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

7.1 1) The term $\left(z_{\alpha/2} \dfrac{\sigma}{\sqrt{n}}\right)$ describes the _____ .   1) _____

2) Find the critical value $z_{\alpha/2}$ needed to construct a(n) 79% confidence interval.   2) _____

3) A sample of size $n = 56$ is drawn from a population whose standard deviation is $\sigma = 4.5$. Find the margin of error for a 95% confidence interval for μ.   3) _____

4) A student looked up the number of years served by 35 of the more than 100 Supreme Court justices. The average number of years served by those 35 justices was 13.8. If the standard deviation of the entire population is 7.3 years, find the 95% confidence interval for the average number of years served by all Supreme Court justices.   4) _____

5) A random sample of 9 TI-89 Titanium calculators being sold over the internet had the following prices, in dollars.   5) _____

142	149	147	146	145
148	154	136	131	

Assume the population standard deviation is $\sigma = 30$ and that the population is approximately normal. Construct a 95% confidence interval for the mean price for all the TI-89's being sold over the internet.

6) A study of elephants is conducted to determine the average weight of a certain subspecies of elephants. The standard deviation for the population is 500 pounds. At a 90% level, how many elephants need to be weighed so the average weight will be accurate to within 250 pounds?   6) _____

7) A researcher conducted a study of the access speed of 45 hard drives and concluded that his maximum error of estimate was 24. If he were to conduct a second study to reduce the maximum error of estimate to 6, about how many hard drives should he include in his new sample?   7) _____

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

7.2 8) The t-distribution has a variance that is greater than one.   8) _____
    A) False   B) True

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

9) Find $t_{\alpha/2}$ when $n = 12$ for the 95% confidence interval for the mean.

9) _____

10) A sample of size $n = 11$ has a sample mean $\overline{x} = 15.6$ and sample standard deviation $s = 2.4$. Construct a 95% confidence interval for the population mean μ.

10) _____

11) The prices (in dollars) for a graphing calculator are shown below for 8 online vendors. Estimate the true mean price for this particular calculator with 95% confidence.

       121   125   151   129
       127   133   121   125

11) _____

12) 7 squirrels were found to have an average weight of 8.7 ounces with a sample standard deviation is 1.1. Find the 95% confidence interval of the true mean weight.

12) _____

7.3 13) In a study of 100 new cars, 29 are white. Find $\hat{p}$ and $\hat{q}$, where $\hat{p}$ is the proportion of new cars that are white.

13) _____

14) Find the standard error for the given values of x and n.
    $x = 125$, $n = 259$

14) _____

15) Use the given data to construct a confidence interval of the requested level.
    $x = 98$, $n = 223$, confidence level 99%

15) _____

16) A recent study of 750 internet users in Europe found that 35% of internet users were women. What is the 95% confidence interval of the true proportion of women in Europe who use the internet?

16) _____

17) In a sample of 45 mice, a biologist found that 40% were able to run a maze in 30 seconds or less. Find the 95% limit for the population proportion of mice who can run a maze in 30 seconds or less.

17) _____

18) A recent poll of 700 people who work indoors found that 278 smoke. If the researchers want to be 98% confident of their results to within 3.5 percentage points, how large a sample is necessary?

18) _____

19) A report states that 42% of home owners had a vegetable garden. How large a sample is needed to estimate the true proportion of home owners who have vegetable gardens to within 4% with 95% confidence?

19) _____

20) In a sample of 855 bartenders, 48.0% report hearing complaints from patrons   20) _____
about their jobs. If the margin of error for the proportion of bartenders hearing
job complaints is 4.4 percentage points, what is the degree of confidence used?

21) The following display from a TI-84 Plus calculator presents a 99% confidence   21) _____
interval for a proportion.

> **1-PropZInt**
> (0.336424, 0.663576)
> $\hat{p} = 0.500000$
> n = 62

Use the information in the display to construct a 95% confidence interval for p.

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

8.1 22) The null hypothesis states that there is no difference between a parameter and a specific   22) _____
value, or that there is no difference between two parameters.
  A) False   B) True

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

23) Is the statement $H_0 : \mu = 6$ a valid null hypothesis?   23) _____

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

24) Sandra Johnson, a researcher, believes her pulse rate will decrease with exercise. Her   24) _____
alternative hypothesis would contain an equal sign.
  A) False   B) True

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

25) Determine whether the alternative hypothesis is left-tailed, right-tailed, or   25) _____
two-tailed.
  $H_0: \mu = 71 \qquad H_1: \mu < 71$

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

26) Stating the hypothesis should be the first step used in hypothesis testing.   26) _____
  A) False   B) True

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

27) Using the z table, find the critical value (or values) for an $\alpha = 0.03$ two-tailed test.   27) _____

28) Using the z table, find the critical value (or values) for an $\alpha = 0.11$ right-tailed   28) _____
test.

