# Math 2200 Test 3 Spring 2014

<div style="text-align:right">April 8, 2014</div>

Student No.                                    Name:

Instruction:

1. There are 20 multiple choice questions, each worth 4 points.

2. There are 10 True/False questions, each worth 2 points. These questions are lablelled **True/False**.

3. PRINT your name and RECORD student number on the SCANTRON.

4. RECORD your answers on the SCANTRON.

5. You may use a graphic calculator with statistics functions, such as TI83, TI84 or TI89. You are allowed one double-side 4x6 notecard.

6. When you look for the correct answer, keep it in mind that it may have been rounded off.

7. There are two blank pages at the end.

8. Good luck!

1. We have calculated a 95% confidence interval and would prefer for our next confidence interval to have a smaller margin of error without losing any confidence. In order to do this, we can

   I. change the $z^*$ value to a smaller number.

   II. take a larger sample.

   III. take a smaller sample.

   A. I only

   B. II only

   C. III only

   D. I and II

   E. I and III

2. **True/False** The President's job approval rating is always a hot topic. Your local paper conducts a poll of 100 randomly selected adults to determine the President's job approval rating. A CNN/USA Today/Gallup poll conducts a poll of 1010 randomly selected adults. Which poll is more likely to report that the President's approval rating is below 50%, assuming that his actual approval rating is 54%?

   A. Your local paper poll

   B. CNN/USA Today/Gallup Poll

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3. **True/False** A state has two aquariums that have dolphins, with more births recorded at the larger aquarium than at the smaller one. Records indicate that in general babies are equally likely to be male or female, but the gender ratio varies from season to season. Which aquarium is more likely to report a season when over two-thirds of the dolphins born were males?

    A. The larger aquarium

    B. The smaller aquarium

4. Cereal A box of Raspberry Crunch cereal contains a mean of 13 ounces with a standard deviation of 0.5 ounce. The distribution of the contents of cereal boxes is approximately Normal. What is the probability that a case of 12 cereal boxes contains a total of more than 160 ounces?

    A. 1.04%

    B. 1.26%

    C. 1.17%

    D. 2.68%

    E. 14.93%

### Problems 5 and 6: Physical Exercise

A random sample of 150 men found that 88 of the men exercise regularly, while a random sample of 200 women found that 130 of the women exercise regularly.

5. Based on the results, construct and interpret a 95% confidence interval for the difference in the proportions of men and women $(p_M - p_W)$ who exercise regularly.

    A. $(-15.0\%, 0.0\%)$

    B. $(-19.9\%, 7.2\%)$

    C. $(-16.6\%, 0.0\%)$

    D. $(-15.0\%, 7.2\%)$

    E. $(-16.6\%, 4.0\%)$

6. **True/False** A friend says that she believes that a higher proportion of women than men exercise regularly. Does your confidence interval support this conclusion?

    A. Yes.

    B. No.

7. The manager of an orchard expects about 70% of his apples to exceed the weight requirement for 'Grade A' designation. At least how many apples must he sample to be 90% confident of estimating the true proportion within ±4%?

   A. 19

   B. 505

   C. 23

   D. 356

   E. 89

8. A recent Gallup poll found that 28% of U.S. teens aged 13-17 have a computer with Internet access in their rooms. The poll was based on a random sample of 1028 teens and reported a margin of error of 3%. What level of confidence did Gallup use for this poll? (Round off to the nearest percentage!)

   A. 94%

   B. 96%

   C. 97%

   D. 98%

   E. 99%

9. A relief fund is set up to collect donations for the families affected by recent storms. A random sample of 400 people shows that 28% of those 200 who were contacted by telephone actually made contributions compared to only 18% of the 200 who received first class mail requests. Which formula calculates the 95% confidence interval for the difference in the proportions of people who make donations if contacted by telephone or first class mail?

   A. $\left( (0.28 - 0.18) - 1.96 \times \sqrt{\frac{0.23 \times 0.77}{200}}, \ (0.28 - 0.18) + 1.96 \times \sqrt{\frac{0.23 \times 0.77}{200}} \right)$

   B. $\left( (0.28 - 0.18) - 1.96 \times \sqrt{\frac{0.23 \times 0.77}{200} + \frac{0.23 \times 0.77}{200}}, \ (0.28 - 0.18) + 1.96 \times \sqrt{\frac{0.23 \times 0.77}{200} + \frac{0.23 \times 0.77}{200}} \right)$

   C. $\left( (0.28 - 0.18) - 1.96 \times \sqrt{\frac{0.23 \times 0.77}{400}}, \ (0.28 - 0.18) + 1.96 \times \sqrt{\frac{0.23 \times 0.77}{400}} \right)$

