

FINAL EXAM REVIEW

Determine which of the four levels of measurement (nominal, ordinal, interval, ratio) is most appropriate.

- 1) The temperatures of eight different plastic spheres.
- 2) The sample of spheres categorized from softest to hardest.
- 3) Salaries of college professors.
- 4) Nationalities of survey respondents.

Identify the sample and population. Also, determine whether the sample is likely to be representative of the population.

- 5) 100,000 randomly selected adults were asked whether they drink at least 48 oz of water each day and only 45% said yes.

Identify which of these types of sampling is used: random, stratified, systematic, cluster, convenience.

- 6) A market researcher selects 500 people from each of 10 cities.
- 7) A tax auditor selects every 1000th income tax return that is received.
- 8) To avoid working late, a quality control analyst simply inspects the first 100 items produced in a day.
- 9) An education researcher randomly selects 48 middle schools and interviews all the teachers at each school.

Identify the type of observational study (cross-sectional, retrospective, prospective).

- 10) A statistical analyst obtains data about ankle injuries by examining a hospital's records from the past 3 years.
- 11) A researcher plans to obtain data by following those in cancer remission since January of 2005.
- 12) A town obtains current employment data by polling 10,000 of its citizens this month.

Provide an appropriate response.

- 13) The following frequency distribution analyzes the scores on a math test. Find the class boundaries of scores interval 40–59.

Scores	Number of students
40–59	2
60–75	4
76–82	6
83–94	15
95–99	5

Construct the cumulative frequency distribution that corresponds to the given frequency distribution.

14)

Speed	Number of cars
0-29	4
30-59	16
60-89	60
90-119	20

Provide an appropriate response.

- 15) The frequency distribution for the weekly incomes of students with part-time jobs is given below. Construct the corresponding relative frequency distribution. Round relative frequencies to the nearest hundredth of a percent if necessary.

Income (\$)	Frequency
200-300	55
301-400	70
401-500	73
501-600	68
More than 600	10

Use the given data to construct a frequency distribution.

- 16) A medical research team studied the ages of patients who had strokes caused by stress. The ages of 34 patients who suffered stress strokes were as follows.

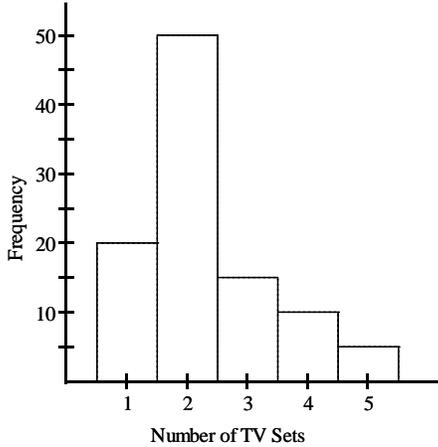
29 30 36 41 45 50 57 61 28 50 36 58
 60 38 36 47 40 32 58 46 61 40 55 32
 61 56 45 46 62 36 38 40 50 27

Construct a frequency distribution for these ages. Use 8 classes beginning with a lower class limit of 25.

Age	Frequency

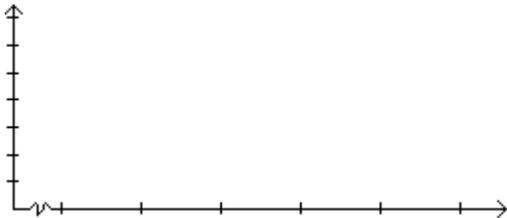
Provide an appropriate response.

- 17) The histogram below represents the number of television sets per household for a sample of U.S. households. What is the minimum number of households having the same number of television sets?



- 18) In a survey, 20 people were asked how many magazines they had purchased during the previous year. The results are shown below. Construct a histogram to represent the data. Use 4 classes with a class width of 10, and begin with a lower class limit of -0.5. What is the approximate amount at the center?

6 15 3 36 25 18 12 18 5 30
24 7 0 22 33 24 19 4 12 9



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.

- 19) Andrew asked seven of his friends how many cousins they had. The results are listed below. Find the mean number of cousins.

15 12 5 14 4 4 6

Find the median for the given sample data.

- 20) The ages (in years) of the eight passengers on a bus are listed below.

