

Construct a frequency distribution for the given qualitative data.

5) The blood types for 40 people who agreed to participate in a medical study were as follows.

5) _____

O A A O O AB O B A O
 A O A B O O O AB A A
 A B O A A O O B O O
 O A O O A B O O A AB

Construct a frequency distribution for the data.

A)

Blood type	Frequency
O	18
A	14
B	5
AB	3

B)

Blood type	Frequency
O	20
A	13
B	4
AB	3

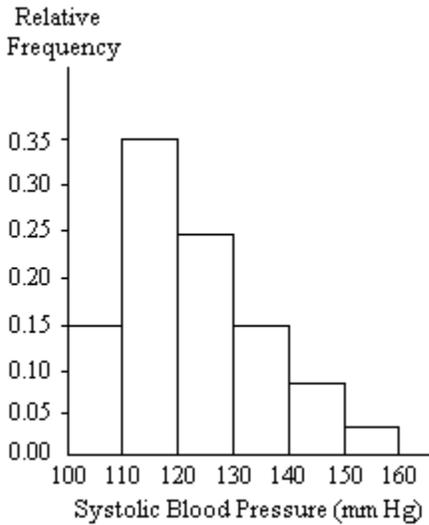
C)

Blood type	Frequency
O	19
A	11
B	5
AB	2

D)

Blood type	Frequency
O	19
A	13
B	5
AB	3

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 between 25 and 40. Use the histogram to answer the question. The blood pressure readings were given to the nearest whole number.



6) Given that 300 people were aged between 25 and 40, approximately how many had a systolic blood pressure reading between 140 and 149 inclusive?

6) _____

- A) 2 B) 24 C) 240 D) 8

Find the median for the given sample data.

9) 5, 8, 24, 27, 31, 39

A) 27

B) 22.5

C) 25.5

D) 24

9) _____

Find the mean for the given sample data. Unless otherwise specified, round your answer to one more decimal place than that used for the observations.

10) 14, 11, 16, 14, 14

A) 17.3

B) 13.8

C) 13

D) 14

10) _____

Obtain the five-number summary for the given data.

11) 2, 4, 5, 7, 9, 12, 13, 15

A) 2, 4, 9, 12, 15

B) 2, 5, 7, 12, 15

C) 2, 4, 8.5, 13, 15

D) 2, 4.5, 8, 12.5, 15

11) _____

List the outcomes comprising the specified event.

12) Three board members for a nonprofit organization will be selected from a group of five people. The board members will be selected by drawing names from a hat. The names of the five possible board members are Allison, Bob, Charlie, Dave, and Emily. The possible outcomes can be represented as follows.

12) _____

ABC ABD ABE ACD ACE
ADE BCD BCE BDE CDE

Here, for example, ABC represents the outcome that Allison, Bob, and Charlie are selected to be on the board. The event A is defined as follows.

A = event that Bob and Dave are both selected

List the outcomes that comprise the event (not A).

A) ACE

B) ABC, ABE, ACE, ADE, BCE, CDE

C) ABC, ABE, ACD, ACE, ADE, BCE, CDE

D) ABD, BCD, BDE

Find the indicated probability by using the general addition rule.

13) In one city, 50.8% of adults are female, 9.1% of adults are left-handed, and 5.1% are left-handed females. For an adult selected at random from the city, let

13) _____

F = event the person is female

L = event the person is left-handed.

Find $P(F \text{ or } L)$. Round approximations to three decimal places.

A) 0.497

B) 0.599

C) 0.548

D) 0.690

Find the indicated probability.

- 14) Sammy and Sally each carry a bag containing a banana, a chocolate bar, and a licorice stick. Simultaneously, they take out a single food item and consume it. The possible pairs of food items that Sally and Sammy consumed are as follows. 14) _____

chocolate bar – chocolate bar
licorice stick – chocolate bar
banana – banana
chocolate bar – licorice stick
licorice stick – licorice stick
chocolate bar – banana
banana – licorice stick
licorice stick – banana
banana – chocolate bar

Find the probability that at least one chocolate bar was eaten.

