**Final Exam Practice Problems**

1. Fifteen percent of the employees in a company have managerial positions, and 25 percent of the employees in the company have MBA degrees. Also, 60 percent of the managers have MBA degrees. Using the probability formulas,
   1. Find the probability that an employee is a manager and has MBA degrees.
   2. Find the probability that an employee is a manager given they have an MBA.
   3. *IS being a manager* and *having an MBA* independent? Justify your answer.

2. The percentage of Americans who have confidence in U.S. banks dropped to 23% in June 2010, which is far below the pre-recession level of 41% reported in June 2007 ([gallup.com](http://gallup.com)).

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| a. | What is the probability that fewer than half of 10 Americans in 2010 have confidence in U.S. banks? |
| b. | What would have been the corresponding probability in 2007? |

3. According to a recent government report, the aging of the U.S. population is translating into many more visits to doctors’ offices and hospitals (*USA Today,* August 7, 2008). It is estimated that an average person makes four visits a year to doctors’ offices and hospitals.

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| a. | What are the mean and the standard deviation of an average person’s number of monthly visits to doctors’ offices and hospitals? |
| b. | What is the probability that an average person does not make any monthly visits to doctors’ offices and hospitals? |
| c. | What is the probability that an average person makes at least one monthly visit to doctors’ offices and hospitals? |

4. The weight of turkeys is normally distributed with a mean of 22 pounds and a standard deviation of 5 pounds.

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| a. | Find the probability that a randomly selected turkey weighs between 20 and 26 pounds. |
| b. | Find the probability that a randomly selected turkey weighs less than 12 pounds. |

5. A machine that is programmed to package 1.20 pounds of cereal in each cereal box is being tested for its accuracy. In a sample of 36 cereal boxes, the mean and standard deviation are calculated as 1.22 pounds and 0.06 pound, respectively.

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|  | 1. Set up the null and the alternative hypotheses to determine if the machine is working improperly—that is, it is either underfilling or overfilling the cereal boxes. |
|  | 1. Calculate the value of the test statistic. |
|  | 1. At a 5% level of significance, can you conclude that the machine is working improperly? Explain. |
|  | 6. **Excel Tab: Field Score** A human resource specialist wants to determine whether the average job satisfaction score (on a scale of 0 to 100) differs depending on a person’s field of employment. She collects scores from 30 employees in three different fields.  a. At the 10% significance level, can we conclude that the average job satisfaction differs by field? |

7. **Excel tab: Property Taxes**. The accompanying table shows a portion of data that refers to the size of a home (in square feet) and its property taxes owed by the owner (in $) in an affluent suburb 30 miles outside New York City.

1. Determine the sample regression equation that enables us to predict property taxes on the basis of the size of the home.
2. Interpret the slope coefficient.
3. Predict the property taxes for a 1500-square-foot home.

8. Nearly one in three children and teens in the United States is obese or overweight (Health, October 2010). A health practitioner in the Midwest collects data on 200 children and teens and finds that 84 of them are either obese or overweight. The health practitioner believes that the proportion of obese and overweight children in the Midwest is not representative of the national proportion

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| a. | Specify the hypothesis test. |
| **b.** | At a 99% confidence level. Do the sample data support the health practitioner’s belief? |

9. Excel tab: **Weightloss**

A diet center claims that it has the most effective weight loss program in the region. Its advertisements say, “Participants in our program lose more than 5 pounds within a month.” Six clients of this program are weighed on the first day of the diet and then one month later.

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| a. | Specify the null and alternative hypotheses that test the diet center’s claim. |
| b. | At the 5% significance level, do the data support the diet center’s claim? |

Solutions:

1. **a.** *P*(Mgr) =0.15   
   *P*(MBA) =0.25   
   P(MBA| Mgr) = 0.60  
   *P*(Mgr⋂ MBA) =*P*(Mgr)P(MBA| Mgr) = (0.15)(0.60) = 0.09

**b.** *P*(Mgr| MBA) = *P*(Mgr⋂ MBA) /*P*(MBA) = 0.09 / 0.25 = 0.36

**c.** Manager and MBA are dependent since *P*(Mgr|MBA) = 0.36 does not equal *P*(Mgr) = 0.15

1. Using the binomial probability formula—also, you can use excel!



3. Using the Poisson formula. You can also use excel!

4. Let *X* represent the weight of a turkey.

5.