9 1 29 11 22 46 40 35

Find the median age.

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

- 21) -20 -45 -46 -45 -49 -45 -49

Find the mean of the data summarized in the given frequency distribution.

22) A company had 80 employees whose salaries are summarized in the frequency distribution below. Find the mean salary.

Salary (\$)	Employees
5,001–10,000	17
10,001–15,000	12
15,001–20,000	12
20,001–25,000	15
25,001–30,000	24

Solve the problem.

23) Elaine gets quiz grades of 90, 83, and 64. She gets a 69 on her final exam. Find the weighted mean if the quizzes each count for 20% and the final exam counts for 40% of the final grade. Round to one decimal place.

Find the range for the given sample data.

24) Rich Borne teaches Chemistry 101. Last week he gave his students a quiz. Their scores are listed below.
24 31 47 29 31 16 48 41 50 54 37 22

Find the variance for the given data. Round your answer to one more decimal place than the original data.

25) 18 16 12 2 11

Find the standard deviation for the given sample data. Round your answer to one more decimal place than is present in the original data.

26) 18 18 18 9 15 5 10 5 15

Use the range rule of thumb to estimate the standard deviation. Round results to the nearest tenth.

27) The heights in feet of people who work in an office are as follows.
5.8 5.9 6.1 5.4 6.0 5.8 5.9 6.2 5.7 5.8

Find the z-score corresponding to the given value and use the z-score to determine whether the value is unusual. Consider a score to be unusual if its z-score is less than -2.00 or greater than 2.00. Round the z-score to the nearest tenth if necessary.

28) A body temperature of 96.7° F given that human body temperatures have a mean of 98.20° F and a standard deviation of 0.62°.

Find the percentile for the data value.

29) **NOTE: Be sure to use the correct formula:**

Percentile for the data value =

$[(\text{number of lesser values}) + 0.5 * (\text{number of equal values})] / (\text{total number of values})$

Data set: 52 31 52 52 47 69 73 71 30;

data value: 52

Find the indicated measure.

30) The weights (in pounds) of 30 newborn babies are listed below. Find P_{16} .

5.5 5.7 5.8 5.9 6.1 6.1 6.4 6.4 6.5 6.6
6.7 6.7 6.7 6.9 7.0 7.0 7.0 7.1 7.2 7.2
7.4 7.5 7.7 7.7 7.8 8.0 8.1 8.1 8.3 8.7

Construct a boxplot for the given data. Include values of the 5-number summary in all boxplots.

31) The weights (in pounds) of 30 newborn babies are listed below. Construct a boxplot for the data set.

5.5 5.7 5.8 5.9 6.1 6.1 6.3 6.4 6.5 6.6
6.7 6.7 6.7 6.9 7.0 7.0 7.0 7.1 7.2 7.2
7.4 7.5 7.7 7.7 7.8 8.0 8.1 8.1 8.3 8.7

Answer the question.

32) On a multiple choice test with four possible answers for each question, what is the probability of answering a question correctly if you make a random guess?

Find the indicated probability.

33) A sample space consists of 38 separate events that are equally likely. What is the probability of each?

Estimate the probability of the event.

34) Of 1232 people who came into a blood bank to give blood, 397 people had high blood pressure. Estimate the probability that the next person who comes in to give blood will have high blood pressure.

Find the indicated complement.

35) Based on meteorological records, the probability that it will snow in a certain town on January 1st is 0.428. Find the probability that in a given year it will not snow on January 1st in that town.

Find the indicated probability.

36) The table below describes the smoking habits of a group of asthma sufferers.

	Nonsmoker	Occasional smoker	Regular smoker	Heavy smoker	Total
Men	431	50	71	49	601
Women	382	48	86	39	555
Total	813	98	157	88	1156

If one of the 1156 people is randomly selected, find the probability that the person is a man or a heavy smoker.

37) In one town, 44% of all voters are Democrats. If two voters are randomly selected for a survey, find the probability that they are both Democrats. Round to the nearest thousandth if necessary.

38) What is the probability that 4 randomly selected people all have different birthdays? Round to four decimal places.

Provide a written description of the complement of the given event.

39) When 100 engines are shipped, all of them are free of defects.

