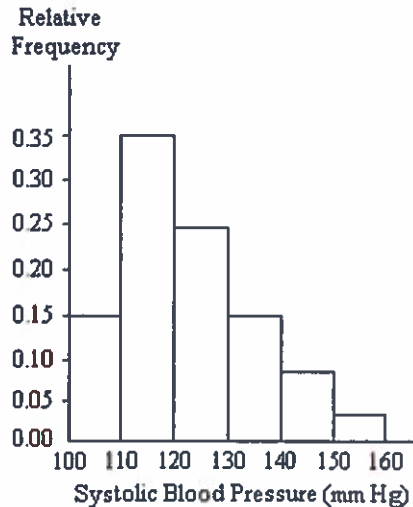
- A) 5 B) 10 C) 6 D) 4

- 10) The histogram below represents the number of television sets per household for a sample of U.S. households. How many households are included in the histogram?



- A) 100 B) 95
C) 90 D) 110

- 11) A nurse measured the blood pressure of each person who visited her clinic. The following is a relative-frequency histogram for the systolic blood pressure readings for those people aged between 25 and 40. The blood pressure readings were given to the nearest whole number. Approximately what percentage of the people aged 25–40 had a systolic blood pressure reading between 110 and 139 inclusive?



- A) 59% B) 89%
C) 75% D) 39%

Find the mean for the given sample data. Unless indicated otherwise, round your answer to one more decimal place than is present in the original data values.

- 12) Last year, nine employees of an electronics company retired. Their ages at retirement are listed below. Find the mean retirement age.

51 61 62
54 68 58
60 57 54

- A) 58.3 yr B) 58.0 yr
C) 57.1 yr D) 57.7 yr

- 13) Listed below are the amounts of weight change (in pounds) for 12 women during their first year of work after graduating from college. Positive values correspond to women who gained weight and negative values correspond to women who lost weight. What is the mean weight change?

2 -4 1 -5 18 -9 16 0 11 -8 11 7
A) 1.5 lb B) 3.3 lb
C) 3.6 lb D) 7.7 lb

Find the median for the given sample data.

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

80 39 214 152 264 239 232

Find the median number of newspapers sold.

- A) 174 newspapers
B) 214 newspapers
C) 152 newspapers
D) 232 newspapers
- 15) The temperatures (in degrees Fahrenheit) in 7 different cities on New Year's Day are listed below.

26 29 33 59 67 68 78

Find the median temperature.

- A) 33°F B) 51°F
C) 67°F D) 59°F
- 16) The normal monthly precipitation (in inches) for August is listed for 20 different U.S. cities. Find the median of the data.

3.5 1.6 2.4 3.7 4.1
3.9 1.0 3.6 4.2 3.4
3.7 2.2 1.5 4.2 3.4
2.7 0.4 3.7 2.0 3.6

- A) 3.50 in. B) 3.40 in.
C) 3.45 in. D) 2.94 in.

Solve the problem.

17) At the U.S. Open Tennis Championship a statistician keeps track of every serve that a player hits during the tournament. The statistician reported that the mean serve speed of a particular player was 95 miles per hour. Suppose that the statistician indicated that the serve speed distribution was skewed to the left. Which of the following values is most likely the value of the median serve speed?

- A) 88 mph
- B) 81 mph
- C) 95 mph
- D) 102 mph

18) The amount spent on textbooks for the fall term was recorded for a sample of five hundred university students. The mean expenditure was calculated to be \$500 and the median expenditure was calculated to be \$425. Which of the following interpretations of the median is correct?

- A) The average of the textbook costs sampled was \$425
- B) 50% of the students sampled had textbook costs that were less than \$425
- C) The most frequently occurring textbook cost in the sample was \$425
- D) 50% of the students sampled had textbook costs equal to \$425

19) Many firms use on-the-job training to teach their employees computer programming. Suppose you work in the personnel department of a firm that just finished training a group of its employees to program, and you have been requested to review the performance of one of the trainees on the final test that was given to all trainees. The mean of the test scores is 74. Additional information indicated that the median of the test scores was 84. What type of distribution most likely describes the shape of the test scores?

- A) skewed to the left
- B) skewed to the right
- C) symmetric
- D) unable to determine with the information given

Find the mode(s) for the given sample data.

20) 20 42 46 42 49 42 49

- A) 41.4
- B) 49
- C) 46
- D) 42

21) 92 56 32 56 29 92

- A) 92
- B) 92, 56
- C) 56
- D) 59.5

22) Listed below are the lengths (in inches) of each snake in the Clarmont Zoo's reptile house.