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

29) The critical value for a right-tailed test with $\alpha = 0.03$ is 1.88.   29) _____
    A) True   B) False

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

30) A sample of 60 chewable vitamin tablets have a sample mean of 227 milligrams   30) _____
of vitamin C. Nutritionists want to perform a hypothesis test to determine how
strong the evidence is that the mean mass of vitamin C per tablet exceeds 230
milligrams. State the appropriate null and alternate hypotheses.

31) A grocery store owner claims that the mean amount spent per checkout is more   31) _____
than \$73. A test is made of $H_0: \mu = 73$ versus $H_1: \mu > 73$. The null hypothesis is
not rejected. State the appropriate conclusion.

32) A recent survey of gasoline prices indicated that the national average was \$4.098   32) _____
per gallon. The Dallas Automobile Club claimed that gasoline in Texas was
significantly lower than the national average. A survey covering 10 different
suburbs in Dallas found the average price of gasoline to be \$3.924 per gallon
with a population standard deviation of \$0.053. What critical value should be
used to test the claim using $\alpha = 0.01$?

8.2 33) A test is made of $H_0: \mu = 55$ versus $H_1: \mu > 55$. A sample of size $n = 68$ is drawn, 33) _____
and $\bar{x} = 56$. The population standard deviation is $\sigma = 27$. Compute the value of
the test statistic z.

34) A test is made of $H_0: \mu = 54$ versus $H_1: \mu \neq 54$. A sample of size $n = 73$ is drawn,   34) _____
and $\bar{x} = 57$. The population standard deviation is $\sigma = 21$. Compute the value of
the test statistic z.

35) A test of $H_0: \mu = 42$ versus $H_1: \mu < 42$ is performed using a significance level of   35) _____
$\alpha = 0.05$. The value of the test statistic is $z = -1.47$. Is H_0 rejected?

36) The Eagle Ridge Contractors Association claims the average price of a home in   36) _____
their subdivision is \$125,150 with a standard deviation of \$7,350. A sample of
36 homes for sale in this subdivision had an average selling price of \$123,550.
The Eagle Ridge Home Owners Association is interested in knowing if the costs
of homes for sale in this subdivision are actually lower than claimed? Compute
the test value.

37) Dr. Christina Cuttleman, a nutritionist, claims that the average number of calories 37) _____
in a serving of popcorn is 75 with a standard deviation of 7. A sample of 50
servings of popcorn was found to have an average of 78 calories. Check Dr.
Cuttleman's claim at $\alpha = 0.05$.

38) The average magnesium concentration in ground water around Metro City is 38) _____
$\mu = 59.3$ parts per million (ppm) with a standard deviation of $\sigma = 18$. The table
below shows the ground-water magnesium concentrations (ppm) from random
sites in a suburb located 15 miles away. At $\alpha = 0.10$, can it be concluded that the
average magnesium concentration in the suburb differs from 59.3 ppm?

43	62	56	32	36
116	27	9	47	111
115	96	27	55	79
59	63	43	36	44
102	54	32	64	93
78	8	105	110	84
124	125	104	104	87

a. State the hypotheses and identify the claim.
b. Find the critical values.
c. Compute the test statistic.
d. Make a decision.
e. Summarize the results.

39) The average greyhound can reach a top speed of 18.8 meters per second. A 39) _____
particular greyhound breeder claims her dogs are faster than the average
greyhound. A sample of 50 of her dogs ran, on average, 19.2 meters per second
with a population standard deviation of 1.4 meters per second. With $\alpha = 0.05$, is
her claim correct?

40) State whether the null hypothesis should be rejected on the basis of the given 40) _____
P-value.
    P-value $= 0.001$, $\alpha = 0.05$, one-tailed test

41) A test of $H_0: \mu = 43$ versus $H_1: \mu \neq 43$ is performed using a significance level of 41) _____
$\alpha = 0.01$. The P-value is 0.129. Is H_0 rejected?

42) A test of $H_0: \mu = 60$ versus $H_1: \mu < 60$ is performed using a significance level of 42) _____
$\alpha = 0.01$. The P-value is 0.118. Is H_0 rejected?