Find the indicated probability. Round to the nearest thousandth.

40) A sample of 4 different calculators is randomly selected from a group containing 18 that are defective and 40 that have no defects. What is the probability that at least one of the calculators is defective?

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

41) The following table contains data from a study of two airlines which fly to Small Town, USA.

	Number of flights which were on time	Number of flights which were late
Podunk Airlines	33	6
Upstate Airlines	43	5

If one of the 87 flights is randomly selected, find the probability that the flight selected arrived on time given that it was an Upstate Airlines flight.

Solve the problem.

42) There are 8 members on a board of directors. If they must form a subcommittee of 6 members, how many different subcommittees are possible?

43) How many ways can 6 people be chosen and arranged in a straight line if there are 8 people to choose from?

Find the mean of the given probability distribution.

44) The number of golf balls ordered by customers of a pro shop has the following probability distribution.

x	P(x)
3	0.14
6	0.29
9	0.36
12	0.11
15	0.10

Provide an appropriate response. Round to the nearest hundredth.

45) The random variable x is the number of houses sold by a realtor in a single month at the Sendsom's Real Estate Office. Its probability distribution is as follows. Find the standard deviation for the probability distribution.

Houses Sold (x)	Probability P(x)
0	0.24
1	0.01
2	0.12
3	0.16
4	0.01
5	0.14
6	0.11
7	0.21

Provide an appropriate response.

46) In a game, you have a $\frac{1}{36}$ probability of winning \$85 and a $\frac{35}{36}$ probability of losing \$4. What is your expected value?

47) Suppose you pay \$2.00 to roll a fair die with the understanding that you will get back \$4.00 for rolling a 2 or a 3, nothing otherwise. What is your expected value?

Assume that a procedure yields a binomial distribution with a trial repeated n times. Use the binomial probability formula to find the probability of x successes given the probability p of success on a single trial. Round to three decimal places.

48) $n = 6, x = 3, p = \frac{1}{6}$

Find the indicated probability. Round to three decimal places.

49) A machine has 11 identical components which function independently. The probability that a component will fail is 0.2. The machine will stop working if more than three components fail. Find the probability that the machine will be working.

Find the indicated probability.

50) A tennis player makes a successful first serve 51% of the time. If she serves 9 times, what is the probability that she gets exactly 3 first serves in? Assume that each serve is independent of the others.

Solve the problem.

51) According to a college survey, 22% of all students work full time. Find the mean for the number of students who work full time in samples of size 16.

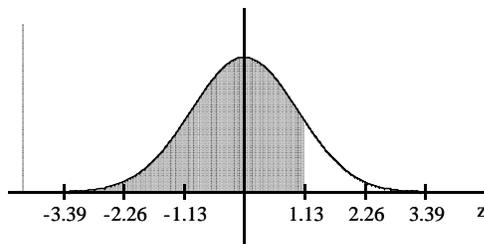
52) According to a college survey, 22% of all students work full time. Find the standard deviation for the number of students who work full time in samples of size 16.

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 $\mu + 2\sigma$.

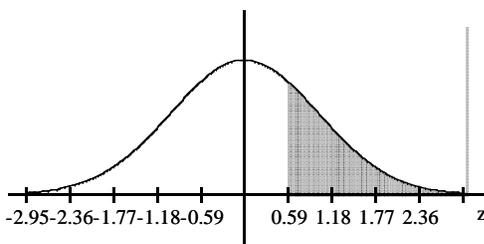
53) A survey for brand recognition is done and it is determined that 68% of consumers have heard of Dull Computer Company. A survey of 800 randomly selected consumers is to be conducted. For such groups of 800, would it be unusual to get 634 consumers who recognize the Dull Computer Company name?

Find the area of the shaded region. The graph depicts the standard normal distribution with mean 0 and standard deviation 1.