9 15 86 13 16 101 85 10 14 17 102

- A) 9 in., 15 in., 86 in., 13 in., 16 in., 101 in., 85 in., 10 in., 14 in., 17 in., 102 in.
- B) 11 in.
- C) 21.3 in.
- D) no mode

Find the range for the given sample data.

23) Jorge has his own business as a painter. The amounts he made in the last five months are shown below.

\$2416 \$2423 \$1644 \$2036 \$1267

- A) \$772
- B) \$1156
- C) \$779
- D) \$1149

24) The amounts below represent the last twelve transactions made to Juan's checking account. Positive numbers represent deposits and negative numbers represent debits from his account.

\$28 -\$20 \$67 -\$22 -\$15 \$17 -\$48
\$41 \$53 -\$13 \$30 \$81

- A) \$81
- B) \$129
- C) \$33
- D) -\$129

Suppose that prices of a certain model of new homes are normally distributed with a mean of \$150,000. Use the empirical rule to find the percentage of buyers who paid:

25) between \$147,700 and \$152,300 if the standard deviation is \$2300.

- A) 34%
- B) 95%
- C) 68%
- D) 99.7%

26) between \$150,000 and \$152,200 if the standard deviation is \$1100.

- A) 68% B) 99.7%
C) 34% D) 47.5%

27) between \$150,000 and \$152,700 if the standard deviation is \$900.

- A) 47.5% B) 34%
C) 99.7% D) 49.85%

28) less than \$145,600 if the standard deviation is \$2200.

- A) 47.5% B) 2.5%
C) 95% D) 97.5%

A set of data items is normally distributed with a mean of 60. Convert the data item to a z-score.

29) data item: 92; standard deviation: 8

- A) 4 B) 8 C) $\frac{15}{8}$ D) 32

30) data item: 15; standard deviation: 12

- A) -12 B) 3.75
C) 12 D) -3.75

A set of data items is normally distributed with a mean of 500. Find the data item in this distribution that corresponds to the given z-score.

31) $z = 2$, if the standard deviation is 10.

- A) 480 B) 510
C) 520 D) 502

32) $z = -3$, if the standard deviation is 20.

- A) 480 B) 560
C) 440 D) 497

Find the percentile for the data value.

33) Data set: 4 6 14 10 4 10 18 18 22 6
6 18 12 2 18;
data value: 14

- A) 60 B) 70 C) 52 D) 35

34) Data set: 4 13 8 6 4 4 13 6 4 13 2
13 15 5 9 4 12 8 6 13;
data value: 6

- A) 62 B) 40 C) 35 D) 25

Find the indicated measure.

35) Use the given sample data to find Q_3 .

- 49 52 52 52 74 67 55 55
A) 6.0 B) 67.0
C) 61.0 D) 55.0

36) The test scores of 32 students are listed below. Find P_{46} .

- 32 37 41 44 46 48 53 55
56 57 59 63 65 66 68 69
70 71 74 74 75 77 78 79
80 82 83 86 89 92 95 99
A) 15 B) 14.72
C) 67 D) 68

Solve the problem.

37) Which of the following best characterizes a simple random sample?

- A) No member of the sample is allowed to communicate with any other member of the sample.
B) All members of the sample voluntarily provide all information requested in a timely manner.
C) Methods are employed to guarantee that all subgroups of the population are represented in the sample.
D) Every set of n elements in the population has an equal probability of being chosen.

Find the indicated probability.

38) A bag contains 2 red marbles, 3 blue marbles, and 7 green marbles. If a marble is randomly selected from the bag, what is the probability that it is blue?

- A) $\frac{1}{3}$ B) $\frac{1}{4}$ C) $\frac{1}{7}$ D) $\frac{1}{9}$

39) A class consists of 66 women and 98 men. If a student is randomly selected, what is the probability that the student is a woman?

- A) $\frac{33}{49}$ B) $\frac{49}{82}$
C) $\frac{1}{164}$ D) $\frac{33}{82}$

- 40) Two 6-sided dice are rolled. What is the probability that the sum of the two numbers on the dice will be 4?
 A) $\frac{1}{12}$ B) 3 C) $\frac{11}{12}$ D) $\frac{2}{3}$

Find the indicated probability.

- 41) You toss a coin 5 times. What is the probability of getting heads on the first toss and tails on the next four tosses?
 A) $\frac{31}{32}$ B) $\frac{27}{32}$ C) $\frac{1}{32}$ D) $\frac{5}{32}$

- 42) You toss one coin and one die. What is the probability of getting heads and 3?
 A) $\frac{1}{8}$ B) $\frac{1}{6}$ C) $\frac{1}{4}$ D) $\frac{1}{12}$

Assume that a researcher randomly selects 14 newborn babies and counts the number of girls selected, x . The probabilities corresponding to the 14 possible values of x are summarized in the given table. Answer the question using the table.