- A) $\frac{1}{3}$ B) $\frac{7}{9}$ C) $\frac{4}{5}$ D) $\frac{5}{9}$

Find the indicated probability by using the complementation rule.

- 15) Based on meteorological records, the probability that it will snow in a certain town on January 1st is 0.371. Find the probability that in a given year it will not snow on January 1st in that town. 15) _____
A) 2.695 B) 0.590 C) 1.371 D) 0.629

Determine the possible values of the random variable.

- 16) Suppose that two balanced dice are rolled. Let Y denote the product of the two numbers. What are the possible values of the random variable Y? 16) _____
A) 2, 3, 4, 5, 6, 8, 10, 12, 15, 18, 20, 24, 30
B) 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 16, 18, 20, 24, 25, 30, 36
C) 0, 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 16, 18, 20, 24, 25, 30, 36
D) (1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)

Find the specified probability.

- 17) Use the special addition rule and the following probability distribution to determine $P(6 < X \leq 8)$. 17) _____
- | | | | | | | | |
|----------|------|------|------|------|------|------|------|
| x | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| P(X = x) | 0.05 | 0.05 | 0.20 | 0.15 | 0.15 | 0.10 | 0.30 |
- A) 0.45 B) 0.35 C) 1.00 D) 0.40

Find the mean of the random variable.

- 18) The random variable X is the number that shows up when a loaded die is rolled. Its probability distribution is given in the table. Round the answer to two decimal places. 18) _____
- | | | | | | | |
|----------|------|------|------|------|------|------|
| x | 1 | 2 | 3 | 4 | 5 | 6 |
| P(X = x) | 0.13 | 0.12 | 0.11 | 0.16 | 0.10 | 0.38 |
- A) 0.17 B) 3.50 C) 4.12 D) 3.99

Find the indicated probability. Round to four decimal places.

- 19) The participants in a television quiz show are picked from a large pool of applicants with approximately equal numbers of men and women. Among the last 10 participants there have been only 2 women. If participants are picked randomly, what is the probability of getting 2 or fewer women when 10 people are picked? 19) _____
- A) 0.0547 B) 0.0439 C) 0.0107 D) 0.0537

Fill in the blanks by standardizing the normally distributed variable.

- 20) Dave drives to work each morning at about the same time. His commute time is normally distributed with a mean of 46 minutes and a standard deviation of 5 minutes. The percentage of time that his commute time exceeds 58 minutes is equal to the area under the standard normal curve that lies to the ___ of _____. 20) _____
- A) right, 2.4 B) right, 12 C) left, 1.2 D) left, 2.4

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

- 21) The area that lies to the left of 1.13 21) _____
- A) 0.8708 B) 0.8485 C) 0.1292 D) 0.8907

Find the indicated probability or percentage for the normally distributed variable.

- 22) A bank's loan officer rates applicants for credit. The ratings are normally distributed with a mean of 200 and a standard deviation of 50. If an applicant is randomly selected, find the probability of a rating that is between 200 and 275. 22) _____
- A) 0.9332 B) 0.4332 C) 0.5 D) 0.0668

- 23) The lengths of human pregnancies are normally distributed with a mean of 268 days and a standard deviation of 15 days. What is the probability that a pregnancy lasts at least 300 days? 23) _____
- A) 0.4834 B) 0.0179 C) 0.9834 D) 0.0166

Find the specified percentile, quartile, or decile.

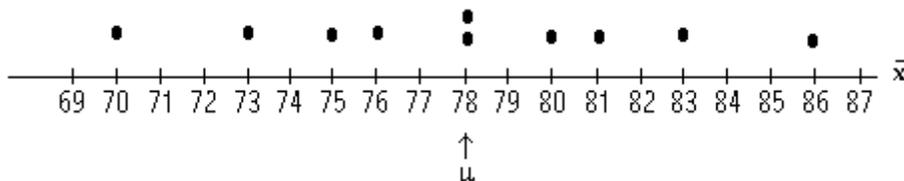
- 24) The weights of certain machine components are normally distributed with a mean of 8.57 g and a standard deviation of 0.08 g. Find the 97th percentile. 24) _____
- A) 8.79 g B) 8.61 g C) 8.72 g D) 8.58 g

Provide an appropriate response.