43) A sample of 46 students enroll in a program that claims to improve scores on the quantitative reasoning portion of the Graduate Record Examination (GRE). The participants take a mock GRE test before the program begins and again at the end to measure their improvement.

The mean number of points improved was $\bar{x} = 16$. Assume the standard deviation is $\sigma = 53$ and let μ be the population mean number of points improved. To determine whether the program is effective, a test is made of the hypotheses $H_0: \mu = 0$ versus $H_1: \mu > 0$.

Compute the value of the test statistic.

43) _____

44) Thirty-seven members of a bowling league sign up for a program that claims to improve bowling scores. The participants bowl a set of five games before the program begins and a set of five games again at the end to measure their improvement.

The mean number of points improved (over the set of five games) was $\bar{x} = 22$. Assume the standard deviation is $\sigma = 44$ and let μ be the population mean number of points improved for the set of five games. To determine whether the program is effective, a test is made of the hypotheses $H_0: \mu = 0$ versus $H_1: \mu > 0$.

i). Compute the value of the test statistic.
ii). Compute the P-value.
iii). Do you reject H_0 at the $\alpha = 0.01$ level?

44) _____

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

```
             Z-Test
   μ ≠ 59
   z = 1.12
   p = 0.47801
   x̄ = 57.88
   n = 54
```

What are the null and alternate hypotheses?

45) _____

8.3 46) What are the critical value for a two-tailed t test when $\alpha = 0.02$ and $n = 19$?

46) _____

47) What is the critical value for a right-tailed t test when $\alpha = 0.025$ and $n = 13$?

47) _____

6

48) A recent study of business travelers claims they spend an average of $41.00 per day on meals. As a test of this claim, a random sampling of 16 business travelers found they had spent an average of $45.00 per day with a standard deviation of $3.65. What are the critical values for a two-tailed t test of this claim with $\alpha = 0.05$?

48) _____

49) The mean annual tuition and fees for a sample of 12 private colleges was $36,800 with a standard deviation of $5000. A dotplot shows that it is reasonable to assume that the population is approximately normal. You wish to test whether the mean tuition and fees for private colleges is different from $33,700.

49) _____

Compute the value of the test statistic and state the number of degrees of freedom.

50) At a certain university, the average attendance at basketball games has been 2725. This year the attendance for the first 14 games has been 2265 with a standard deviation of 485. The athletic director claims that the attendance is the same as last year. If $\alpha = 0.05$, what are the critical values for this two-tailed t test?

50) _____

51) The mean annual tuition and fees for a sample of 11 private colleges was $26,500 with a standard deviation of $6000. A dotplot shows that it is reasonable to assume that the population is approximately normal. You wish to test whether the mean tuition and fees for private colleges is different from $31,000.

51) _____

i). State the null and alternate hypotheses.
ii). Compute the value of the test statistic and state the number of degrees of freedom.
iii). State a conclusion regarding H_0. Use the $\alpha = 0.05$ level of significance.

52) Use technology to find the P-value for the test value.
 $t = 1.532$, $n = 22$, right-tailed

52) _____

53) Use technology to find the P-value for the following values of the test statistic t, sample size n, and alternate hypothesis H_1.
 $t = 1.247$, $n = 10$, $H_1: \mu > \mu_0$

53) _____

54) Use technology to find the P-value for the following values of the test statistic t, sample size n, and alternate hypothesis H_1.
 $t = 1.535$, $n = 15$, $H_1: \mu \neq \mu_0$

54) _____

55) The following display from a TI-84 Plus calculator presents the results of a   55) _____
hypothesis test for a population mean μ.

T-Test
$\mu < 52$
t = -4.479421
p = 0.000020
$\bar{x} = 51.87$
Sx = 0.21523
n = 55

Do you reject H_0 at the $\alpha = 0.10$ level of significance?

8.4 56) The formula for the test value in a z test for proportions is _____ .   56) _____

57) In a simple random sample of size 88, there were 22 individuals in the category   57) _____
of interest. It is desired to test $H_0: p = 0.31$ versus $H_1: p < 0.31$. Compute the test
statistic z.

58) In a simple random sample of size 64, there were 32 individuals in the category   58) _____
of interest. It is desired to test $H_0: p = 0.36$ versus $H_1: p < 0.36$. Do you reject H_0
at the 0.05 level?

