

AP Stats
Chap 22-24
Practice Test

Name _____ Pd _____

SECTION I

Number of Questions — 15

Percent of Total Grade — 50

Directions: Solve each of the following problems, using the available space (or extra paper) for scratchwork. Decide which is the best of the choices given and place that letter on the ScanTron sheet. No credit will be given for anything written on these pages for this part of the test. Do not spend too much time on any one problem.

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

Interpret the confidence interval.

1. Analysis of a random sample of 250 Illinois nurses produced a 95% confidence interval for the mean annual salary of $\$42,803 < \mu(\text{Nurse Salary}) < \$49,692$. 1. _____
 - A. About 95% of Illinois nurses earn between \$42,803 and \$49,692.
 - B. We are 95% confident that the average nurse salary in the U.S. is between \$42,803 and \$49,692.
 - C. If we took many random samples of Illinois nurses, about 95% of them would produce this confidence interval.
 - D. We are 95% confident that the interval from \$42,803 to \$49,692 contains the true mean salary of all Illinois nurses.
 - E. About 95% of the nurses surveyed earn between \$42,803 and \$49,692.

2. A random sample of clients at a weight loss center were given a dietary supplement to see if it would promote weight loss. The center reported that the 100 clients lost an average of 44 pounds, and that a 95% confidence interval for the mean weight loss this supplement produced has a margin of error of ± 7 pounds. 2. _____
 - A. We are 95% sure that the average weight loss among the clients in this study was between 37 and 51 pounds.
 - B. 95% of the clients in the study lost between 37 and 51 pounds.
 - C. We are 95% confident that the mean weight loss produced by the supplement in weight loss center clients is between 37 and 51 pounds.
 - D. 95% of the people who use this supplement will lose between 37 and 51 pounds.
 - E. The average weight loss of clients who take this supplement will be between 37 and 51 pounds.

3. How many unpopped kernels are left when you pop a bag of microwave popcorn? Quality control personnel at Yummy Popcorn take a random sample of 50 bags of popcorn. They pop each bag in a microwave and then count the number of unpopped kernels. The following interval is produced:
 t-interval for μ : with 99% Confidence,
 $11 < \mu(\text{unpopped}) < 25$ 3. _____
- A. We are 99% sure that the average number of unpopped kernels in bags of Yummy brand popcorn is between 11 and 25 kernels.
 B. We are 99% confident that the average number of unpopped kernels in microwave popcorn bags is between 11 and 25.
 C. About 99% of the sampled bags had between 11 and 25 unpopped kernels.
 D. 99% of all samples of Yummy popcorn will produce this confidence interval.
 E. The average number of unpopped kernels in a bag of Yummy popcorn is between 11 and 25 kernels.

Provide an appropriate response.

4. How much fat do reduced fat cookies typically have? You take a random sample of 50 reduced-fat cookies and test them in a lab, finding a mean fat content of 3.2 grams and a standard deviation of 1.1 grams of fat. Have the conditions and assumptions for inference been met? 4. _____
- A. No, it is not a random sample.
 B. No, we have sampled more than 10% of the population.
 C. No, the sample is not big enough to satisfy the nearly normal condition.
 D. No, the sample is not likely to be representative.
 E. Yes, all conditions and assumptions are reasonably assumed to be met.

Use the given sample data to construct the indicated confidence interval for the population mean.

5. $n = 12$, $\bar{x} = 23.8$, $s = 5.6$ 5. _____
 Find a 99% confidence interval for the mean.
 A. (19.41, 28.19)
 B. (18.80, 28.80)
 C. (18.68, 28.92)
 D. (18.78, 28.82)
 E. (18.68, 28.80)

Classify the hypothesis test as lower-tailed, upper-tailed, or two-sided.

6. 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 from the previous mean of 21.6 hours. 6. _____
- A. Lower-tailed B. Two-sided C. Upper-tailed

For the given hypothesis test, explain the meaning of a Type I error or a Type II error, as specified.

7. In the past, the mean running time for a certain type of flashlight battery has been 8.0 hours. The manufacturer has introduced a change in the production method and wants to perform a hypothesis test to determine whether the mean running time has increased as a result. The hypotheses are:

$$H_0 : \mu = 8.0 \text{ hours}$$

$$H_A : \mu > 8.0 \text{ hours}$$

Explain the result of a Type II error.