- 25) What is the sampling distribution of a statistic? 25) _____
- A) The distribution of all possible observations of the statistic for samples of a given size from a population
- B) The distribution of all possible sizes of samples from a population that can be used to make observations of the statistic
- C) The distribution of observations of a variable in a sample for a given value of the statistic
- D) The distribution of observations of the statistic for all possible sizes of samples from a population

Find the requested probability.

- 26) The test scores of 5 students are under consideration. The following is the dotplot for the sampling distribution of the sample mean for samples of size 2. _____



Find the probability, expressed as a percent, that the sample mean will be within 2 points of the population mean.

- A) 20% B) 40% C) 30% D) 50%

For samples of the specified size from the population described, find the mean and standard deviation of the sample mean \bar{x} .

- 27) One barge from Inland Waterways, Inc. can carry a load of 6284.8 lb. Records of past trips show that the weights of the cans that it carries have a mean of 94 lb and a standard deviation of 16 lb. For samples of size 64, find the mean and standard deviation of \bar{x} . _____

- A) $\mu_{\bar{x}} = 16$; $\sigma_{\bar{x}} = 94$ B) $\mu_{\bar{x}} = 94$; $\sigma_{\bar{x}} = 2$
 C) $\mu_{\bar{x}} = 94$; $\sigma_{\bar{x}} = 16$ D) $\mu_{\bar{x}} = 2$; $\sigma_{\bar{x}} = 94$

Identify the distribution of the sample mean. In particular, state whether the distribution of \bar{x} is normal or approximately normal and give its mean and standard deviation.

- 28) The mean annual income for adult women in one city is \$28,520 and the standard deviation of the incomes is \$5100. The distribution of incomes is skewed to the right. Determine the sampling distribution of the mean for samples of size 74. _____

- A) Approximately normal, mean = \$28,520, standard deviation = \$5100
 B) Normal, mean = \$28,520, standard deviation = \$69
 C) Approximately normal, mean = \$28,520, standard deviation = \$593
 D) Normal, mean = \$28,520, standard deviation = \$593

Solve the problem.

- 29) Based on a sample of size 49, a 95% confidence interval for the mean score of all students, μ , on an aptitude test is from 59.3 to 66.7. Find the margin of error. _____

- A) 1.04
 B) 3.7
 C) There is not enough information to find the margin of error.
 D) 7.4

Find the necessary sample size.

- 30) The weekly earnings of students in one age group are normally distributed with a standard deviation of 75 dollars. A researcher wishes to estimate the mean weekly earnings of students in this age group. Find the sample size needed to assure with 95 percent confidence that the sample mean will not differ from the population mean by more than 3 dollars. _____

- A) 12 B) 2401 C) 97 D) 33

Find the confidence interval specified. Assume that the population is normally distributed.

- 31) A sociologist develops a test to measure attitudes about public transportation, and 27 randomly selected subjects are given the test. Their mean score is 76.2 and their standard deviation is 21.4. Construct the 95% confidence interval for the mean score of all such subjects. 31) _____
- A) 64.2 to 88.2 B) 74.6 to 77.8 C) 67.7 to 84.7 D) 69.2 to 83.2

Find the confidence interval specified.

- 32) A random sample of 88 light bulbs had a mean life of $\bar{x} = 517$ hours. Assume that $\sigma = 39$ hours. Construct a 90% confidence interval for the mean life, μ , of all light bulbs of this type. 32) _____
- A) 510.1 to 523.9 hours B) 507.3 to 526.7 hours
C) 508.9 to 525.1 hours D) 506.3 to 527.7 hours

A hypothesis test is to be performed. Determine the null and alternative hypotheses.

- 33) At one school, the average amount of time that tenth-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 hypothesis test to determine whether the average amount of time spent watching television per week has decreased. 33) _____
- A) $H_0 : \mu = 21.6$ hours B) $H_0 : \mu < 21.6$ hours
 $H_a : \mu < 21.6$ hours C) $H_a : \mu > 21.6$ hours
C) $H_0 : \mu < 21.6$ hours D) $H_0 : \mu = 21.6$ hours
 $H_a : \mu = 21.6$ hours E) $H_a : \mu \leq 21.6$ hours

The value obtained for the test statistic, z , in a one-mean z -test is given. Also given is whether the test is two tailed, left tailed, or right tailed. Determine the P-value.