Probabilities of Girls					
x(girls)	P(x)	x(girls)	P(x)	x(girls)	P(x)
0	0.000	5	0.122	10	0.061
1	0.001	6	0.183	11	0.022
2	0.006	7	0.209	12	0.006
3	0.022	8	0.183	13	0.001
4	0.061	9	0.122	14	0.000

- 43) Find the probability of selecting exactly 8 girls.
 A) 0.022 B) 0.183
 C) 0.122 D) 0.000
- 44) Find the probability of selecting 12 or more girls.
 A) 0.022 B) 0.006
 C) 0.007 D) 0.001

Determine if the outcome is unusual. Consider as unusual any result that differs from the mean by more than 2 standard deviations. That is, unusual values are either less than $\mu - 2\sigma$ or greater than $\mu + 2\sigma$.

- 45) A survey for brand recognition is done and it is determined that 68% of consumers have heard of Dull Computer Company. A survey of 800 randomly selected consumers is to be conducted. For such groups of 800, would it be unusual to get 530 consumers who recognize the Dull Computer Company name?
 A) Yes B) No

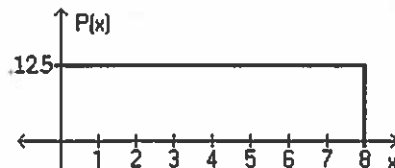
Find the indicated probability.

- 46) A mountain search and rescue team receives a mean of 0.78 calls per day. Find the probability that on a randomly selected day, they will receive fewer than two calls.
 A) 0.1394 B) 0.8160
 C) 0.1840 D) 0.3576
- 47) On one tropical island, hurricanes occur with a mean of 2.74 per year. Find the probability that during the next 3 years the number of hurricanes will be 2.
 A) 0.2424
 B) 0.0010
 C) 0.0249
 D) 0.0646
 E) 0.0091

Provide an appropriate response.

- 48) Use the standard normal distribution to find $P(0 < z < 2.25)$.
 A) 0.4878 B) 0.5122
 C) 0.7888 D) 0.8817

Using the following uniform density curve, answer the question.



- 49) What is the probability that the random variable has a value greater than 2?
 A) 0.750 B) 0.625
 C) 0.700 D) 0.875

- 50) What is the probability that the random variable has a value between 4.1 and 7.4?
 A) 0.6625 B) 0.4125
 C) 0.5375 D) 0.2875

Assume that the weight loss for the first month of a diet program varies between 6 pounds and 12 pounds, and is spread evenly over the range of possibilities, so that there is a uniform distribution. Find the probability of the given range of pounds lost.

- 51) Less than 11 pounds
 A) $\frac{5}{6}$ B) $\frac{1}{6}$ C) $\frac{1}{3}$ D) $\frac{5}{7}$
- 52) Between 8 pounds and 11 pounds
 A) $\frac{1}{3}$ B) $\frac{1}{2}$ C) $\frac{2}{3}$ D) $\frac{1}{4}$

If z is a standard normal variable, find the probability.

- 53) The probability that z is less than 1.13
 A) 0.8907 B) 0.8485
 C) 0.8708 D) 0.1292
- 54) $P(z < 0.97)$
 A) 0.1660 B) 0.8078
 C) 0.8315 D) 0.8340
- 55) The probability that z is greater than -1.82
 A) -0.0344 B) 0.4656
 C) 0.0344 D) 0.9656
- 56) $P(z > 0.59)$
 A) 0.2190 B) 0.2776
 C) 0.7224 D) 0.2224
- 57) The probability that z lies between -1.10 and -0.36
 A) 0.2237 B) 0.4951
 C) 0.2239 D) -0.2237
- 58) $P(-0.73 < z < 2.27)$
 A) 0.7557 B) 1.54
 C) 0.2211 D) 0.4884

Assume that X has a normal distribution, and find the indicated probability.

- 59) The mean is $\mu = 60.0$ and the standard deviation is $\sigma = 4.0$.
 Find the probability that X is less than 53.0.
 A) 0.5589 B) 0.9599
 C) 0.0802 D) 0.0401
- 60) The mean is $\mu = 15.2$ and the standard deviation is $\sigma = 0.9$.
 Find the probability that X is greater than 17.
 A) 0.9713 B) 0.9821
 C) 0.0228 D) 0.9772
- 61) The mean is $\mu = 22.0$ and the standard deviation is $\sigma = 2.4$.
 Find the probability that X is between 19.7 and 25.3.
 A) 0.3370 B) 1.0847
 C) 0.4107 D) 0.7477

Use the given data to find the minimum sample size required to estimate the population proportion.