* 2. .
  3. ***p*-value approach** 0.05 < *p*-value < 0.10. Since the *p*-value The sample data do not suggest that the machine is working improperly.

; the critical values are ―2.030 and 2.030. . Same conclusion as in c.

6. ANOVA: Single Factor

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| SUMMARY | | | | | | | |  | |  | | |  | | | |  | | | |  | |
| *Groups* | | | | | | *Count* | | *Sum* | | *Average* | | | *Variance* | | | |  | | | |  | |
| Field 1 | | | | | | 30 | | 2438 | | 81.26667 | | | 35.16782 | | | |  | | | |  | |
| Field 2 | | | | | | 30 | | 2249 | | 74.96667 | | | 36.44713 | | | |  | | | |  | |
| Field 3 | | | | | | 30 | | 2400 | | 80 | | | 15.44828 | | | |  | | | |  | |
|  | |  | |  | |  | | | | |  | | |  | | | |  | | |
| ANOVA | | |
| *Source of Variation* | | | | *SS* | | | | | *df* | | *MS* | | | *F* | | *P-value* | | *F crit @ 10%* | |
| Between Groups | | | | 666.2889 | | | | | 2 | | 333.1444 | | | 11.4794 | | 3.76E-05 | | 2.364616 | |
| Within Groups | | | | 2524.833 | | | | | 87 | | 29.02107 | | |  | |  | |  | |
| Total | | | | 3191.122 | | | | | 89 | |  | | |  | |  | |  | |

At we reject . At the 10% significance level, we can conclude that the average job **satisfaction differs by field.**

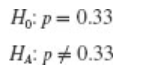
7.

* 1. Excel Output:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Regression Statistics* | | | | | | |
| Multiple R | | | | | 0.758682 | |
| R Square | | | | | 0.575598 | |
| Adjusted R Square | | | | | 0.55202 | |
| Standard Error | | | | | 6641.919 | |
| Observations | | | | | 20 | |
| ANOVA | |  |  | | | |  | |  | |  | | |  | | |
|  | | *df* | *SS* | | | | *MS* | | *F* | | *Significance F* | | | |
| Regression | | 1 | 1076965251 | | | | 1076965251 | | 24.41263127 | | 0.000105524 | | | |
| Residual | | 18 | 794071491 | | | | 44115082.83 | |  | | |  | | | |
| Total | | 19 | 1871036742 | | | |  | |  | |  | | | |
|  | *Coefficients* | | | *Standard Error* | | *t Stat* | | *P-value* | | *Lower 95%* | | | *Upper 95%* | |
| Intercept | 6499.413 | | | 3918.948 | | 1.658458 | | 0.114549 | | -1733.99 | | | 14732.82 | |
| Size | 6.806259 | | | 1.37753 | | 4.940914 | | 0.000106 | | 3.912175 | | | 9.700343 | |

The estimated model is

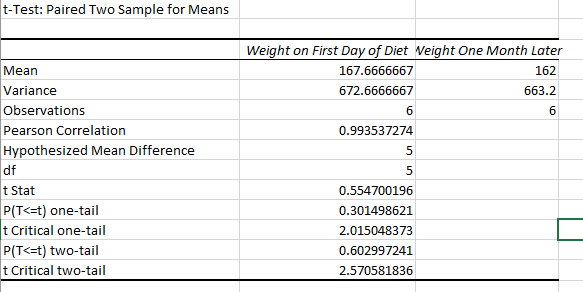
* 1. As Size increases by 1 square foot, the property taxes are predicted to increase by $6.81.
  2. When

8.

a.

b. reject the null hypothesis at 99% confidence (test-statistic 2.71, CV 2.58 and -2.58) (p value is **0.006**)

9. Paired T-test

1. 

Fail to Reject the Null Hypothesis. The diet center’s **claim is not supported by the data** at the with 95% confidence.