- A. The manufacturer will decide the mean battery life is 8.0 hours when in fact it is 8.0 hours.
- B. The manufacturer will decide the mean battery life is greater than 8.0 hours when in fact it is 8.0 hours.
- C. The manufacturer will decide the mean battery life is greater than 8.0 hours when in fact it is greater than 8.0 hours.
- D. The manufacturer will decide the mean battery life is less than 8.0 hours when in fact it is greater than 8.0 hours.
- E. The manufacturer will decide the mean battery life is 8.0 hours when in fact it is greater than 8.0 hours.

Construct the indicated confidence interval for the difference between the two population means. Assume that the assumptions and conditions for inference have been met.

8. Two types of flares are tested for their burning times (in minutes) and sample results are given below.

Brand X	Brand Y
$n = 35$	$n = 40$
$\bar{x} = 19.4$	$\bar{x} = 15.1$
$s = 1.4$	$s = 0.8$

Construct a 95% confidence interval for the difference $\mu_X - \mu_Y$ based on the sample data.

- A. (3.8, 4.8)
- B. (3.2, 5.4)
- C. (3.5, 5.1)
- D. (3.6, 5.0)
- E. (-4.7, -3.9)

9. A researcher was interested in comparing the salaries of female and male employees of a particular company. Independent random samples of 8 female employees (sample 1) and 15 male employees (sample 2) yielded the following weekly salaries (in dollars). 9. _____

Female	Male
495	722 518
760	562 904
556	880 1150
904	520 805
520	500 480
1005	1250 970
743	750 605
660	1640

Determine a 98% confidence interval for the difference, $\mu_1 - \mu_2$, between the mean weekly salary of all female employees and the mean weekly salary of all male employees.

- A. (-\$385, \$164)
- B. (-\$335, \$111)
- C. (-\$382, \$158)
- D. (-\$431, \$208)
- E. (-\$158, \$382)

Interpret the given confidence interval.

10. A grocery store is interested in determining whether or not a difference exists between the shelf life of Tasty Choice doughnuts and Sugar Twist doughnuts. A random sample of 100 boxes of each brand was selected and the mean shelf life in days was determined for each brand. A 90% confidence interval for the difference of the means, $\mu_{TC} - \mu_{ST}$, was determined to be (1.4, 2.5). 10. _____
- A. We are 90% confident that a randomly selected box of Tasty Choice doughnuts will have a shelf life that is between 1.4 and 2.5 days longer than a randomly selected box of Sugar Twist doughnuts.
 - B. Based on this sample, we are 90% confident that Sugar Twist doughnuts will last on average between 1.4 and 2.5 days longer than Tasty Choice doughnuts.
 - C. We know that 90% of all random samples done on the population will show that the mean shelf life of Tasty Choice doughnuts is between 1.4 and 2.5 days longer than the mean shelf life of Sugar Twist doughnuts.
 - D. We know that 90% of Tasty Choice doughnuts last between 1.4 and 2.5 days longer than Sugar Twist doughnuts.
 - E. Based on this sample, we are 90% confident that Tasty Choice doughnuts will last on average between 1.4 and 2.5 days longer than Sugar Twist doughnuts.

Use the paired t-interval procedure to obtain the required confidence interval for the mean difference. Assume that the conditions and assumptions for inference are satisfied.

11. Ten different families are tested for the number of gallons of water a day they use before and after viewing a conservation video. Construct a 90% confidence interval for the mean of the difference of the "before" minus the "after" times if $\bar{d}(\text{after}-\text{before}) = -4.8$ and $s_d = 5.2451$ 11. _____

Before	33	33	38	33	35	35	40	40	40	31
After	34	28	25	28	35	33	31	28	35	33
A. (-3.8, -5.8)	B. (-1.5, -8.1)	C. (-1.8, -7.8)	D. (-2.1, -7.5)	E. (-2.5, -7.1)						

12. A test of writing ability is given to a random sample of students before and after they completed a formal writing course. The results are given below. Construct a 99% confidence interval for the mean difference between the before and after scores if $\bar{d}(\text{after}-\text{before}) = -2.0$ and $s_d = 2.6457$ 12. _____

Before	70	80	92	99	93	97	76	63	68	71	74
After	69	79	90	96	91	95	75	64	62	64	76

- A. (13.6, -17.6)
- B. (0.2, -4.2)
- C. (0.1, -4.1)
- D. (0.5, -4.5)
- E. (-1.2, -2.8)

Interpret the given confidence interval.

