STAT303 Sec 508-510
Spring 2011
Exam #3
Form A

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1. **Don't even open this until you are told to do so.**
2. There are 20 multiple-choice questions on this exam, each worth 5 points. There is partial credit. Please mark your answers **clearly**. Multiple marks will be counted wrong.
3. You will have 60 minutes to finish this exam.
4. If you have questions, please write out what you are thinking on the back of the page so that we can discuss it after I return it to you.
5. If you are caught cheating or helping someone to cheat on this exam, you both will receive a grade of **zero** on the exam. You must work alone.
6. This exam is worth the 15% of your course grade.
7. When you are finished please make sure you have marked your CORRECT section (Tuesday 12:45 is 508, 2:20 is 509, and 3:55 is 510) and FORM and 20 answers, then turn in JUST your scantron to the correct pile for your section.
8. Good luck!

1. If I test $H_0 : \pi = 0.5$ vs. $H_A : \pi \neq 0.5$ and reject at the 10% level, then

   A. I would also reject at the 1 and 5% levels.
   B. 0.5 would be in a 90% confidence interval for the true proportion.
   C. 0 would be outside a 90% confidence interval for the true proportion.
   D. All of the above are true.
   E. None of the above are true.

2. Which of the following situations for a hypothesis test would be the LEAST likely to make a Type II error when testing $H_0 : \pi = 0.5$ if $\pi = 0.8$?

   A. $n = 100, \alpha = 0.01$ and $H_A : \pi \neq 0.5$
   B. $n = 100, \alpha = 0.01$ and $H_A : \pi > 0.5$
   C. $n = 100, \alpha = 0.10$ and $H_A : \pi \neq 0.5$
   D. $n = 100, \alpha = 0.10$ and $H_A : \pi > 0.5$
   E. $n = 50, \alpha = 0.10$ and $H_A : \pi \neq 0.5$

3. According to recent studies, 1% of all patients who undergo laser surgery to correct their vision (*i.e.*, LASIK) have serious post-laser vision problems (All About Vision, 2006). In a random sample of 100,000 LASIK patients, let X be the number who experience serious post-laser vision problems. Find the approximate probability that fewer than 950 patients in a sample of 100,000 will experience serious post-laser vision problems.

   A. 0.0287
   B. 0.0559
   C. 0.2981
   D. 0.0516
   E. None of the above are true SINCE we do NOT know the sampling distribution.

4. Using the information below, what is the correct range of the p-value if I wanted to test $H_0 : \pi = 0.25$ vs. $H_A : \pi \neq 0.25$?

```
90% (0.286, 0.514)
95% (0.264, 0.536)
99% (0.222, 0.578)
```

   A. p-value > 0.10 0.5 is in all of the intervals
   B. $0.10 > p$-value > 0.05
   C. $0.05 > p$-value > 0.01
   D. p-value< 0.01, 0 isn't in any of the intervals
   E. This is a z-test, so we should get an exact p-value.

5. Does your major affect your grade expectations? The table below show the counts and expected counts for *college* and *expected grade* from our survey.

```
     AGLS | EDUC | GEOS | GEST | LIBA | SCIE | Total
A      15 |   20 |    6 |    1 |  13  |    6 |   61
     12.71| 24.4 | 5.083| 3.05 |10.68 | 5.083|
----------+------+------+------+------+------+-------
B       9 |   20 |    4 |    4 |   6  |    3 |   46
     9.583| 18.4 | 3.833|  ????| 8.05 | 3.833|
----------+------+------+------+------+------+-------
C       1 |    8 |    0 |    1 |   2  |    1 |   13
     2.708| 5.20 | 1.083| 0.65 | 2.27 | 1.083|
----------+------+------+------+------+------+-------
Total  25 |   48 |   10 |    6 |  21  |   10 |  120

Statistic    DF    Value    P-value
Chi-square       9.459864    0.4891
```

   How likely is a *GEOS* major to expect an *A*?

