

## Stat\*2090. The list of problems for the test 1

Use the following to answer questions 1-3:

Bags of a certain brand of tortilla chips claim to have a net weight of 14 oz. Net weights actually vary slightly from bag to bag. A representative of a consumer advocate group wishes to see if there is any evidence that the mean net weight is less than advertised and so intends to test the hypotheses  $H_0: \mu = 14$ ,  $H_a: \mu < 14$  at 5% significance level. To do this, he selects 16 bags of tortilla chips of this brand at random and determines the net weight of each. He finds a sample mean of 13.88 oz with a standard deviation of  $s = 0.24$  oz.

1. What is the critical value?
  - A) 1.753
  - B) -1.753
  - C) 1.746
  - D) -1.746
  
2. What is the value of the test statistic?
  - A)  $t = -0.50$
  - B)  $t = -2.00$
  - C)  $t = -8.00$
  - D)  $t = -8.33$
  
3. Determine which of the following statements regarding the decision the representative would make is true.
  - A) He would not reject  $H_0$ , so the mean net weight of chips is less than advertised.
  - B) He would reject  $H_0$ , so the mean net weight of chips is less than advertised.
  - C) He would not reject  $H_0$ , so the mean net weight of chips is not less than advertised.
  - D) He would reject  $H_0$ , so the mean net weight of chips is not less than advertised.

Use the following to answer questions 4-6:

A simple random sample of 100 bags of tortilla chips produced at Plant A is selected every hour for quality control. In the current sample, 18 bags had more chips (measured in weight) than the labeled quantity. This sample information is being compared to data collected at Plant B. In the current sample of 100 bags of chips from Plant B, 12 bags had more chips than the labeled quantity. Is this difference of proportions of overweighed chips at Plant A and Plant B statistically significant at the 10% significance level?

4. What is the estimate for the difference in proportions,  $p_1 - p_2$ ?
  - A) 0.06
  - B) 0.6
  - C) -0.06
  - D) 0.15

5. What is the test statistic?
- A) 1.19
  - B) -1.19
  - C) 0.2348
  - D) 0.15
6. The critical values for two-tailed test at 10% significance level are  $z_{crit} = -1.645$  and  $z_{crit} = 1.645$ . Which statement is true
- A) The test statistic is not between the critical values, so  $H_0$  should be rejected.
  - B) The test statistic is between the critical values, so  $H_0$  should not be rejected.
  - C) The test statistic is not between the critical values, so  $H_0$  should not be rejected.
  - D) The test statistic is between the critical values, so  $H_0$  should be rejected.

Use the following to answer questions 7-9:

The candy company that makes M&M's claims that 10% of the M&M's it produces are green. Suppose that the candies are packaged at random in large bags of 200 M&M's. When we randomly pick a bag of M&M's we may assume that this represents a simple random sample of size  $n = 200$ . Suppose we wish to test  $H_0: p = 0.10$  versus  $H_a: p \neq 0.10$ .

7. Suppose that in the randomly selected bag of M&M's there are only 12 green M&M's. What is the test statistic?
- A)  $z = -1.886$
  - B)  $z = -0.444$
  - C)  $z = 1.886$
  - D)  $z = 0.444$
8. Find the negative critical value
- A) -1.645
  - B) -1.96
  - C) -1.66
  - D) -1.984
9. What is the margin of error for 90% confidence interval?
- A) 0.0276
  - B) 0.0168
  - C) 0.035
  - D) 0.0212

Use the following to answer questions 10-13:

A simple random sample of 100 college students was interviewed. They were asked what size pizza they usually order and what their favorite topping is. The results are presented below:

Size	Topping			Total
	Pepperoni	Veggie	Cheese	
Small	18	11	6	35
Medium	14	12	7	33
Large	3	9	20	32
Total	35	32	33	100

10. What would be the null hypothesis for a chi-square test based on these data?
  - A) Pizza topping and pizza size are independent.
  - B) The average pizza size is the same for pepperoni, veggie, and cheese pizzas.
  - C) The distribution of pizza topping is the same for small, medium, and large pizzas.
  - D) The distribution of pizza size is different for the three different pizza toppings.
  
11. Under the null hypothesis that there is no association between pizza size and pizza topping, what is the value of the expected count for a small pepperoni pizza?
  - A) 11.67
  - B) 12
  - C) 12.25
  - D) 13
  
12. What are the appropriate degrees of freedom for the chi-square statistic?
  - A) 3
  - B) 4
  - C) 6
  - D) 8
  
13. If p-value is 0.0002, it can be concluded at 1% significance level that
  - A)  $H_0$  should be rejected, so there is no association between pizza size and pizza topping.
  - B)  $H_0$  should be rejected, so the association between pizza size and pizza topping exists.
  - C)  $H_0$  should not be rejected, so there is no association between pizza size and pizza topping.
  - D)  $H_0$  should not be rejected, so the association between pizza size and pizza topping exists.