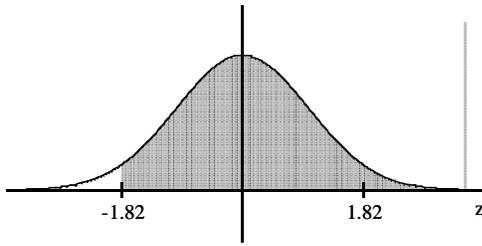
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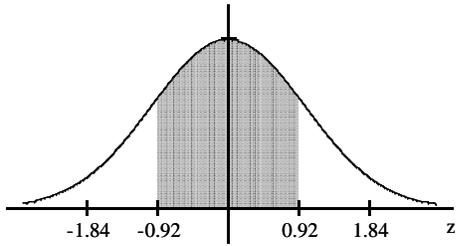
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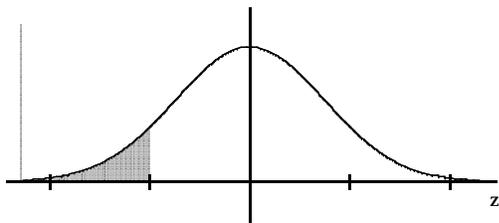


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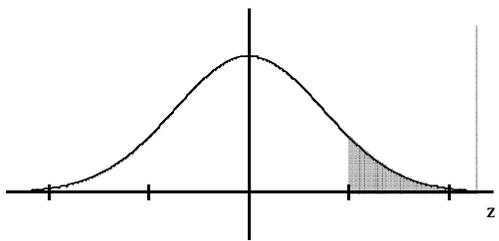


Find the indicated z score. The graph depicts the standard normal distribution with mean 0 and standard deviation 1.

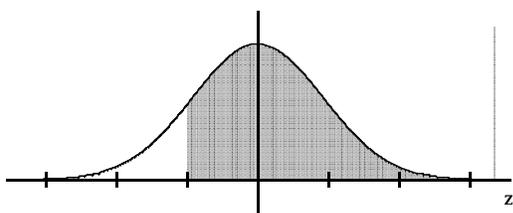
58) Shaded area is 0.0901.



59) Shaded area is 0.0901.



60) Shaded area is 0.8599.



Solve the problem. Round to the nearest tenth unless indicated otherwise.

61) In one region, the September energy consumption levels for single-family homes are found to be normally distributed with a mean of 1050 kWh and a standard deviation of 218 kWh. Find P_{45} , which is the consumption level separating the bottom 45% from the top 55%.

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

- 62) 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.

Find the indicated probability.

- 63) The diameters of bolts produced by a certain machine are normally distributed with a mean of 0.30 inches and a standard deviation of 0.01 inches. What percentage of bolts will have a diameter greater than 0.32 inches?

Solve the problem.

- 64) The amount of snowfall falling in a certain mountain range is normally distributed with a mean of 70 inches, and a standard deviation of 10 inches. What is the probability that the mean annual snowfall during 25 randomly picked years will exceed 72.8 inches?

Find the indicated critical z value.

- 65) Find the critical value $z_{\alpha/2}$ that corresponds to a 91% confidence level.

Assume that a sample is used to estimate a population proportion p. Find the margin of error E that corresponds to the given statistics and confidence level. Round the margin of error to four decimal places.

- 66) 90% confidence; $n = 300$, $x = 140$

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

- 67) $n = 56$, $x = 30$; 95% confidence

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

- 68) Margin of error: 0.005; confidence level: 96%; \hat{p} and \hat{q} unknown

- 69) Margin of error: 0.04; confidence level: 99%; from a prior study, \hat{p} is estimated by 0.12.

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

- 70) A survey of 865 voters in one state reveals that 408 favor approval of an issue before the legislature. Construct the 95% confidence interval for the true proportion of all voters in the state who favor approval.

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

Assume that the population has a normal distribution.

- 71) A laboratory tested twelve chicken eggs and found that the mean amount of cholesterol was 185 milligrams with $s = 17.6$ milligrams. Construct a 95% confidence interval for the true mean cholesterol content of all such eggs.

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

- 72) How many students must be randomly selected to estimate the mean weekly earnings of students at one college? We want 95% confidence that the sample mean is within \$2 of the population mean, and the population standard deviation is known to be \$60.

Solve the problem.

- 73) Find the critical value $\chi^2_{\frac{2}{R}}$ corresponding to a sample size of 6 and a confidence level of 95 percent.

74) Find the critical value χ^2_L corresponding to a sample size of 24 and a confidence level of 95 percent.

