- The next three questions refer to the following situation

  The Excellent Drug Company claims its aspirin tablets will relieve headaches faster than any other aspirin on the market. To determine whether Excellent's claim is valid, random samples of size 15 are chosen from aspirins made by Excellent and the Simple Drug Company. An aspirin is given to each of the 30 randomly selected persons suffering from headaches and the number of minutes required for each to recover from the headache is recorded. The sample results are:

	$\bar{X}$	s^2
Excellent (E)	8.4	4.2
Simple (S)	8.9	4.6

  A 5% significance level of two-sample z-Test is performed to determine whether Excellent's aspirin cures headaches significantly faster than Simple's aspirin.

  - The appropriate hypothesis to be tested is:
    1. $H_0 : \mu_E - \mu_S = 0 \quad H_a : \mu_E - \mu_S > 0$
    2. $H_0 : \mu_E - \mu_S = 0 \quad H_a : \mu_E - \mu_S < 0$
    3. $H_0 : \mu_E - \mu_S = 0 \quad H_a : \mu_E - \mu_S \neq 0$
  - Absolute value of the calculated value of the appropriate test statistic is:
    1. 1.61
    2. 2.33
    3. 0.65
    4. 1.24
    5. 0.85
  - Absolute value of the critical value for this test is:
    1. 1.960
    2. 1.701
    3. 2.048
    4. 2.145
    5. 1.645

- A researcher wishes to test a particular hypothesis about a new technique that has been developed in the laboratory. Experience shows that the variable being measured can reasonably be considered to be normally distributed. In order to test to determine if the new technique is more precise than the old standard technique the researcher uses the Wilcoxon Rank Sum Test. The researcher has used a procedure which

  1. is easier to use and is more informative than a t-test.

  2. has greater power to detect small differences than the t test in this case.

  3. may be easier to use but is less powerful than the t test in this circumstance.

  4. is both inappropriate and invalid.

- We wish to test if a new feed increases the mean weight gain compared to an old feed. At the conclusion of the experiment it was found that the new feed gave a 10 kg bigger gain than the old feed. A two-sample t-test with the proper one-sided alternative was done and the resulting p-value was .082. This means:

  1. there is an 8.2% chance the null hypothesis is true.

  2. There was only a 8.2% chance of observing an increase greater than 10 kg (assuming the null hypothesis was true).

  3. There was only an 8.2% chance of observing an increase greater than 10 kg (assuming the null hypothesis was false).

  4. There is an 8.2% chance the alternate hypothesis is true.

  5. There is only an 8.2% chance of getting a 10 kg. increase.

- The infamous researcher, Dr. Gnirips, claims to have found a drug that causes people to grow taller. The coach of the Basketball team at Brandon University has expressed interest but demands evidence. Ten people are randomly selected from students at Brandon, their heights measured, the drug administered, and 2 hours later their heights re-measured. The results were as follows:

Person	1	2	3	4	5	6	7	8	9	10
Pre-Drug	68	69	74	78	70	66	71	70	71	65
Post-Drug	70	69	75	78	73	69	72	73	72	66

  Using the paired t-test, an appropriate decision rule for the hypotheses H_0:Drug has no effect versus H_a: Drug increases height at (a = .05) will be

  1. Reject H_0 if the test statistic is > 1.96
  2. Reject H_0 if the test statistic is > 1.645
  3. Reject H_0 if the test statistic is > 1.83
  4. Reject H_0 if the test statistic is > 1.73
  5. Reject H_0 if the test statistic is > 2.10

- A group of 10 men were given a special diet for two weeks to test weight loss in pounds. To determine if the data provide sufficient evidence to indicate the special diet leads to a weight loss, the appropriate test procedure is either:

  1. two sample t-test or Rank Sum test
  2. paired t-test or Sign test
  3. two sample t-test or Sign test
  4. paired t-test or Rank Sum test

- A statistics professor would like to determine whether students in his class showed improved performance on the final examination as compared to the mid-term examination. A random sample of 4 students selected from a large class revealed the following mid-term and final scores:

Student	1	2	3	4
Mid-term	70	62	57	68
Final	80	79	87	88

  Making the appropriate normal assumptions, the value of the test statistic is:

  1. 19.25/8.30
  2. 19.25/(8.30/2)
  3. 19.25/sqrt(28.295/4 + 28.295/4)
  4. 19.25/sqrt(34.92/4 + 21.67/4)
  5. 19.25/(2/8.30)

- The following data give uric acid levels (in milligrams per 100 milliliters) for 5 subjects before and after a special diet.

