**Homework 5**

1. Students in the new MBA class at a state university has the following specialization profile: Finance-67, Marketing-45, Operations and Supply Chain Management-51, Information Systems-18. Find the probability that a student is either a finance or marketing major. Are the events finance specialization and marketing specialization mutually exclusive? If so, what assumption must be made?

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| Given : finance-67, marketing-45, operations and supply chain management-51, information systems-18 | | | | | | | | | |
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| Total students =67+45+51+18=181 | | | |  |  |  |  |  |  |
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| Let A probability that students are from financial = 5/181=0.35911 | | | | | | |  |  |  |
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| Let B probability that students are from marketing = 45/181=0.2486 | | | | | | |  |  |  |
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| It is given that the two are mutually exclusive then P(AnB)=0 | | | | | |  |  |  |  |
| The probability that a student is either inance or marketing major as P(A u B) = P(A)+P(B)-P(A u B) | | | | | | | | | |
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| P(A u B)= P(A) + P(B) = 0.35911 + 0.2486 = 0.6077 | | | | |  |  |  |  |  |
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1. An airline tracks data on its flight arrivals. Over the past 6 months, 50 flights on one route arrived early, 150 arrived on time, 25 were late, and 45 were canceled.
   1. What is the probability that a flight is early? On time? Late? Canceled?
   2. Are these outcomes mutually exclusive?
   3. What is the probability that a flight is either early or on time?

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| The total flights = 50 + 150 + 25 + 45 = 270 | | | | |
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| **a)** P (Flight is early) = 50/270 = 5/27 | | | |  |
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| P (Flight is on time) = 150/270 = 5/9 | | | |  |
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| P (Flight is late) = 25/270 = 5/54 | | | |  |
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| P (Flight is cancelled) = 45/270 = 1/6 | | | |  |
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| **b)** Yes they are mutually exclusive | | | |  |
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| **c)** P (flight is either early or on time) | | | |  |
|  | P(flight is early) + P (flight is on time) | | | |
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|  | 5/27 + 5/9 = 20/27 | |  |  |
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1. A survey of 200 college graduates who have been working for at least 3 years found that 90 owned only mutual funds, 20 owned only stocks, and 70 owned both.
   1. What is the probability that an individual owns a stock? A mutual fund?
   2. What is the probability that an individual owns neither stocks nor mutual funds?
   3. What is the probability that an individual owns either a stock or a mutual fund?

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|  | a) Probability that an individual owns a stock =(20+70)/200=0.45 | | | | | | |  |  |  |
|  | Probability that an individual owns A mutual fund=(90+70)/200=0.8 | | | | | | |  |  |  |
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|  | b) Probability that an individual owns neither stocks nor mutual funds=(200-90-20-70)/200=0.1 | | | | | | | | | |
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|  | c) Probability that an individual owns either a stock or a mutual fund =1-0.1 =0.9 | | | | | | | |  |  |
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1. Row 26 of the Excel file Census Education Data gives the number of employed persons having a specific educational level.
   1. Find the probability that an employed person has attained each of the educational levels listed in the data.
   2. Suppose that A is the event "has at least an Associate's Degree" and B is the event "is at least a high school graduate." Find the probabilities of these events. Are they mutually exclusive? Why or why not? Find the probability P(A or B).

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| a) The total employed persons = 11668755 + 36228706 + 20448104 + 9890659 + 22115069 + 10890838 | | | | | | | | | |
|  |  | 1.11E+08 |  |  |  |  |  |  |  |
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| no of person that attained each of the education level = 10890838 | | | | | | |  |  |  |
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| probability = 10890838/111242131 = 0.0979 | | | | |  |  |  |  |  |
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| b) n(A) = 9890659 + 22115069 + 10890838 = 42896566 | | | | | |  |  |  |  |
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| Total persons with some type of college degree = 12915825 + 28242604 + 13604669 | | | | | | | |  |  |
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|  | n(A) = 57763098 | |  |  |  |  |  |  |  |
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| n(B) = 20448104 + n(A) | | |  |  |  |  |  |  |  |
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| > 20448104 + 42896566 = 63344670 | | | |  |  |  |  |  |  |
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| Total persons = n(nB) = 29620292 + n(nA) | | | |  |  |  |  |  |  |

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| P(B]=n(B]/n(nB] = 63344670/87383390 =0.7249 | | | > 29620292 + 57763098 = 87383390 | | | |  |  |  |
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| If (A n B] not equal to 0 then A and B are mutually exclusive but here (AnB) = 42896556 not equal 0 | | | | | | | | | |
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|  | Hence A & B are mutually exclusive | | | |  |  |  |  |  |
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|  | c) P(A u B] = P(A) + P(A) - P(A n B) | | | |  |  |  |  |  |
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|  |  | P(A n B] = 42896566 / 57763098 = 0.7426 | | | |  |  |  |  |
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|  | That is P(A U B] = 0.7426 + 0.7249 - 0.7426 = 00.7249 | | | | |  |  |  |  |

1. Use data National Income.xlsx, which sampled the income of 500 respondent in a county.
   1. Apply the Histogram function in Data Analysis to plot the frequency distribution of national income in the sample
   2. Apply the Descriptive Statistics function in Data Analysis to obtain the descriptive stats of national income in the sample

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| *Bin* | *Frequency* |
| 6560.018 | 1 |
| 11798.29 | 1 |
| 17036.57 | 4 |
| 22274.84 | 6 |
| 27513.12 | 6 |
| 32751.4 | 19 |
| 37989.67 | 23 |
| 43227.95 | 41 |
| 48466.22 | 32 |
| 53704.5 | 52 |
| 58942.77 | 40 |
| 64181.05 | 65 |
| 69419.32 | 44 |
| 74657.6 | 49 |
| 79895.88 | 38 |
| 85134.15 | 27 |
| 90372.43 | 21 |
| 95610.7 | 12 |
| 100849 | 7 |
| 106087.3 | 5 |
| 111325.5 | 4 |
| 116563.8 | 1 |
| More | 2 |

B: Descriptive Statistics

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| *Income ($)* | |
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| Mean | 60559.46 |
| Standard Error | 872.204 |
| Median | 60613.49 |
| Mode | 60613.49 |
| Standard Deviation | 19503.07 |
| Sample Variance | 3.8E+08 |
| Kurtosis | 0.012173 |
| Skewness | 0.108121 |
| Range | 115242.1 |
| Minimum | 6560.018 |
| Maximum | 121802.1 |
| Sum | 30279728 |
| Count | 500 |