Assume that all samples have been randomly selected from a population with a normal distribution.

TEST SCORE:

12

1) You randomly select and weigh 25 samples of an allergy medicine. The sample standard deviation is 1.20 milligrams. Assuming the weights are normally distributed, construct a 99% confidence interval for σ, the population standard deviation. (Round your answer to 3 decimal places.)

99% conf. interval

$s = 1.20$

$n = 25$

$\alpha = .01$

critical values

99% .01 = .005 in each tail

df = 24

$\chi^2_R = 45.559$

$\chi^2_L \quad 1 - .005 = .995$

$\to = 9.886$

$$\sqrt{\frac{(n-1)s^2}{\chi^2_R}} < \sigma < \sqrt{\frac{(n-1)s^2}{\chi^2_L}}$$

$$\sqrt{\frac{(24)(1.20)^2}{45.559}} < \sigma < \sqrt{\frac{(24)(1.20)^2}{9.886}}$$

$$\boxed{.871 < \sigma < 1.870}$$ ✓

10

2) Nielsen Media Research wants to estimate the mean amount of time that full-time college students spend watching television each weekday. FIND THE SAMPLE SIZE necessary to estimate the mean with a 17 minute margin of error. Assuming that a 95 % confidence level is desired. Also assume that a pilot study showed that σ = 112.2 minutes.

95% confidence level

$\alpha = .05 \quad \alpha/2 = .025$

$Z_{\alpha/2} = 1.96$

$\sigma = 112.2$ minutes

$$n = \left[\frac{Z_{\alpha/2}\,\sigma}{E}\right]^2$$

$$n = \left[\frac{(1.96)(112.2)}{17}\right]^2$$

$n = 167.34$

ROUND UP

$$\boxed{n = 168}$$ ✓

168

.2833

18

TRUE / FALSE QUESTIONS: (circle the correct answer)

T 3) The Chi – square distribution is not a symmetric distribution: T / F

T 4) A correlation coefficient of 1 indicates that there is a strong positive linear relationship. T / ~~F~~

F 5) When predicting a value of y based on some given value of x, if no significant linear correlation exists the best predicted y –value is found by substituting the x-value into the regression equation. T / F

F 6) When doing a hypothesis test, the claim always goes in to the alternate hypothesis (H_1) T / F

T 7) A standard deviation measures variability and is useful to know in determining product reliability. T / F

F 8) When the p-value is greater than the significance level (alpha) we reject the H_0 (the null hypothesis) T / F   P value > α fail to reject

-3

You want to buy a vacuum cleaner, and a salesperson tells you the repair costs for the Eureka Whirlwind **vacuum** and the Hoover - Wind Tunnel **vacuum** are equal. You research the repair costs of 34 Eureka Whirlwinds and 46 Hoover Wind Tunnels. The results are listed below.

10

Eureka Whirlwind Vacuum: $n_1 = 34,\ \bar{x}_1 = 50,\ s_1 = 10$

Hoover – Wind Tunnel vacuum: $n_2 = 46,\ \bar{x}_2 = 60,\ s_2 = 18$

9) Construct a 99% confidence interval estimate of the difference between the two population means.

$\boxed{\text{STAT}}$ ▷ Tests
2-SampleTInt

$\boxed{-18.36 < (\mu_1 - \mu_2) < -1.643}$

10/10

10) Was the salesperson being truthful? Does there appear to be a difference between the two vacuum cleaners? Explain. The Sales person was not being Truthful

There is a difference because zero is not included in the confidence interval ($\mu_1 - \mu_2 = 0$ implies $\mu_1 = \mu_2$)

A trial study on an experimental nasal spray vaccine for children produced the following results: 14 out of 1070 children who received the vaccine developed the flu while 95 out of the 532 children who did not use the experimental nasal spray developed the flu. Test the claim that the proportion of children who developed the flu was lower for those using the experimental nasal spray than for those children who did not use it. Use a significance level of .05