- 62) Margin of error: 0.04; confidence level: 94%;
 \hat{p} and \hat{q} unknown
 A) 587 B) 572
 C) 486 D) 553
- 63) Margin of error: 0.044; confidence level: 95%;
 \hat{p} and \hat{q} unknown
 A) 497 B) 405
 C) 352 D) 635
- 64) Margin of error: 0.09; confidence level: 90%;
 from a prior study, \hat{p} is estimated by 0.23.
 A) 180 B) 5
 C) 60 D) 53
- 65) Margin of error: 0.005; confidence level: 99%;
 from a prior study, \hat{p} is estimated by 0.166.
 A) 21,274 B) 36,719
 C) 184 D) 33,047

Use the given information to find the minimum sample size required to estimate an unknown population mean μ .

66) How many women must be randomly selected to estimate the mean weight of women in one age group. We want 90% confidence that the sample mean is within 3.7 lb of the population mean, and the population standard deviation is known to be 28 lb.

- A) 156 B) 155
C) 221 D) 153

67) How many weeks of data must be randomly sampled to estimate the mean weekly sales of a new line of athletic footwear? We want 99% confidence that the sample mean is within \$200 of the population mean, and the population standard deviation is known to be \$1100.

- A) 165 B) 201
C) 117 D) 82

Express the null hypothesis and the alternative hypothesis in symbolic form. Use the correct symbol (μ , p , σ) for the indicated parameter.

68) A skeptical paranormal researcher claims that the proportion of Americans that have seen a UFO, p , is less than 3 in every one thousand.

- A) $H_0: p = 0.003$ B) $H_0: p > 0.003$
 $H_1: p > 0.003$ $H_1: p \leq 0.003$
C) $H_0: p < 0.003$ D) $H_0: p = 0.003$
 $H_1: p \geq 0.003$ $H_1: p < 0.003$

69) The owner of a football team claims that the average attendance at games is over 62,900, and he is therefore justified in moving the team to a city with a larger stadium.

- A) $H_0: \mu < 62,900$ B) $H_0: \mu = 62,900$
 $H_1: \mu \geq 62,900$ $H_1: \mu > 62,900$
C) $H_0: \mu > 62,900$ D) $H_0: \mu = 62,900$
 $H_1: \mu \leq 62,900$ $H_1: \mu < 62,900$

70) A researcher claims that 62% of voters favor gun control.

- A) $H_0: p = 0.62$ B) $H_0: p < 0.62$
 $H_1: p \neq 0.62$ $H_1: p \geq 0.62$
C) $H_0: p \neq 0.62$ D) $H_0: p \geq 0.62$
 $H_1: p = 0.62$ $H_1: p < 0.62$

Formulate the indicated conclusion in nontechnical terms. Be sure to address the original claim.

71) A researcher claims that 62% of voters favor gun control. Assuming that a hypothesis test of the claim has been conducted and that the conclusion is failure to reject the null hypothesis, state the conclusion in nontechnical terms.

- A) There is sufficient evidence to warrant rejection of the claim that 62% of voters favor gun control.
B) There is not sufficient evidence to support the claim that 62% of voters favor gun control.
C) There is not sufficient evidence to warrant rejection of the claim that 62% of voters favor gun control.
D) There is sufficient evidence to support the claim that more than 62% of voters favor gun control.

72) The manufacturer of a refrigerator system for beer kegs produces refrigerators that are supposed to maintain a true mean temperature, μ , of 49°F, ideal for a certain type of German pilsner. The owner of the brewery does not agree with the refrigerator manufacturer, and claims he can prove that the true mean temperature is incorrect. Assuming that a hypothesis test of the claim has been conducted and that the conclusion is to reject the null hypothesis, state the conclusion in nontechnical terms.

- A) There is sufficient evidence to support the claim that the mean temperature is different from 49°F.
- B) There is not sufficient evidence to support the claim that the mean temperature is equal to 49°F.
- C) There is sufficient evidence to support the claim that the mean temperature is equal to 49°F.
- D) There is not sufficient evidence to support the claim that the mean temperature is different from 49°F.

73) A cereal company claims that the mean weight of the cereal in its packets is at least 14 oz. Assuming that a hypothesis test of the claim has been conducted and that the conclusion is to reject the null hypothesis, state the conclusion in nontechnical terms.

