TIM7100

DATA FILE 9

ASSIGNMENT 10

1. What is the probability that a randomly selected observation exceeds the
   1. Mean of a normal distribution?
   2. Median of a normal distribution?
   3. Mean of a non-normal distribution?
   4. Median of a non-normal distribution?
2. Data for the average cost of a major remodeling job nearly 20 years ago in 11 selected US cities were captured and are shown below:

|  |  |
| --- | --- |
| ***City*** | ***Average Cost*** |
| **Atlanta, GA** | **$20,427** |
| **Boston, MA** | **27,255** |
| **Des Moines, IA** | **22,115** |
| **Kansas City, MO** | **23,256** |
| **Louisville, KY** | **21,887** |
| **Portland, OR** | **24,255** |
| **Raleigh-Durham, NC** | **19,852** |
| **Reno, NV** | **23,624** |
| **Ridgewood, NJ** | **25,885** |
| **San Francisco, CA** | **28,999** |
| **Tulsa, OK** | **20,836** |

* 1. Under what circumstances could a ***t-test*** be used to determine whether the mean cost of remodeling a kitchen in the United States was greater than $25,000?
  2. What is the name of an alternative nonparametric test? Specify the null and alternative hypotheses of the test.
  3. Conduct the test in part b using α = .05. Interpret your results in the context of the problem.

1. A couple of decades ago, two researchers sampled private sector and public sector organizations in Australia to study the planning undertaken in their information systems departments. The researchers asked each sample organization how much it had spent on information systems and technology in the previous fiscal year as a percentage of the organization’s total revenues. The results are reported in the table below.

|  |  |
| --- | --- |
| ***Private Sector*** | ***Public Sector*** |
| 2.58% | 5.40% |
| 5.05 | 2.55 |
| .05 | 9.00 |
| 2.10 | 10.55 |
| 4.30 | 1.02 |
| 2.25 | 5.11 |
| 2.50 | 12.42 |
| 1.94 | 1.67 |
| 2.33 | 3.33 |

* 1. Do the two sampled populations have identical probability distributions or is the distribution for public sector organizations in Australia located to the right of Australia’s private sector firms. Test using α = .05.
  2. Is the p-value for the test less than or greater than .05. Justify your answer.

1. Flextime, which allows employees to design their own 40-hour work week may be one way to combat problems associated with motivation and absenteeism. One large manufacturing firm was considering implementing flextime for its employees, depending on the success or failure of a pilot program. Ten employees were randomly selected and given a questionnaire designed to measure their attitude toward their job. Each was then permitted to design and follow a flextime workday. After six months, attitudes toward their job were again measured. The resulting attitude scores are display in the table below. The higher the score, the more favorable the employee’s attitude toward his or her work. Use a nonparametric test procedure to evaluate the success of the pilot flextime program. Test using α = .05.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Employee*** | ***Before*** | ***After*** | ***Employee*** | ***Before*** | ***After*** |
| ***1*** | **54** | **68** | ***6*** | **82** | **88** |
| ***2*** | **25** | **42** | ***7*** | **94** | **90** |
| ***3*** | **80** | **80** | ***8*** | **72** | **81** |
| ***4*** | **76** | **91** | ***9*** | **33** | **39** |
| ***5*** | **63** | **70** | ***10*** | **90** | **93** |

1. Suppose you want to use the Kruskal-Wallis *H-test* to compare the probability distributions of three populations. The following are independent random samples selected from the three populations:

I: 66, 23, 55, 88, 58, 62, 79, 49

II: 19, 31, 16, 29, 30, 33, 40

III: 75, 96, 102, 75, 98, 78

* 1. What type of experimental design was used?
  2. Specify the null and alternative hypotheses you would test.
  3. Specify the rejection region you would use for your hypothesis test at α = .01.
  4. Conduct the test at α = .01.

1. Compute Spearman’s rank correlation coefficient for each of the following pairs of sample observations:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***x*** | 33 | 61 | 20 | 19 | 40 |
| ***y*** | 26 | 36 | 65 | 25 | 35 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***x*** | 89 | 102 | 120 | 137 | 41 |
| ***y*** | 81 | 94 | 75 | 52 | 136 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***x*** | 2 | 15 | 4 | 10 |
| ***y*** | 11 | 2 | 15 | 21 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***x*** | 5 | 20 | 15 | 10 | 3 |
| ***y*** | 80 | 83 | 91 | 82 | 87 |

1. Many water treatment facilities supplement the natural fluoride concentration with hydrofluosilicic acid in order to reach a target concentration of fluoride in drinking water Certain levels are thought to enhance dental health but very high concentrations can be dangerous. Suppose that one such treatment plant targets 0.75 milligrams per liter (mg/L) for their water. The plant tests 25 samples each day to determine whether the median level differs from the target.
   1. Set up the null and alternative hypotheses.
   2. Set up the test statistic and rejection region using α = .10.
   3. Explain the implication of a Type I error in the context of this application. Explain the implication of a Type II error in the context of this application.
   4. Suppose that one day’s samples result in 18 values that exceed 0.75 mg/L. Conduct the test and state the appropriate conclusion in the context of this application.