Subject	Before	After
1	5.2	5.2
2	6.3	6.2
3	6.4	6.3
4	5.5	5.6
5	5.9	5.6

  To test the hypothesis that the diet reduces the uric acid level, we might use

  a. a two sample t-test since the uric acid levels before and after the diet can be assumed independent.

  b. a sign test

  c. a paired t-test

  d. a and b

  e. b and c

- The following 3 questions refer to the following

  An agricultural field station is investigating the differences between the mean yields of two varieties of corn. They are particularly interested in testing if the second variety gives a lower yield than the first variety. Because of fertility differences, both varieties were planted in each of seven farms across the province. At harvest time, the plots were harvested and the yield recorded. The output from some statistical software appears below:

Paired t-Test			
Mean Difference	2.809715	Prob $> \|t\|$	0.0584
Std Error	1.204112	DF	6

  - The null and alternate hypotheses are:
    1. $H_0 : \bar{X}_{\text{diff}} = 0 \quad H_a : \bar{X}_{\text{diff}} \neq 0$
    2. $H_0 : \mu_{\text{diff}} = 0 \quad H_a : \mu_{\text{diff}} > 0$
    3. $H_0 : \mu_{\text{diff}} = 0 \quad H_a : \mu_{\text{diff}} \neq 0$
    4. $H_0 : \mu_{\text{diff}} = 0 \quad H_a : \mu_{\text{diff}} < 0$
  - The test statistic and p-value are:
    1. 2.333 .0584
    2. 1.204 .0292
    3. 2.810 .0584
    4. 1.204 .9708
    5. 2.333 .0292

- Suppose that 100 students in a physical-education class shoot at a target with a bow and arrow. They either hit the target or miss it. These 100 students are then given a demonstration on the proper technique for shooting with the bow and arrow. After the demonstration, they again shoot at the target. In order to investigate the hypothesis that the demonstration was helpfu, we record each student's performances (*miss* or *hit*) before and after the demonstration. Which of the following is correct?

  1. We should do a χ^2 test for homogeneity.
  2. We should do a χ^2 test for independence.
  3. We should not use a χ^2 test.

- The next set of questions refer to the following situation In the paper "Color Association of Male and Female Fourth-Grade School Children" (J. Psych., 1988, 383-8), children were asked to indicate what emotion they associated with the color red. The response and the sex of the child are noted and summarized below. The first number in each cell is the count, the second number is the row percent.

Frequency	anger	happy	love	pain	Total
f	27	19	39	17	102
m	34	12	38	28	112
Total	61	31	77	45	214

  - Under a suitable null hypothesis, the expected frequency for the cell corresponding to Anger and Males is:
    1. 15.9
    2. 55.7
    3. 30.4
    4. 31.9
    5. 29.1
  - The null hypothesis will be rejected at =0.05 if the test statistic exceeds:
    1. 3.84
    2. 5.99
    3. 7.81
    4. 9.49
    5. 14.07
  - Which of the following is NOT CORRECT?

    1. The children were cross-classified by sex and emotion associated with red. Each child was counted in one and only one cell.

    2. The null hypothesis is that the type of emotion associated with red is independent of the sex of the child.

    3. The null hypothesis is that the proportion of emotions associated with red is the same for both sexes.

    4. If we reject the null hypothesis than we have proven that the two sexes associate red with emotions in different ways.

- The next set of questions refer to the following situation:

  A survey was conducted to investigate the severity of rodent problems in egg and poultry operations. A random sample of operators was selected, and the operators were classified according to the type of operation and the extent of the rodent population. A total of 78 egg operators and 53 turkey operators were classified and the summary information is:

Count	egg	turkey	
mild	26	27	53
moderate	37	22	59
server	15	4	19
	78	53	131

  The corresponding χ^2 test statistic is equal to 5.635.

  - The expected count in the (egg, mild infestation) cell is:
    1. about 26.00
    2. about 33.33
    3. about 53.00
    4. about 31.55
    5. about 78.00
  - The approximate p-value is found to be:
    1. about .060
    2. about .014
    3. about .032
    4. about .008
    5. about .05

– Which of the following is not correct?

  1. Operators who had both operations could not be used because this type of analysis requires each unit to be counted in one and only one cell.

  2. The null hypothesis is that the severity of the rodent problem is independent of the type of operator.

  3. The alternate hypothesis is that the proportion of turkey operators with mild, moderate, and severe rodent problems is different from the proportion of egg operators with mild, moderate, and severe rodent problems.

  4. A Type I error would be to conclude that the severity of rodent problems is dependent upon the type of operator while, in fact, the proportion of turkey operators with mild, moderate, and severe rodent problems is the same as the proportion of egg operators with mild, moderate, and severe rodent problems.

  5. A Type II error would be to conclude that the proportion of egg operators with mild, moderate, or severe rodent problems is the same as the proportion of turkey operators with mild, moderate, or severe rodent problems when in fact they are independent.

– One reviewer of the study suggested that there may be a problem with the study because results from small operators were pooled with the results from large operators. Which of the following is NOT CORRECT?

  1. Simpson's paradox occurs when conclusions from a pooled table differ from the individual tables.

  2. Tables can be pooled when the underlying rates are equal among tables.

  3. Simpson's paradox occurs when tables with unequal row totals are pooled.

  4. Inspection of the row or column percents will give a good clue if Simpson's paradox is likely to occur.