- A) There is sufficient evidence to warrant rejection of the claim that the mean weight is less than 14 oz.
- B) There is not sufficient evidence to warrant rejection of the claim that the mean weight is at least 14 oz.
- C) There is not sufficient evidence to warrant rejection of the claim that the mean weight is less than 14 oz.
- D) There is sufficient evidence to warrant rejection of the claim that the mean weight is at least 14 oz.

74) A researcher claims that the amounts of acetaminophen in a certain brand of cold tablets have a standard deviation different from the $\sigma = 3.3$ mg claimed by the manufacturer. Assuming that a hypothesis test of the claim has been conducted and that the conclusion is failure to reject the null hypothesis, state the conclusion in nontechnical terms.

- A) There is sufficient evidence to support the claim that the standard deviation is different from 3.3 mg.
- B) There is not sufficient evidence to support the claim that the standard deviation is different from 3.3 mg.
- C) There is sufficient evidence to support the claim that the standard deviation is equal to 3.3 mg.
- D) There is not sufficient evidence to support the claim that the standard deviation is equal to 3.3 mg.

Do one of the following, as appropriate: (a) Find the critical value $z_{\alpha/2}$, (b) find the critical value $t_{\alpha/2}$, (c) state that neither the normal nor the t distribution applies.

75) 98%; $n = 7$; $\sigma = 27$; population is normally distributed.

- A) $t_{\alpha/2} = 2.575$
- B) $t_{\alpha/2} = 1.96$
- C) $z_{\alpha/2} = 2.33$
- D) $z_{\alpha/2} = 2.05$

76) 90%; $n = 10$; σ is unknown; population is approximately normally distributed.

- A) $t_{\alpha/2} = 1.812$
- B) $z_{\alpha/2} = 2.262$
- C) $t_{\alpha/2} = 1.833$
- D) $z_{\alpha/2} = 1.383$

77) 90%; $n = 9$; $\sigma = 4.2$; population appears to be very skewed.

- A) Neither the normal nor the t distribution applies.
- B) $z_{\alpha/2} = 2.365$
- C) $z_{\alpha/2} = 2.896$
- D) $z_{\alpha/2} = 2.306$

Use the given data to find the best predicted value of the response variable. Assume $\alpha = 0.05$.

78) Four pairs of data yield $r = 0.942$ and the regression equation $\hat{y} = 3x$. Also, $\bar{y} = 12.75$. What is the best predicted value of y for $x = 4.3$?

- A) 12.75 B) 2.826
C) 12.9 D) 0.942

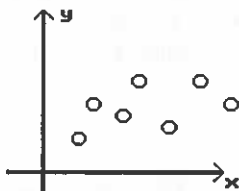
79) Eight pairs of data yield $r = 0.708$ and the regression equation $\hat{y} = 55.8 + 2.79x$. Also, $\bar{y} = 71.125$. What is the best predicted value of y for $x = 6.8$?

- A) 74.77 B) 382.23
C) 57.80 D) 71.13

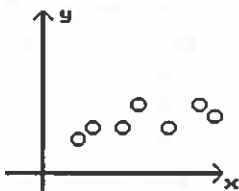
Determine which scatterplot shows the strongest linear correlation.

80) Which shows the strongest linear correlation?

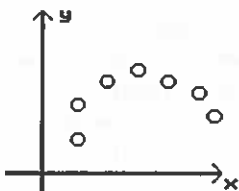
A)



B)



C)



PART II. FREE RESPONSE

Provide an appropriate response.

81) The scores on a recent statistics test are given in the frequency distribution below. Construct the corresponding relative frequency distribution.

Scores	Frequency
0-60	4
61-70	10
71-80	12
81-90	4
91-100	5

Solve the problem.

82) Using a strict interpretation of the relevant criteria characterizing a normal distribution, does the frequency distribution below appear to have a normal distribution?

Closing Share Price	Frequency
0-5	2
6-10	5
11-15	15
16-20	27

Provide an appropriate response.

83) **Without** calculating the standard deviation, compare the standard deviation for the following three data sets. (Note: All data sets have a mean of 30.) Which do you expect to have the largest standard deviation and which do you expect to have the smallest standard deviation? Explain why!

- Set A: 30 30 30 30 30 30 30 30 30 30
30
Set B: 20 25 25 30 30 30 30 35 35
40
Set C: 20 20 20 25 25 35 35 40 40
40

Use the empirical rule to solve the problem. Show work!

- 84) At one college, GPA's are normally distributed with a mean of 2.4 and a standard deviation of 0.6. What percentage of students at the college have a GPA more than 4.2?
- 85) At one college, GPA's are normally distributed with a mean of 2.4 and a standard deviation of 0.6. What percentage of students at the college have a GPA between 1.2 and 3?

Find the indicated probability.