Use the following to answer questions 14-16:

Psychologists in Britain did a test with six year olds. They gave Quiz 1 then had half of the children play and gave the other half a drink of water. They then gave Quiz 2, a similar quiz, to all of the children. (Boston Globe Nov 2009). Consider a replication of this experiment with the following quiz scores for the children who drank water.

	Simon	Rani	Ethan	Natalie	Sophie	Xaioli
Quiz 1	12	10	14	10	11	14
Quiz 2	13	10	16	9	14	15

Do a complete hypothesis test at the 5% significance level to determine whether the scores after drinking water were higher? (Use the order Quiz 1 – Quiz 2). The Minitab output is listed below.

```
0.000    hypothesized value
11.833   mean Quiz 1
12.833   mean Quiz 2
-1.000   mean difference (Quiz 1 - Quiz 2)
1.414    std. dev.
0.577    std. error
6        n
5        df

-1.73    t
.0719    p-value (one-tailed, lower)

-2.484   confidence interval 95.% lower
0.484    confidence interval 95.% upper
1.484    margin of error
```

14. The alternate hypothesis is :

- A)  $H_1: \mu_1 < \mu_2$
- B)  $H_1: \mu_d < 0$
- C)  $H_1: \mu_d > 0$
- D)  $H_1: \mu_1 > \mu_2$

15. The degrees of freedom are

- A) 3
- B) 5
- C) 6
- D) 11

16. It can be concluded that

- A) The scores are not higher after drinking water.
- B) The scores are higher after drinking water.
- C) The scores are independent of drinking water.
- D) The scores of Quiz 1 and 2 are different.

17. A Type I error is committed if we make:
- A) a correct decision when the null hypothesis is false
  - B) a correct decision when the null hypothesis is true
  - C) an incorrect decision when the null hypothesis is false
  - D) an incorrect decision when the null hypothesis is true
18. For a 99% confidence interval of the population mean based on a sample of  $n = 30$  with  $s = 0.08$ , the critical value of  $t$  is
- A) 2.750
  - B) 2.756
  - C) 2.457
  - D) 2.462
19. A Type II error is committed if we make:
- A) a correct decision when the null hypothesis is false
  - B) a correct decision when the null hypothesis is true
  - C) an incorrect decision when the null hypothesis is false
  - D) an incorrect decision when the null hypothesis is true
20. A simple random sample of 100 of a certain popular model car in 2003 found that 20 had a certain minor defect in the brakes. A simple random sample of 400 of this model car in 2004 found that 50 had the minor defect in the brakes. Let  $p_1$  and  $p_2$  be the proportion of all cars of this model in 2003 and 2004, respectively, that actually have the defect. What is a 90% confidence interval for  $p_1 - p_2$ ?
- A)  $0.075 \pm 0.071$
  - B)  $0.075 \pm 0.085$
  - C)  $0.075 \pm 0.112$
  - D)  $0.079 \pm 0.071$
21. To estimate  $\mu$ , the mean salary of full professors at American colleges and universities, you obtain the salaries of a random sample of 400 full professors. The sample mean is \$73,220 and the sample standard deviation is \$4400. What is a 99% confidence interval for the mean  $\mu$ ?
- A)  $73,220 \pm 28$
  - B)  $73,220 \pm 433$
  - C)  $73,220 \pm 569$
  - D)  $73,220 \pm 4400$

22. When calculating a one-sample  $t$  confidence interval, which level of confidence will give the largest interval?
- A) 80%
  - B) 90%
  - C) 95%
  - D) 100%
23. Suppose a simple random sample size of  $n$  is drawn from an appropriately normal population. What degrees of freedom should be used to perform a one sample  $t$  procedure?
- A)  $n-1$
  - B)  $n+1$
  - C)  $n-2$
  - D)  $n+2$
24. An instructor is teaching two sections of the same basic statistics course. The instructor is giving the same exams, homework assignments, and quizzes in both sections. Which  $t$  procedure should be used to determine if there is a difference in the academic performance between the two course sections?
- A) One-sample  $t$  test.
  - B) Matched-pairs  $t$  procedure.
  - C) Two-sample  $t$  test.
  - D) None of the above.
25. Suppose two simple random samples of size 88 and 93 are drawn from a Normal population. What degrees of freedom could be used to perform a two-sample  $t$  procedure?
- A) 88
  - B) 93
  - C) 87
  - D) 92
26. A simple random sample of 20 third-grade children from a certain school district is selected, and each is given a test to measure his/her reading ability. You are interested in calculating a 95% confidence interval for the population mean score. In the sample, the mean score is 64 points, and the standard deviation is 12 points. What is the margin of error associated with the confidence interval?
- A) 2.68 points
  - B) 4.64 points
  - C) 5.62 points
  - D) 6.84 points

## Answer Key

1. B
2. B
3. B
4. A
5. A
6. B
7. A
8. A
9. A
10. A
11. C
12. B
13. B
14. B
15. B
16. A
17. D
18. B
19. C
20. A
21. C
22. D
23. A
24. C
25. C
26. C