

**Quantitative methods**  
**Final exam for group MBA5 – 2017**

**Task 1. (4 points)**

Rolling a dice three times, evaluate the probability of having at least one 6.

**Task 2. (4 points)**

An urn contains two white balls and two black. A ball is drawn and replaced with a ball of a different colour. Then a second ball is drawn. Calculate the probability  $p$  that the first extracted was white, when the second is white.

**Task 3. (4 points)**

Each of thirteen people is given 4 cards from a standard deck of 52 cards. What is the probability that each of them has one spade?

**Task 4. (4 points)**

The average IQ in a population is 100 with standard deviation 15 (by definition, IQ is normalized so this is the case). What is the probability that a randomly selected group of 100 people has an average IQ above 115?

**Task 5. (4 points)**

A Magazine wants to launch an online version, but only if more than 20% of its subscribers would subscribe to it. A random survey of 400 subscribers indicated that 90 would be interested. Test the hypothesis that online version be successful ( $\alpha=0.05$ )?

**Task 6. (20 points)**

You are the owner of an ice-cream producing company. You have been operating for quite a long time, and believe you understand your market well. Not long ago, you observed your market share beginning to slip a bit and decided to embark on a promotion campaign to increase your sales. At this point, after the marketing campaign

is over, you would like to investigate whether it worked. Your economists have collected the data (file: exam.xls) for the 365 days of the year 2016.

The following variables are in your database:

*SALES = Total sales of cups of ice cream, in millions of cups.*

*PRICE = The average price that stores are charging for your ice cream. The stores differ quite a bit in the price they charge, so this variable changes quite a bit*

*COMP = Your main competitor's average price. Since your competitor claims they are a "premium" brand, while you are for "every person," COMP is generally higher than PRICE*

*TEMPER = the average temperature in the city each day in the year.*

*ECONOMY = an indicator of overall national economic sentiment. The year wasn't a very good year, and it got worse as the year went on, so the index declines over the year.*

*WEEKEND = a binary variable that is one on Saturday and Sunday. People like to go out for ice cream on weekends.*

*DAY\_WEEK = a weekday variable, taking values 1,2,3,4,5,6,7,1,2,3,4,5,6,7,...*

*DAY\_YEAR = a yearday variable that takes values from 1 to 365.*

*PROMO = a binary variable that equals 1 from July 1 until the end of the year. This is when you ran your promotion*

1. Summarize the data in this data set in a way that will help the reader of your report see a basic picture of your ice cream business. Use standard statistical devices, including graphs. Make this a concise readable, summary of the data that will help your reader understand the analysis to follow. (5 points)
2. Determine, using regression methods, what effects that are contained in your data help to explain your ice cream sales. I.e., specify and estimate an equation that adequately describes your sales. Check your regression model for all necessary tests. (10 points)
3. Answer the question "Did the promotional campaign work?" statistically. Justify your answer with the results of your estimated model. (5 points)