- 34) A left-tailed test: 34) _____
 $z = -0.58$
- A) 0.7190 B) 0.4380 C) 0.5620 D) 0.2810

Classify the conclusion of the hypothesis test as a Type I error, a Type II error, or a correct decision.

- 35) A health insurer has determined that the "reasonable and customary" fee for a certain medical procedure is \$1200. They suspect that the average fee charged by one particular clinic for this procedure is higher than \$1200. The insurer wants to perform a hypothesis test to determine whether their suspicion is correct. The hypotheses are: 35) _____
- $H_0 : \mu = \$1200$
 $H_a : \mu > \$1200$
- where μ is the mean amount charged by the clinic for this procedure.
Suppose that the results of the sampling lead to rejection of the null hypothesis. Classify that conclusion as a Type I error, a Type II error, or a correct decision, if in fact the average fee charged by the clinic is \$1200 .
- A) Type II error B) Type I error C) Correct decision

A sample mean, sample standard deviation, and sample size are given. Use the one-mean t-test to perform the required hypothesis test about the mean, μ , of the population from which the sample was drawn. Use the critical-value approach.

- 36) $\bar{x} = 20.9$, $s = 7$, $n = 11$, $H_0 : \mu = 18.7$, $H_a : \mu \neq 18.7$, $\alpha = 0.05$ 36) _____
- A) Test statistic: $t = 1.04$. Critical values: $t = \pm 2.201$. Do not reject H_0 . There is not sufficient evidence to conclude that the mean is different from 18.7.
- B) Test statistic: $t = 1.04$. Critical values: $t = \pm 2.201$. Reject H_0 . There is sufficient evidence to conclude that the mean is different from 18.7.
- C) Test statistic: $t = 1.04$. Critical values: $t = \pm 2.228$. Do not reject H_0 . There is not sufficient evidence to conclude that the mean is different from 18.7.
- D) Test statistic: $t = 1.04$. Critical values: $t = \pm 1.96$. Reject H_0 . There is sufficient evidence to conclude that the mean is different from 18.7.

Determine the null and alternative hypotheses for the proposed hypothesis test.

- 37) A researcher wants to perform a hypothesis test to determine whether the mean credit card debt for credit card holders aged 18–35 is greater than the mean credit card debt for credit card holders aged over 35. 37) _____
- A) Let \bar{x}_1 denote the mean credit card debt for credit card holders aged 18–35 and let \bar{x}_2 denote the mean credit card debt for credit card holders over 35. The null and alternative hypotheses are $H_0: \bar{x}_1 = \bar{x}_2$ and $H_a: \bar{x}_1 > \bar{x}_2$.
- B) Let μ_1 denote the mean credit card debt for credit card holders aged 18–35 and let μ_2 denote the mean credit card debt for credit card holders over 35. The null and alternative hypotheses are $H_0: \mu_1 > \mu_2$ and $H_a: \mu_1 < \mu_2$.
- C) Let μ_1 denote the mean credit card debt for credit card holders aged 18–35 and let μ_2 denote the mean credit card debt for credit card holders over 35. The null and alternative hypotheses are $H_0: \mu_1 = \mu_2$ and $H_a: \mu_1 > \mu_2$.
- D) Let μ_1 denote the mean credit card debt for credit card holders aged 18–35 and let μ_2 denote the mean credit card debt for credit card holders over 35. The null and alternative hypotheses are $H_0: \mu_1 = \mu_2$ and $H_a: \mu_1 < \mu_2$.

Summary statistics are given for independent simple random samples from two populations. Preliminary data analyses indicate that the variable under consideration is normally distributed on each population. Decide whether use of the pooled t-test and pooled t-interval procedure is reasonable. Explain your answer.