- 86) Of the 84 people who answered "yes" to a question, 14 were male. Of the 73 people that answered "no" to the question, 12 were male. If one person is selected at random from the group, what is the probability that the person answered "yes" or was male?
- 87) A study of consumer smoking habits includes 183 people in the 18-22 age bracket (59 of whom smoke), 140 people in the 23-30 age bracket (34 of whom smoke), and 99 people in the 31-40 age bracket (22 of whom smoke). If one person is randomly selected from this sample, find the probability of getting someone who is age 18-22 or does not smoke.

Find the indicated probability. Express your answer as a simplified fraction unless otherwise noted.

- 88) The table below shows the soft drinks preferences of people in three age groups.
- | | cola | root beer | lemon |
|-------------------|------|-----------|-------|
| under 21 years | 40 | 25 | 20 |
| between 21 and 40 | 35 | 20 | 30 |
| over 40 years | 20 | 30 | 35 |

If one of the 255 subjects is randomly selected, find the probability that the person drinks root beer given that they are over 40.

Find the indicated probability.

- 89) In a class of 40 students, 22 are women, 10 are earning an A, and 7 are women that are earning an A. If a student is randomly selected from the class, find the probability that the student is a woman given that the student is earning an A.
- 90) The manager of a used car lot took inventory of the automobiles on his lot and constructed the following table based on the age of each car and its make (foreign or domestic):

Make	Age of Car (in years)		
	0 - 2	3 - 5	6 - 10
Foreign	43	26	10
Domestic	36	28	14
Total	79	54	24

A car was randomly selected from the lot. Given that the car selected was a foreign car, what is the probability that it was older than 2 years old?

Solve the problem.

- 91) Suppose a basketball player is an excellent free throw shooter and makes 92% of his free throws (i.e., he has a 92% chance of making a single free throw). Assume that free throw shots are independent of one another. Find the probability that the player will make three consecutive free throws.

Find the indicated probability.

- 92) The brand name of a certain chain of coffee shops has a 58% recognition rate in the town of Coffleton. An executive from the company wants to verify the recognition rate as the company is interested in opening a coffee shop in the town. He selects a random sample of 9 Coffleton residents. Find the probability that the number that recognize the brand name is not 4.

- 93) A multiple choice test has 7 questions each of which has 4 possible answers, only one of which is correct. If Judy, who forgot to study for the test, guesses on all questions, what is the probability that she will answer exactly 3 questions correctly?

Find the indicated probability. Round to three decimal places.

- 94) A company purchases shipments of machine components and uses this acceptance sampling plan: Randomly select and test 22 components and accept the whole batch if there are fewer than 3 defectives. If a particular shipment of thousands of components actually has a 7% rate of defects, what is the probability that this whole shipment will be accepted?
- 95) An airline estimates that 97% of people booked on their flights actually show up. If the airline books 70 people on a flight for which the maximum number is 68, what is the probability that the number of people who show up will exceed the capacity of the plane?

Provide an appropriate response.

- 96) Three randomly selected households are surveyed as a pilot project for a larger survey to be conducted later. The numbers of people in the households are 4, 6, and 10. Consider the values of 4, 6, and 10 to be a population. Assume that samples of size $n = 2$ are randomly selected with replacement from the population of 4, 6, and 10. The nine different samples are as follows: (4, 4), (4, 6), (4, 10), (6, 4), (6, 6), (6, 10), (10, 4), (10, 6), and (10, 10).

- (i) Find the median of each of the nine samples, then summarize the sampling distribution of the medians in the format of a table representing the probability distribution.
- (ii) Compare the population median to the mean of the sample medians.
- (iii) Do the sample medians target the value of the population median? In general, do medians make good estimators of population medians? Why or why not?

97) Three randomly selected households are surveyed as a pilot project for a larger survey to be conducted later. The numbers of people in the households are 3, 6, and 10. Consider the values of 3, 6, and 10 to be a population. Assume that samples of size $n = 2$ are randomly selected with replacement from the population of 3, 6, and 10. The nine different samples are as follows: (3, 3), (3, 6), (3, 10), (6, 3), (6, 6), (6, 10), (10, 3), (10, 6), and (10, 10).

(i) Find the mean of each of the nine samples, then summarize the sampling distribution of the means in the format of a table representing the probability distribution.

(ii) Compare the population mean to the mean of the sample means.

(iii) Do the sample means target the value of the population mean? In general, do means make good estimators of population means? Why or why not?

Solve the problem.

98) The scores on a certain test are normally distributed with a mean score of 43 and a standard deviation of 3. What is the probability that a sample of 90 students will have a mean score of at least 43.3162?