Use the given degree of confidence and sample data to find a confidence interval for the population standard deviation σ . Assume that the population has a normal distribution. Round the confidence interval limits to the same number of decimal places as the sample standard deviation.

75) Weights of men: 90% confidence; $n = 14$, $\bar{x} = 161.5$ lb, $s = 13.7$ lb

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

76) An entomologist writes an article in a scientific journal which claims that fewer than 16 in ten thousand male fireflies are unable to produce light due to a genetic mutation. Use the parameter p , the true proportion of fireflies unable to produce light.

Assume that the data has a normal distribution and the number of observations is greater than fifty. Find the critical z value used to test a null hypothesis.

77) $\alpha = 0.09$ for a right-tailed test.

Find the value of the test statistic z using $z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$.

78) A claim is made that the proportion of children who play sports is less than 0.5, and the sample statistics include $n = 1320$ subjects with 30% saying that they play a sport.

Use the given information to find the P -value. Also, use a 0.05 significance level and state the conclusion about the null hypothesis (reject the null hypothesis or fail to reject the null hypothesis).

79) The test statistic in a right-tailed test is $z = 0.52$.

80) The test statistic in a two-tailed test is $z = 1.95$.

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

81) An entomologist writes an article in a scientific journal which claims that fewer than 3 in ten thousand male fireflies are unable to produce light due to a genetic mutation. 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.

Assume that a hypothesis test of the given claim will be conducted. Identify the type I or type II error for the test.

82) A medical researcher claims that 10% of children suffer from a certain disorder. Identify the type I error for the test.

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

83) A manufacturer considers his production process to be out of control when defects exceed 3%. In a random sample of 85 items, the defect rate is 5.9% but the manager claims that this is only a sample fluctuation and production is not really out of control. At the 0.01 level of significance, test the manager's claim.

Assume that a simple random sample has been selected from a normally distributed population and test the given claim. Use either the traditional method or P-value method as indicated. Identify the null and alternative hypotheses, test statistic, critical value(s) or P-value (or range of P-values) as appropriate, and state the final conclusion that addresses the original claim.

84) Use a significance level of $\alpha = 0.05$ to test the claim that $\mu = 32.6$. The sample data consist of 15 scores for which $\bar{x} = 42.5$ and $s = 5.9$. Use the traditional method of testing hypotheses.

85) A large software company gives job applicants a test of programming ability and the mean for that test has been 160 in the past. Twenty-five job applicants are randomly selected from one large university and they produce a mean score and standard deviation of 183 and 12, respectively. Use a 0.05 level of significance to test the claim that this sample comes from a population with a mean score greater than 160. Use the P-value method of testing hypotheses.

Find the critical value or values of χ^2 based on the given information.

86) $H_0: \sigma = 8.0$

$n = 10$

$\alpha = 0.01$

87) $H_1: \sigma > 3.5$

$n = 14$

$\alpha = 0.05$

88) $H_1: \sigma < 0.14$

$n = 23$

$\alpha = 0.10$

Use the traditional method to test the given hypothesis. Assume that the population is normally distributed and that the sample has been randomly selected.

89) A machine dispenses a liquid drug into bottles in such a way that the standard deviation of the contents is 81 milliliters. A new machine is tested on a sample of 24 containers and the standard deviation for this sample group is found to be 26 milliliters. At the 0.05 level of significance, test the claim that the amounts dispensed by the new machine have a smaller standard deviation.

Find the value of the linear correlation coefficient r .

90)

x	47.0	46.6	27.4	33.2	40.9
y	8	10	10	5	10

Suppose you will perform a test to determine whether there is sufficient evidence to support a claim of a linear correlation between two variables. Find the critical values of r given the number of pairs of data n and the significance level α .

91) $n = 11, \alpha = 0.05$

Use the given data to find the best predicted value of the response variable.

92) 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 $x = 4.6$?

93) 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 $x = 3.6$?