   D. $\left( (0.28 - 0.18) - 1.96 \times \sqrt{\frac{0.28 \times 0.72}{200} + \frac{0.18 \times 0.82}{200}}, \ (0.28 - 0.18) + 1.96 \times \sqrt{\frac{0.28 \times 0.72}{200} + \frac{0.18 \times 0.82}{200}} \right)$

   E. $\left( (0.28 - 0.18) - 1.96 \times \sqrt{\frac{0.23 \times 0.77}{400} + \frac{0.18 \times 0.82}{400}}, \ (0.28 - 0.18) + 1.96 \times \sqrt{\frac{0.23 \times 0.77}{400} + \frac{0.18 \times 0.82}{400}} \right)$

**Problems 10, 11 and 12: Sleep**

Do more than 50% of U.S. adults feel they get enough sleep? According to Gallup's December 2004 Lifestyle poll, 55.03% of U.S. adults said that that they get enough sleep. The poll was based on a random sample of 1003 U.S. adults.

10. **True/False** Which set of hypothesis should you test?

   A. $H_0 : p = 0.5$
      $H_A : p > 0.5$

   B. $H_0 : p = 0.5$
      $H_A : p < 0.5$

11. What is the $p$ value?

   A. $3.4 \times 10^{-8}$

   B. $8.2 \times 10^{-6}$

   C. $0.00071$

   D. $0.17$

   E. $0.47$

12. **True/False** State your conclusion in the context of the problem.

   A. There is strong evidence that the proprotion of U.S. adults who feel they get enough sleep is more than 50%

   B. There is not sufficient evidence that the proprotion of U.S. adults who feel they get enough sleep is more than 50%

13. We test the hypothesis that $p = 35\%$ versus $p < 35\%$. We don't know it but actually $p = 26\%$. With which sample size and significance level will our test have the greatest power?

    A. $\alpha = 0.01, n = 250$

    B. $\alpha = 0.01, n = 400$

    C. $\alpha = 0.03, n = 250$

    D. $\alpha = 0.03, n = 400$

    E. The power will be the same as long as the true proportion $p$ remains $26\%$.

14. A professor was curious about her students' grade point averages (GPAs). She took a random sample of 15 students and found a mean GPA of 3.01 with a standard deviation of 0.534. Which of the following formulas gives a 99% confidence interval for the mean GPA of the professor's students?

    A. $\left(3.01 - 2.947 \times \frac{0.534}{\sqrt{14}}, \ 3.01 + 2.947 \times \frac{0.534}{\sqrt{14}}\right)$

    B. $\left(3.01 - 2.977 \times \frac{0.534}{\sqrt{14}}, \ 3.01 + 2.977 \times \frac{0.534}{\sqrt{14}}\right)$

    C. $\left(3.01 - 2.947 \times \frac{0.534}{\sqrt{15}}, \ 3.01 + 2.947 \times \frac{0.534}{\sqrt{15}}\right)$

    D. $\left(3.01 - 2.576 \times \frac{0.534}{\sqrt{15}}, \ 3.01 + 2.576 \times \frac{0.534}{\sqrt{15}}\right)$

    E. $\left(3.01 - 2.977 \times \frac{0.534}{\sqrt{15}}, \ 3.01 + 2.977 \times \frac{0.534}{\sqrt{15}}\right)$

**Hint:** If you have a TI-83, then you will not be able to use invT function to find the critical t-score. Compute the confidence interval and compare it with the given choices. Be careful to keep enough significant digits.

15. At one vehicle inspection station, 13 of 52 trucks and 11 of 88 cars failed the emissions test. Assuming these vehicles were representative of the cars and trucks in that area, what is the standard error of the difference in the percentages of all cars and trucks that are not in compliance with air quality regulations?

    A. 0.025

    B. 0.032

    C. 0.049

    D. 0.070

    E. 0.095

**Problems 16 and 17: Doritos**

Some students checked 6 bags of Doritos marked with a net weight of 28.3 grams. They carefully weighed the contents of each bag, recording the following weights (in grams):

$$29.1, \ 28.4, \ 28.6, \ 28.8, \ 29.0, \ 29.4$$

16. Assume the weights of Dorito bags follow a normal distribution. Create the 95% confidence interval for the mean weight.

    A. $(28.51, 29.26)$

    B. $(28.29, 29.26)$

    C. $(28.29, 29.48)$

    D. $(28.17, 29.60)$

    E. $(28.51, 29.48)$

17. **True/False** Based on the result of the previous problem, we conclude that

    A. There is evidence that the company is filling the bags to more than the stated weight on average.

    B. There is no sufficient evidence that the company is filling the bags to more than the stated weight on average.

18. Based on data from two VERY LARGE independent samples, two students tested a hypothesis about equality of population means using $\alpha = 0.05$. One student used a one-tail test and rejected the null hypothesis, but the other used a two-tail test and failed to reject the null. Which of these might have been their calculated value of t-score?