99) Assume that women's heights are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. If 90 women are randomly selected, find the probability that they have a mean height between 62.9 inches and 64.0 inches.

100) Human body temperatures are normally distributed with a mean of 98.20°F and a standard deviation of 0.62°F . If 19 people are randomly selected, find the probability that their mean body temperature will be less than 98.50°F .

Use the given degree of confidence and sample data to construct a confidence interval for the population proportion p .

101) A survey of 300 union members in New York State reveals that 112 favor the Republican candidate for governor. Construct the 98% confidence interval for the true population proportion of all New York State union members who favor the Republican candidate.

Use the confidence level and sample data to find a confidence interval for estimating the population μ . Round your answer to the same number of decimal places as the sample mean. Assume the population is normal.

102) A laboratory tested 83 chicken eggs and found that the mean amount of cholesterol was 233 milligrams with $\sigma = 12.9$ milligrams. Construct a 95% confidence interval for the true mean cholesterol content, μ , of all such eggs.

103) Twenty randomly selected students took the calculus final. If the sample mean was 83 and the standard deviation was 13.5, construct a 99% confidence interval for the mean score of all students.

Identify the null hypothesis, alternative hypothesis, test statistic, conclusion about the null hypothesis, and final conclusion that addresses the original claim.

104) An article in a journal reports that 34% of American fathers take no responsibility for child care. A researcher claims that the figure is higher for fathers in the town of Littleton. A random sample of 234 fathers from Littleton yielded 96 who did not help with child care. Test the researcher's claim at the 0.05 significance level.

105) A random sample of 100 pumpkins is obtained and the mean circumference is found to be 40.5 cm. Assuming that the population standard deviation is known to be 1.6 cm, use a 0.05 significance level to test the claim that the mean circumference of all pumpkins is equal to 39.9 cm.

Assume that a simple random sample has been selected from a normally distributed population and test the given claim. Identify the null and alternative hypotheses, test statistic, critical value(s), and state the final conclusion that addresses the original claim.

106) A manufacturer makes ball bearings that are supposed to have a mean weight of 30 g. A retailer suspects that the mean weight is actually less than 30 g. The mean weight for a random sample of 16 ball bearings is 28.4 g with a standard deviation of 4.5 g. At the 0.05 significance level, test the claim that the sample comes from a population with a mean weight less than 30 g.

Given the linear correlation coefficient r and the sample size n , determine the critical values of r and use your finding to state whether or not the given r represents a significant linear correlation. Use a significance level of 0.05.

107) $r = 0.543$, $n = 25$

108) $r = -0.802$, $n = 5$

Answer Key

Testname: 201610STA2023FINALEXAMREVIEW

- 1) A
- 2) B
- 3) A
- 4) A
- 5) B
- 6) B
- 7) A
- 8) A
- 9) A
- 10) A
- 11) C
- 12) A
- 13) B
- 14) B
- 15) D
- 16) C
- 17) D
- 18) B
- 19) A
- 20) D
- 21) B
- 22) D
- 23) B
- 24) B
- 25) C
- 26) D
- 27) D
- 28) B
- 29) A
- 30) D
- 31) C
- 32) C
- 33) A
- 34) C
- 35) C
- 36) D
- 37) D
- 38) B
- 39) D
- 40) A
- 41) C
- 42) D
- 43) B
- 44) C
- 45) B
- 46) B
- 47) E
- 48) A
- 49) A
- 50) B
- 51) A
- 52) B
- 53) C
- 54) D
- 55) D
- 56) B
- 57) A
- 58) A
- 59) D
- 60) C
- 61) D
- 62) D
- 63) A
- 64) C
- 65) B
- 66) B
- 67) B
- 68) D
- 69) B
- 70) A
- 71) C
- 72) A
- 73) D
- 74) B
- 75) C
- 76) C
- 77) A
- 78) A
- 79) A
- 80) B
- 81)
- 82) No; no; The frequencies do not increase, reach a maximum, and then decrease.
- 83) Set C would have the largest standard deviation, since its values as a group are farther from 30 than in Sets A and B. Set A has the smallest standard deviation, namely 0, since all values are the same, and thereby equal the mean.
- 84) 0.15%

Scores	Relative Frequency
0-60	11.43%
61-70	28.57%
71-80	34.29%
81-90	11.43%
91-100	14.29%

Answer Key

Testname: 201610STA2023FINALEXAMREVIEW

85) 81.5%

86) 0.611

87) 0.867

88) $\frac{6}{17}$

89) $\frac{7}{10}$

90) $\frac{36}{79}$

91) 0.7787

92) 0.814

93) 0.173

94) 0.803

95) 0.375

96) (i)

Sample Median	Probability
4	1/9
5	2/9
6	1/9
7	2/9
8	2/9
10	1/9

(ii) The population median is 6, but the mean of the sample medians is 6.7. The values are not equal.