Answer Key

Testname: M227REVIEWFA13

- 1) Interval
- 2) Ordinal
- 3) Ratio
- 4) Nominal
- 5) Sample: the 100,000 selected adults; population: all adults; representative
- 6) Stratified
- 7) Systematic
- 8) Convenience
- 9) Cluster
- 10) Retrospective
- 11) Prospective
- 12) Cross-sectional
- 13) 39.5, 59.5
- 14)

Speed	Cumulative Frequency
Less than 30	4
Less than 60	20
Less than 90	80
Less than 120	100

15)

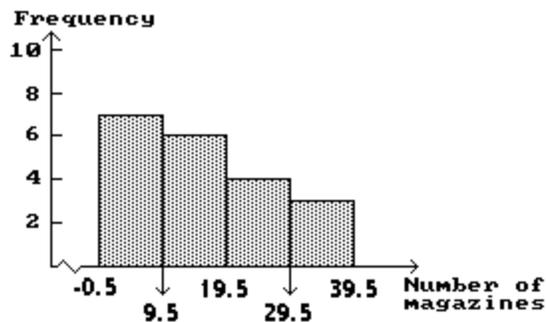
Income (\$)	Relative Frequency
200-300	19.93%
301-400	25.36%
401-500	26.45%
501-600	24.64%
More than 600	3.62%

16)

Age	Frequency
25-29	3
30-34	3
35-39	6
40-44	4
45-49	5
50-54	3
55-59	5
60-64	5

17) 5

18) The approximate amount at the center is 16 magazines.



19) 8.6 cousins

20) 25.5 yr

21) -45

22) \$18,562.50

23) 75.0

24) 38

25) 38.2

26) 5.4

27) 0.2

28) -2.4; unusual

29) 50

30) 6.1 lb

31)



32) $\frac{1}{4}$

33) $\frac{1}{38}$

34) 0.322

35) 0.572

36) 0.554

37) 0.194

38) 0.9836

39) At least one of the engines is defective.

40) 0.785

41) $\frac{43}{48}$

42) 28

43) 20,160

44) $\mu = 8.22$

45) $\sigma = 2.62$

46) -\$1.53

47) -\$0.67

Answer Key

Testname: M227REVIEWFA13

- 48) 0.054
49) 0.839
50) 0.154
51) 3.5
52) 1.7
53) Yes
54) 0.8708
55) 0.2776
56) 0.9656
57) 0.6424
58) -1.34
59) 1.34
60) -1.08
61) 1021.7
62) 0.7477
63) 2.28%
64) 0.0808
65) 1.70
66) 0.0474
67) $0.405 < p < 0.667$
68) 42,025
69) 438
70) $0.438 < p < 0.505$
71) $173.8 \text{ mg} < \mu < 196.2 \text{ mg}$
72) 3458
73) 12.833
74) 11.689
75) $10.4 \text{ lb} < \sigma < 20.3 \text{ lb}$
76) $H_0: p = 0.0016$
 $H_1: p < 0.0016$
77) 1.34
78) -14.53
79) 0.3015; fail to reject the null hypothesis
80) 0.0512; fail to reject the null hypothesis
81) There is sufficient evidence to support the claim that the true proportion is less than 3 in ten thousand.
82) Reject the claim that the percentage of children who suffer from the disorder is equal to 10% when that percentage is actually 10%.
83) $H_0: p = 0.03$. $H_1: p > 0.03$. Test statistic: $z = 1.57$.
P-value: $p = 0.0582$.
Critical value: $z = 2.33$. Fail to reject null hypothesis.
There is not sufficient evidence to warrant rejection of the manager's claim that production is not really out of control.
84) $H_0: \mu = 32.6$. $H_1: \mu \neq 32.6$. Test statistic: $t = 6.50$.
Critical values: $t = \pm 2.145$. Reject H_0 . There is sufficient evidence to warrant rejection of the claim that the mean is 32.6.
- 85) $H_0: \mu = 160$. $H_1: \mu > 160$. Test statistic: $t = 9.583$.
P-value < 0.005 . Reject H_0 . There is sufficient evidence to support the claim that the mean is greater than 160.
86) 1.735, 23.589
87) 22.362
88) 14.042
89) Test statistic: $\chi^2 = 2.370$. Critical value: $\chi^2 = 13.091$.
Reject the null hypothesis. There is sufficient evidence to support the claim that the new machine produces a lower standard deviation.
90) 0.175
91) $r = \pm 0.602$
92) 12.75
93) 65.84