- 38) $\bar{x}_1 = 566.9$, $s_1 = 51.2$, $n_1 = 37$, $\bar{x}_2 = 480.2$, $s_2 = 53.5$, $n_2 = 42$ 38) _____
- A) Reasonable; the sample standard deviations are close to being equal suggesting that the assumption of equal population standard deviations is reasonable. Also both sample sizes are large.
- B) Not reasonable; the sample means suggest that the two population means differ.
- C) Reasonable; the sample means are close to being equal suggesting that the assumption of equal population means is reasonable. Also both sample sizes are large.
- D) Not reasonable; the sample standard deviations suggest that the two population standard deviations differ.

The number of successes and the sample size are given for a simple random sample from a population. Determine the sample proportion, \hat{p} .

39) $x = 33, n = 125$

A) $\hat{p} = 0.364$

B) $\hat{p} = 0.284$

C) $\hat{p} = 0.214$

D) $\hat{p} = 0.264$

39) _____

Find the indicated margin of error.

40) In a survey of 6700 T.V. viewers, 3350 said they watch network news programs. Find the margin of error for the 99% confidence interval used to estimate the population proportion.

40) _____

A) 0.00900

B) 0.0138

C) 0.0120

D) 0.0158

SHORT ANSWER. Answer each question as best as you can. Work must be shown in order to receive full credit.

Find the sample standard deviation for the given data. Round your final answer to one more decimal place than that used for the observations.

41) Christine is currently taking college astronomy. The instructor often gives quizzes. On the past five quizzes, Christine got the following scores. (8 points)

41) _____

48 42 21 20 55

Find the indicated probability or percentage for the sampling error.

42) The monthly spending on food by single adults in a city are normally distributed with a mean of \$410 and a standard deviation of \$70. What is the probability that the sampling error made in estimating the mean monthly spending of all single adults in that city by the mean of a random sample of 90 such adults will be at most \$10? (8 points)

42) _____

Obtain the probability distribution of the random variable.

43) When two balanced dice are rolled, 36 equally likely outcomes are possible as shown below.

43) _____

- (1, 1) (1, 2) (1, 3) (1, 4) (1, 5) (1, 6)
- (2, 1) (2, 2) (2, 3) (2, 4) (2, 5) (2, 6)
- (3, 1) (3, 2) (3, 3) (3, 4) (3, 5) (3, 6)
- (4, 1) (4, 2) (4, 3) (4, 4) (4, 5) (4, 6)
- (5, 1) (5, 2) (5, 3) (5, 4) (5, 5) (5, 6)
- (6, 1) (6, 2) (6, 3) (6, 4) (6, 5) (6, 6)

Let X denote the smaller of the two numbers. If both dice come up the same number, then X equals that common value. Find the probability distribution of X . Leave your probabilities in fraction form. **(6 points)**

Apply the pooled t -interval procedure to obtain the required confidence interval. You may assume that the assumptions for using the procedure are satisfied.

44) A paint manufacturer wanted to compare the drying times of two different types of paint. Independent simple random samples of 11 cans of type A and 9 cans of type B were selected and applied to similar surfaces. The drying times, in hours, were recorded. The summary statistics are as follows.

44) _____

Type A	Type B
$\bar{x}_1 = 71.6$	$\bar{x}_2 = 68.3$
$s_1 = 3.3$	$s_2 = 3.2$
$n_1 = 11$	$n_2 = 9$

Determine a 99% confidence interval for the difference between the mean drying time of type A and the mean drying time of type B. **(8 points)**

Perform a one-sample z-test for a population mean using either the critical value approach or the P-value approach. Be sure to state the hypotheses and the significance level, to compute the value of the test statistic, how you reach your conclusions, and what your conclusion is in terms of the scenario described.

- 45) In 2000, the average duration of long-distance telephone calls originating in one town was 9.4 minutes. A long-distance telephone company wants to perform a hypothesis test to determine whether the average duration of long-distance phone calls has changed from the 2000 mean of 9.4 minutes. They randomly sampled 50 calls originating in the town and found that the mean duration of these 50 calls was 8.6 minutes. Do the data provide sufficient evidence to conclude that the mean call duration, μ , has changed from the 2000 mean of 9.4 minutes? Perform the appropriate hypothesis test using a significance level of 1%. Assume that $\sigma = 4.8$ minutes. **(10 points)** 45) _____