   A. 6/61
   B. 6/10
   C. 6/120
   D. 5.083/61
   E. 5.083/10

6. Suppose you expect a C, then you are mostly likely a

   A. AGLS major
   B. EDUC major
   C. GEOS major
   D. GEST major
   E. LIBA major

7. What are the correct degrees of freedom for the χ^2-test for the table above (the one in the last 2 problems)?

   A. 28
   B. 18
   C. 10
   D. 119
   E. 15

8. What is the correct conclusion for the χ^2-test?

   A. Since the p-value is large, we can say your major does affect your expected grade.
   B. Since the p-value is large, we can't say your major affects your expected grade.
   C. Since the p-value is large, we can say your major doesn't affect your expected grade.
   D. The test is invalid since not all the expected counts are at least 5.
   E. The test is invalid since not all the expected counts are at least 1.

9. If expected grade and major (college) are independent, what is the expected count for a general studies (GEST) major who expects a B?

   A. 2.30
   B. 4
   C. 6.96
   D. 17.25
   E. 69

10. A commonly prescribed drug on the market for relieving nervous tension is believed to be 60% effective. Experimental results with a new drug administered to a random sample of 100 adults who were suffering from nervous tension showed that 72 of them showed improvement. Is there sufficient evidence that the new drug is superior to the one commonly prescribed? Which set of hypotheses is the most appropriate for this situation?

    A. $H_0 : p \leq 0.72$ vs. $H_A : p > 0.72$
    B. $H_0 : p = 0.72$ vs. $H_A : p \neq 0.72$
    C. $H_0 : \pi = 0.72$ vs. $H_A : \pi \neq 0.72$
    D. $H_0 : \pi = 0.6$ vs. $H_A : \pi \neq 0.6$
    E. $H_0 : \pi \leq 0.6$ vs. $H_A : \pi > 0.6$

11. If we stated the alternative above as "the new drug is better than the commonly used drug", which of the following would be true?

    A. A Type I error would be failing to prove your drug is better when it is so, as the manufacturer you would want to use a small α-level.
    B. A Type II error would be failing to prove your drug is better when it is so, as the manufacturer you would want to use a small α-level.
    C. A Type I error would be failing to prove your drug is better when it is so, as the manufacturer you would want to use a large α-level.
    D. A Type II error would be failing to prove your drug is better when it is so, as the manufacturer you would want to use a large α-level.
    E. A Type I error would be marketing an inferior drug, so as the manufacturer you would want to use a large α-level.

12. Suppose a 90% confidence interval for the true proportion, π, is (0.046, 0.251). Which of the following is true?

    A. The true proportion will only be larger than 0.251 5% of the time.
    B. The true proportion will be between 0.046 and 0.251 only 90% of the time.
    C. The true proportion should fall between 0.046 and 0.251 about 90% of the time.
    D. The true proportion may or may not be between 0.046 and 0.251.
    E. None of the above are correct.

13. What is the approximate distribution of the sample proportion of successes, p, if $n = 40$ and $\pi = 0.7$)?

    A. $p \sim N(0.7, 0.072^2)$
    B. $\pi \sim N(0.7, 0.072^2)$
    C. $p \sim N(0.7, 0.00525^2)$
    D. $\pi = 0.7$ is normal, but $\pi = 1 - 0.7$ is not.
    E. None of the above are correct.

14. Clinical trials involved treating flu patients with Tamiflu, which is a medicine intended to attack the in fluenza virus and stop it from causing flu symptoms. In a recent study, 9.9% of patients treated with Tamiflu experienced nausea as an adverse reaction. If we want to use a 0.05 significance level to test the claim that the rate of nausea is greater with Tamiflu than the 6% rate experienced by flu patients given a placebo, which set of hypotheses should we use?

    A. $H_0 : \pi_{Tami} \leq \pi_{not}$ vs. $H_A : \pi_{Tami} > \pi_{not}$
    B. $H_0 : \pi_{Tami} = \pi_{not}$ vs. $H_A : \pi_{Tami} \neq \pi_{not}$
    C. $H_0 : \pi_{Tami} \leq 0.06$ vs. $H_A : \pi_{Tami} > 0.06$
    D. $H_0 : \pi_{Tami} = 0.06$ vs. $H_A : \pi_{Tami} \neq 0.06$
    E. $H_0 : \pi_{Tami} \leq 0.099$ vs. $H_A : \pi_{Tami} > 0.099$

15. If the p-value in the test above (it doesn't matter which answer you choose) was 0.0221, which of the following would be true if 12% of the patients treated with Tamiflu experienced nausea instead of 9.9% but everything else, alternative sign, sample size, etc. stayed the same?