   A. 1.22

   B. 1.55

   C. 1.88

   D. 2.22

   E. 2.66

19. The two samples whose statistics are given in the table thought to come from populations with equal variances. What is the pooled estimate of the population standard deviation?

| n | Mean | Std Dev |
|---|------|---------|
| 50 | 22 | 3 |
| 55 | 25 | 4 |

   A. 1.87

   B. 3.50

   C. 3.52

   D. 3.56

   E. 5.00

**Problems 20, 21 and 22: Crossing Ontario**

Between 1954 and 2003, swimmers have crossed Lake Ontario 43 times. Both women and men have made the crossing. We exclude one crossing by Vikki Keith, who swam a round trip. The summary statistics of the rest 42 trips are: (measured in minutes)

| Group | Count | Mean | Std Dev |
|--------|-------|---------|---------|
| Female | 22 | 1271.59 | 261.111 |
| Male | 20 | 1196.75 | 304.369 |

20. Construct the 95% confidence interval for the difference between male and female times ($T_m - T_f$, measured in minutes).

    A. $(-313.37, 163.7)$

    B. $(-223.11, 163.7)$

    C. $(-223.11, 73.43)$

    D. $(-234.87, 75.78)$

    E. $(-252.89, 103.21)$

21. Test using the altenative hypothesis $T_m < T_f$ and find the $p$ value.

    A. 1.87%

    B. 4.49%

    C. 20.0%

    D. 45.2%

    E. 72.3%

22. **True/False** Based on the results of the previous two problems, what is your conclusion?

    A. The average male crossing time is shorter than the average female crossing time.

    B. We are not certain whether there is difference in the average crossing time between the genders.

**Problems 23 and 24: Summer School**

Having done poorly on their math final exams in June, six students repeat the course in summer school and take another exam in August.

| June | 54 | 49 | 68 | 66 | 62 | 62 |
|--------|----|----|----|----|----|----|
| August | 50 | 65 | 74 | 64 | 68 | 72 |

23. We consider these students to be representative of all students who might attend this summer school in other years, and we assume that the exam scores of all students follows a normal distributoin. We wish to determine whether these results provide evidence that the program is worthwhile. Testing an appropriate hypothesis, what is the $p$ value?

   A. 3.29%

   B. 4.31%

   C. 6.99%

   D. 7.20%

   E. 11.2%

24. **True/False** If we conclude that the program is not worthwhile, when in fact there is an increase in students' performance, what kind of error have we made?

   A. Type I error

   B. Type II error

**Problems 25, 26 and 27: Poverty**

In a study of how the burden of poverty varies among U. S. regions, a random sample of 1000 individuals from each region of the United States recently yielded the information on poverty (based on defining the poverty level as an income below $10,400 for a family of 4 people). The data is shown in the table below. (All the conditions are satisfied - don't worry about checking them.)

|          | Northwest | Midwest | South | West |
|----------|-----------|---------|-------|------|
| Poor     | 112       | 105     | 154   | 113  |
| Not Poor | 888       | 895     | 846   | 887  |

25. What is the expected number of poor perple in each region?

    A. 105

    B. 121

    C. 484

    D. 879

    E. 3516

26. Doing a $\chi^2$ test, what is the $p$ value?

    A. $2.9 \times 10^{-3}$

    B. 0.043

    C. 0.078

    D. 0.23

    E. 14.01

27. **True/False** With the $p$ value in the previous problem, state the appropriate conclusion.

    A. There is not enough evidence to reject that poverty is independent of geographic location in the United States.

    B. There is strong evidence to conclude that poverty is associated with geographic location in the United States.

**Problems 28, 29 and 30: Fish Diet**

Medical researchers followed 6272 Swedish men for 30 years to see if there was any association between the amount of fish in their diet and the prostate cancer.

| Fish Consumption | Total subjects | Prostate Cancer |
|---|---|---|
| Never/seldom | 124 | 14 |
| Small part of diet | 2621 | 201 |
| Moderate part | 2978 | 209 |
| Large part | 549 | 42 |

We are to do a $\chi^2$ test for independence.

28. **True/False** What are the null hypothesis and the alternative hypothesis?

   A. $H_0$ : Prostate cancer and fish consumption are independent.
      $H_A$ : There is an association between prostate cancer and fish consumption.

   B. $H_0$ : There is no linear association between Prostate cancer and fish consumption.
      $H_A$ : There is a strong linear association between Prostate cancer and fish consumption.

29. What is the expected number of people who had no prostate cancer and never or seldom eat fish?

   A. 106.9

   B. 110

   C. 2756.7

   D. 114.79

   E. 9.21

30. What is the $p$ value?

   A. $1.78 \times 10^{-4}$

   B. 0.0198

   C. 0.0374

   D. 0.0455

   E. 0.2985

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