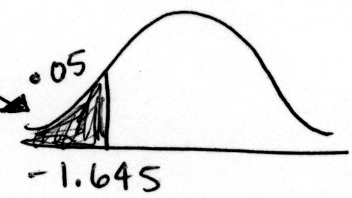
11) Where does the claim go? In the H_0 or in the H_1? $P_1 < P_2$ goes in H_1

12) The null hypothesis is $P_1 = P_2$

13) The alternate hypothesis is $P_1 < P_2$

$$Z = \frac{\hat{P}_1 - \hat{P}_2 - \cancel{(P_1 - P_2)}^{\,0}}{\sqrt{\frac{\bar{P}\bar{q}}{n_1} + \frac{\bar{P}\bar{q}}{n_2}}}$$

14) The test statistic is $Z = -12.39$



15) The critical value is -1.645

16) The p-value is 0

17) Choose one. a) FAIL TO REJECT H_0 b) REJECT H_0.

18) Is there sufficient sample evidence to support the stated claim. ? YES / NO

5 each
x 8

The Currier Aviation Company uses a new production method to manufacture aircraft altimeters. A simple random sample of 28 altimeters are tested in a pressure chamber. The sample has a standard deviation of 58.4 ft. At the 0.10 significance level, test the claim that the new production method manufactures altimeters with <u>less variation</u> than the old production method. (The old production method manufactures altimeters with a standard deviation of 43.7 ft)

$n = 28$
$s = 58.4$
$.10$
$\sigma\ 43.7$

19) Which parameter is being tested here? a) μ b) σ c) P

20) What is the claim? $\sigma < 43.7$

21) The null hypothesis is $H_0 : \sigma = 43.7$

22) The alternate hypothesis is $H_1 : \sigma < 43.7$ CLAIM

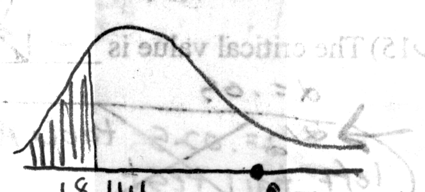
23) The test statistic is
a) 15.118
b) 48.2199
c) 50.0059
d) 43.7
e) none of the above

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{(27)(58.4)^2}{(43.7)^2} = 48.2199$$

24) The critical value is
a) 36.741
b) 37.916
c) 18.939
d) 18.114
e) none of the above

From A-4
df = 28 − 1 = 27
1 − .10 = .90

Left Tail Test (<)



Test statistic not in critical region → fail to reject H_0

25) Which is the correct conclusion for the problem. ________

a) The sample data support the claim that the new production method manufactures altimeters with less variation than the old production method
b) There is not sufficient sample evidence to support the claim that the new production method manufactures altimeters with less variation than the old production method
c) There is sufficient evidence to warrant rejection of the claim that the new production method manufactures altimeters with less variation than the old production method
d) There is not sufficient evidence to warrant rejection of the claim that the new production method manufactures altimeters with less variation than the old production method.

26) Based on the your results **should Currier Aviation adopt this new production method to manufacture altimeters** is it really better than the old production method?

The new production method is <u>NOT</u> better because the standard deviation for the new method is greater so it operates with more variance

4 pts x 8

The following table shows the SAT scores for six students before and after an intensive tutoring session. Test the claim that the intensive tutoring session was effective in helping students raise their SAT scores. (Use a significance level of 0.05)

X-Y>0
− = increase
+ = decrease

Before	445	510	429	452	629	500
After	446	571	517	400	610	540
	−1	−61	−88	52	19	−14

27) What is the claim? $\mu_d < 0$

$X-Y>0$ decrease score
* $X-Y<0$ increase score
$X-Y=0$ no change

28) The null hypothesis is $H_0: \mu_d = 0$

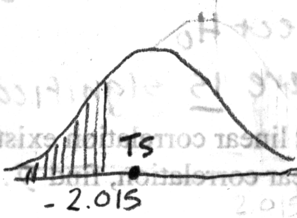
29) The alternate hypothesis is $H_1: \mu_d < 0$ CLAIM

30) The test statistic is $-.926$

$\boxed{\text{STAT}}$ ▷ Tests μ_0 0
2-TTest List L_3 <

31) The critical value is -2.015

left Tail because <
.05 −2.015
df = 5



32) The p-value is .199

STAT ▷ Tests
2-TTest

33) Choose one. a) FAIL TO REJECT H_0 b) REJECT H_0.