59) In a simple random sample of size 100, there were 60 individuals in the category   59) _____
of interest. It is desired to test $H_0: p = 0.69$ versus $H_1: p < 0.69$.

    i). Compute the sample proportion $\hat{p}$.
    ii). It is desired to test $H_0: p = 0.69$ versus $H_1: p > 0.69$ Compute the test sta
    iii). Do you reject H_0 at the 0.05 level?

60) It has been claimed that at UCLA at least 40% of the students live on campus. In   60) _____
a random sample of 250 students, 90 were found to live on campus. Does the
evidence support the claim at $\alpha = 0.01$?

61) A political strategist claims that 56% of voters in Madison County support his   61) _____
candidate. In a poll of 300 randomly selected voters, 150 of them support the
strategist's candidate. At $\alpha = 0.05$, is the political strategist's claim warranted?

62) A scientist claims that only 65% of geese in his area fly south for the winter. He tags 65 random geese in the summer and finds that 20 of them do not fly south in the winter. If $\alpha = 0.05$, is the scientist's belief warranted?

63) The following display from a TI-84 Plus calculator presents the results of a hypothesis test for a population proportion p.

```
1-PropZTest
prop > 0.29
z = -1.60
p = 0.054799
^
p = 0.205
n = 73
```

State the null and alternate hypotheses.

64) The following display from a TI-84 Plus calculator presents the results of a hypothesis test for a population proportion p.

```
1-PropZTest
prop > 0.28
z = -1.16
p = 0.123024
^
p = 0.222
n = 81
```

Can H_0 be rejected at the 0.05 level?

1) maximum error of estimate
2) 1.25
3) 1.18
4) $11.4 < \mu < 16.2$
5) (124.6, 163.8)
6) 11
7) 720
8) B
9) 2.20
10) $14.0 < \mu < 17.2$
11) $120.9 < \mu < 137.1$
12) $7.7 < \mu < 9.7$
13) $\hat{p} = 0.29, \hat{q} = 0.71$
14) 0.031
15) $0.354 < p < 0.525$
16) $0.316 < p < 0.384$
17) $25.7\% < p < 54.3\%$
18) 1062
19) 585
20) 99%
21) (0.376, 0.624)
22) B
23) Yes, this is a statement that compares a parameter to a value.
24) A
25) left-tailed
26) B
27) ±2.17
28) 1.23
29) A
30) $H_0: \mu = 230, H_1: \mu > 230$
31) There is not enough evidence to conclude that the mean checkout price is greater than $73.
32) -2.33
33) 0.31
34) 1.22
35) No
36) -1.31

37) $H_0 : \mu = 75$ (the claim) and $H_1 : \mu \neq 75$

Critical values: ± 1.96

Test value: 3.03

Reject the null hypothesis.

There is not enough evidence to support the claim that the average number of calories in a serving of popcorn is 75.

38) a. $H_0 : \mu = 59.3$ ppm and $H_1 : \mu \neq 59.3$ ppm (claim)

b. C.V. $= \pm 1.96$

c. $z = 3.3$ ($\bar{x} = 69.429$ ppm)

d. Reject the null hypothesis

e. There is evidence to support the claim that the suburb's average magnesium concentration differs from Metro City's.

39) Yes, because the test value 2.02 falls in the critical region.

40) Reject

41) No

42) No

43) 2.05

44) i). $z = 3.0414$

ii). $P = 0.0012$

iii). Yes

45) $H_0 : \mu = 59$, $H_1 : \mu \neq 59$

46) ± 2.552

47) 2.179

48) ± 2.131

49) 2.148; 11 degrees of freedom

50) ± 2.160

51) i). $H_0 : \mu = 31{,}000$, $H_1 : \mu \neq 31{,}000$

ii). -2.487; 10 degrees of freedom

iii). Do not reject H_0.

There is insufficient evidence to conclude that the mean annual tuition and fees is different from \$31,000.

52) 0.0702

53) 0.1219

54) 0.1470

55) Yes

56) $z = \dfrac{\hat{p} - p}{\sqrt{pq/n}}$

57) -1.22

58) No

59) i). 0.600

   ii). -1.95

   iii). Yes

60) $H_0 : p = 0.40$ (claim) and $H_1 : p < 0.40$

   Critical Value: -2.33

   Test value: -1.29

   Do not reject null hypothesis since the test value falls in the noncritical region.

   There is not enough evidence to reject the claim that at least 40% of UCLA students live on campus.

61) No, because the test value -2.09 is in the critical region.

62) Yes, because the test value 0.72 is in the noncritical region.

63) $H_0 : p = 0.29, H_1 : p > 0.29$

64) No