(iii) The sample medians do not target the population median of 6, so sample medians do not make good estimators of population medians.

97) (i)

x	Probability
3	1/9
6	1/9
10	1/9
4.5	2/9
6.5	2/9
8	2/9

(ii) The mean of the population is 6.33 and the mean of the sample means is also 6.33.

(iii) The sample means target the population mean. Sample means make good estimators of population means because they target the value of the population mean instead of systematically underestimating or overestimating it.

98) 0.1587

99) 0.9318

100) 0.9826

101) $0.308 < p < 0.438$

102) $230 \text{ mg} < \mu < 236 \text{ mg}$

103) $76.21 < \mu < 89.79$

104) $H_0: p = 0.34$. $H_1: p > 0.34$. Test statistic: $z = 2.27$.

Critical value: $z = 1.645$. Reject null hypothesis.

There is sufficient evidence to support the researcher's claim that the proportion for fathers in Littleton is higher than 34%.

105) $H_0: \mu = 39.9$; $H_1: \mu \neq 39.9$. Test statistic: $z = 3.75$.

Reject H_0 . There is sufficient evidence to warrant rejection of the claim that the mean equals 39.9 cm.

106) $H_0: \mu = 30 \text{ g}$. $H_1: \mu < 30 \text{ g}$. Test statistic: $t = -1.422$.

Critical value: $t = -1.753$. Fail to reject H_0 . There is not sufficient evidence to support the claim that the mean is less than 30 g.

107) Critical values: $r = \pm 0.396$, significant linear correlation

108) Critical values: $r = \pm 0.878$, no significant linear correlation

COUNTING PRINCIPLE

1.)

When making random guesses for an unknown four-digit passcode, each digit can be 0, 1, . . . , 9. What is the total number of different possible passcodes? Given that all of the guesses have the same chance of being correct, what is the probability of guessing the correct passcode on the first attempt?

2.)

Jan has 10 different photos from which she will choose 6 to hang on a wall. How many different ways can she do so?

3.)

At the Oriental Cafe Chinese restaurant, dinner consists of selecting 3 items from column A, selecting 4 items from column B, and selecting 3 items from column C from the menu. If columns A, B, and C have 5, 7, and 6 items, respectively, how many different dinner combinations are possible?

SOLUTIONS:

1.)

There are 10 different possibilities for each digit, so the total number of different possible passcodes is $n_1 \cdot n_2 \cdot n_3 \cdot n_4 = 10 \cdot 10 \cdot 10 \cdot 10 = 10,000$.

Because all of the passcodes are equally likely, the probability of getting the correct passcode on the first attempt is $1/10,000$ or 0.0001 .

2.)

This problem is a **COMBINATION** problem because the order in which the six photos are selected is unimportant. There are a total of ten different photos, so $n = 10$. Six photos are to be selected thus $r = 6$.

$${}_{10}C_6 = \frac{10!}{(10-6)!6!} = \frac{10!}{4!6!} = \frac{10 \cdot \cancel{9} \cdot 8 \cdot 7 \cdot \cancel{6} \cdot \cancel{5} \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1}}{4 \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1} \cdot \cancel{6} \cdot \cancel{5} \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1}} = 210$$

Thus, there are 210 different ways Jan can choose 6 photos from a group of 10 photos.

3.)

For column A, 3 of 5 items must be selected, which can be represented as ${}_5C_3$. For column B, 4 of 7 items must be selected, which can be represented as ${}_7C_4$. For column C, 3 of 6 items must be selected, or ${}_6C_3$.

$${}_5C_3 = 10 \quad {}_7C_4 = 35 \quad \text{and} \quad {}_6C_3 = 20$$

Using the counting principle, we can determine the total number of dinner combinations by multiplying the number of choices from columns A, B, and C:

$$\begin{aligned} \text{Total number of dinner choices} &= {}_5C_3 \cdot {}_7C_4 \cdot {}_6C_3 \\ &= 10 \cdot 35 \cdot 20 = 7000 \end{aligned}$$

Therefore, 7000 different combinations are possible under these conditions.

One More Question

Qu:

If you know the names of the ten remaining students in the Spelling Bee, what is the probability of randomly selecting an order and getting the order that is used in the Spelling Bee?

Answer:

10! is the number of possible arrangements of students for the Spelling Bee

Thus,

1/10! or **1 / 3,628,800** (fraction) or **.000000276** (decimal number)

is the probability of choosing the correct order to be used in the Spelling Bee.