34) Is this intensive tutoring session effective in helping students raise their SAT scores. ?

Explain – this is not just a YES / NO question.

No - There is not sufficient sample evidence to support the claim that the intensive tutoring session was effective in helping students raise their SAT scores

8 x

2 x

2 x

35) Coffee sales and temperatures: The paired data below consists of outdoor temperature and coffee sales for a coffee shop for 6 randomly selected days. Temperature was recorded in Fahrenheit and coffee sales are in hundreds of dollars.

X Temperature (F)	29	41	51	60	78	81
Y Coffee Sales ($)	26.2	24.8	19.7	20	11.4	11.2

TAKE ANSWERS TO 3 DECIMAL PLACES

x4

a) Find the value of the linear correlation coefficient (r)

r = .978

b) Is there a significant linear correlation? (This is not just a "yes" or "no" question, show all steps in a hypothesis test leading to your answer)

x8

$H_0: \rho = 0$ (No significant linear correlation

$H_1: \rho \neq 0$

Test stat = r = .978

Crit value = .811

n = 6

α = .05

-.811 .811

Since test statistic lies in critical region, Reject H_0

So there IS significant linear correlation

c) If a significant linear correlation exists, find the regression **equation**. If there is no significant linear correlation, find $\bar{y}$.

x5

y = -.31x + 36.21 ✓

d) Find the best predicted coffee sales when the temperature reaches 70 degrees Fahrenheit.

x5

y = -.31(70) + 36.21 $\boxed{y = 14.51}$

4 pts x 6

Assume that a simple random sample has been selected from a normally distributed population. **Use a significance level of 0.01** to test the claim that the mean lifetime of Honda car engines is greater than 220,000 miles. The mean lifetime of a sample of 25 car engines is 226,450 miles and it is known that σ = 11,000 miles.

$\sigma = 11{,}000$ $\quad \bar{x} = 226{,}450$

$\alpha = .01$ $\quad n = 25$

36) What is the null hypothesis? $H_0: \mu = 220{,}000$

37) What is the alternate hypothesis? $H_1: \mu > 220{,}000$ CLAIM

38) Find the test statistic

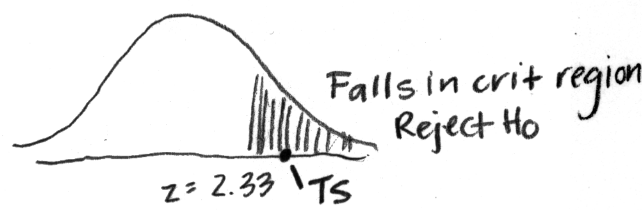
$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{226{,}450 - 220{,}000}{11{,}000/\sqrt{25}} = \boxed{2.932}$$

39) The critical value is

$\alpha = .01$

right tail test (>)

$\boxed{z = 2.33}$



40) The p-value is

area to right of test statistic

when $z = 2.93$ area $= .9983$

area from LEFT

$1 - .9983 = \boxed{.0017}$ ✓

41) **Which is the correct conclusion for the problem.** ________

a) The sample data support the claim that the mean lifetime of Honda car engines is greater than 220,000 miles

b) There is not sufficient sample evidence to support the claim that the mean lifetime of Honda car engines is greater than 220,000 miles

c) There is sufficient evidence to warrant rejection of the claim that the mean lifetime of Honda car engines is greater than 220,000 miles

d) There is not sufficient evidence to warrant rejection of the claim that the mean lifetime of Honda car engines is greater than 220,000 miles.