13. A high school coach uses a new technique in training middle distance runners. He records the times for 4 different athletes to run 800 meters before and after this training. A 90% confidence interval for the difference of the means before and after the training, $\mu_B - \mu_A$, was determined to be (2.6, 4.8). 13. _____
- A. We know that 90% of all random samples done on runners at this high school will show that the mean time difference before and after the training is between 2.6 and 4.8 seconds.
 - B. Based on this sample, with 90% confidence, the average time for the 800-meter run for middle distance runners at this high school is between 2.6 and 4.8 seconds shorter after the new training.
 - C. We know that 90% of the middle distance runners shortened their times between 2.6 and 4.8 seconds after the training.
 - D. Based on this sample, with 90% confidence, the average time for the 800-meter run for middle distance runners at this high school is between 2.6 and 4.8 seconds longer after the new training.
 - E. We are 90% confident that a randomly selected middle distance runner at this high school will have a time for the 800-meter run that is between 2.6 and 4.8 seconds shorter after the training than before the training.
14. At one SAT test site students taking the test for a second time volunteered to inhale supplemental oxygen for 10 minutes before the test. In fact, some received oxygen, but others (randomly assigned) were given just normal air. Test results showed that 42 of 66 students who breathed oxygen improved their SAT scores, compared to only 35 of 63 students who did not get the oxygen. Which procedure should we use to see if there is evidence that breathing extra oxygen can help test-takers think more clearly? 14. _____
- A. 1-sample t-test
 - B. matched pairs t-test
 - C. 2-proportion z-test
 - D. 2-sample t-test
 - E. 1-proportion z-test
15. A survey asked people "On what percent of days do you get more than 30 minutes of vigorous exercise?" Using their responses we want to estimate the difference in exercise frequency between men and women. We should use a 15. _____
- A. 2-sample t-interval
 - B. 1-proportion z-interval
 - C. 1-sample t-interval
 - D. matched pairs t-interval
 - E. 2-proportion z-interval

SECTION II

Question 16

Percent of Total Grade – 50

Directions: Show all of your work. Indicate clearly the methods you use, because you will be graded on the correctness of your methods as well as on the accuracy of your results and explanations.

Choose ONE of the following three questions.

Music and Memory.

16. Is it a good idea to listen to music when studying for a big test? In a study conducted by some statistics students, 62 people were randomly assigned to listen to rap music, music by Mozart, or no music while attempting to memorize objects pictured on a page. They were then asked to list all the objects they could remember. Here are summary statistics for each group:

	Rap	Mozart	No Music
Count	29	20	13
Mean	10.72	10	12.77
SD	3.99	3.19	4.73

Does it appear that it is better to study while listening to Mozart than rap music? Test an appropriate hypothesis and state your conclusion.

Chips Ahoy.

16. In 1998, as an advertising campaign, the Nabisco Company announced a “1000 Chips Challenge,” claiming that every 18-ounce bag of their Chips Ahoy cookies contained at least 1000 chocolate chips. Dedicated statistics students at the Air Force Academy (no kidding) purchased some randomly selected bags of cookies and counted the chocolate chips in each. Some of their data are given below.

1219	1214	1087	1200
1121	1325	1345	1244
1356	1132	1191	1270
1295	1135	1419	1258

What does this evidence say about Nabisco’s claim? Test an appropriate hypothesis and state your conclusion.

Sex Sells.

16. Ads for many products use sexual images to try to attract attention to the product. But do these ads bring people's attention to the item that was being advertised? To investigate, a group of statistics students cut ads out of magazines. They were careful to find two ads for each of eight similar items, one with a sexual image and one without. They arranged the ads in random order and had subjects look at them for one minute. Then they asked the subjects to list as many of the products as they could remember. Their data are shown in the table.

Subject Number	Ads Remembered	
	Sexual Image	No Sex
1	2	2
2	6	7
3	3	1
4	6	5
5	1	0
6	3	3
7	3	5
8	7	4

Is there evidence that the sexual images mattered? Test an appropriate hypothesis and state your conclusion.