    A. The p-value would be smaller since the null would be less believable.
    B. The p-value would be smaller since the null would be more believable.
    C. The p-value would be larger since the null would be less believable.
    D. The p-value would be larger since the null would be more believable.
    E. We would have to run another test to find out.

16. Testing $H_0 : \pi \leq 0.5$ vs. $H_A : \pi > 0.5$, I get a p-value of 0.064 from a sample proportion, $p = 0.75$. Which of the following the best interpretation of the p-value?

    A. 75% of the time I would get this sample proportion or more even though the true proportion is only 50%.
    B. 75% of the time I would get this sample when the true proportion is more than 50%.
    C. 6.4% of the time I would get at least 50% when I should get 75%.
    D. 6.4% of the time I would get a sample proportion of at least 75% when the true proportion is no more than 50%.
    E. 75% of all sample proportions from this population with mean 50% are more than 64%.

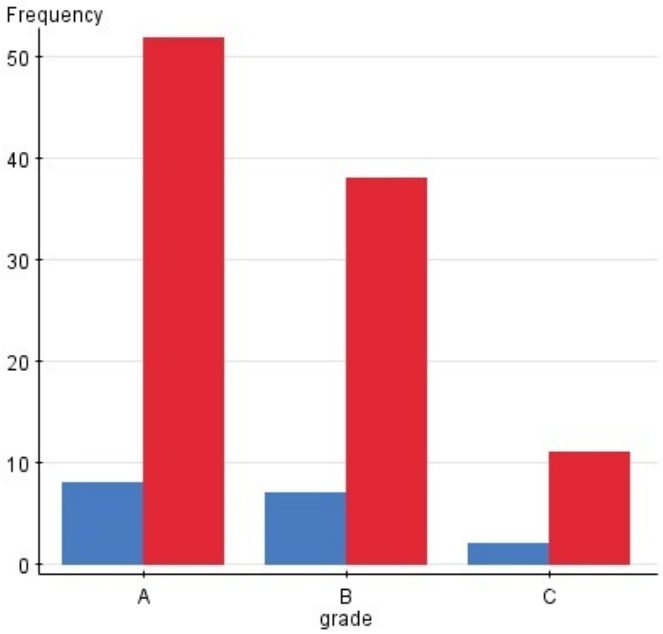
17. Which of the following statements are true?

    A. We must use the standard error of p when running a hypothesis test on π since we don't know what the true value of π is.
    B. We must use 0.5 for p when calculating the necessary sample size for a given margin of error since it is the average value (middle of 0 and 1).
    C. We can use the z-test (normal approximation) for testing $H_0 : \pi_1 = \pi_2$ as long as one of the sample proportions, p's is normal.
    D. Two of the above are true statements.
    E. None of the above are true statements.

18. Using the information below, what is the correct range of the p-value if I wanted to test $H_0 : \pi_1 = \pi_2$ vs. $H_A : \pi_1 \neq \pi_2$?

```
90% (-0.015, 0.215)
95% (-0.037, 0.237)
99% (-0.080, 0.280)
```

    A. p-value > 0.10
    B. $0.10 > p$-value > 0.05
    C. $0.05 > p$-value > 0.01
    D. p-value < 0.01
    E. You need a test statistic value to determine the p-value.



19. The plot above compares 'expected grade' for left and right handed students (the shorter bars are for lefties). Which of the following is true about the data represented in the graph?

    A. More students expect an A no matter which hand they use.
    B. The proportions look similar so there doesn't seem to be a relationship between 'hand' and 'expected grade'.
    C. There are roughly four to five times as many right handed students as left.
    D. All of the above are true.
    E. Only two of the above are true.

20. If we want to test the claim the left handedness is "more common in males than females", what is the correct p-value?

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Hypothesis test results:
p1 : proportion left handed females
p2 : proportion left handed males, p1-p2: difference
H0 : p1 - p2 = 0 vs. HA : p1 - p2 not= 0
Diff Count1 Total1 Count2 Total2 Diff.   Std. Err.
p1-p2      9     65      8     59 0.0029 0.062
      Z-Stat P-value
      0.046   0.963
```

    A. 0.963
    B. 0.037
    C. 0.074
    D. 0.4815
    E. 0.5185

1E,2D,3B,4C,5B,6B,7C,8E,9A,10E,11D,
12D,13A,14C,15A,16D,17E,18A,19D,20E