Queens College
Department of Mathematics

Final Examination
$$2\frac{1}{2}\text{ Hours}$$

Mathematics 110   **Spring 2016**

Instructions: Answer all questions. Show all work in the exam booklet.

1.   The scores on a high school History Final have an approximately normal distribution with a mean $\mu = 71$ and a standard deviation $\sigma = 4.5$. Suppose 450 students took the exam in June
   a)   Find the percent of the scores above 80.
   b)   Find the number of students who scored below 71.
   c)   Between what grades would you expect to find the middle 40% of the data?

2.   As a reward for productivity, the ABC Corporation has decided to give its employees one day off on the first week of each month. The employees are voting and their preference rankings are listed below:

Number of votes

Day	12	20	4	8	11
Monday	2 √	1 √	3 √	5	2
Tuesday	5	3 √	2 √	2 √	4
Wednesday	4	4	5	1 √	5
Thursday	3	5	4	3 √	1 √
Friday	1 √	2 √	1 √	4 √	3

   a)   Which day would be selected using the plurality method?
   b)   Which day would be selected using the plurality with runoff between the top 2 days?
   c)   Which day would be selected using Borda's method?
   d)   Which day would be selected using the approval voting method?

3.   a) If 543 votes were cast, what is the smallest number of votes a winning candidate needs to have in a 5 candidate election that is to be decided by plurality?

   b) Amy, Ben, Carla and Don are running for president of their Math Club. After the first 37 votes are counted, the tallies are as follows,
   Amy   8
   Ben   14
   Carla   12
   Don   3

   If there are 13 votes left, what is the minimum number of remaining votes Amy needs to be assured of a win?

4.   A random sample of ACT grades from the last high school senior class are listed:
   28   32   32   30   35   25   30   14   30   17
   29   18   32   35   35   30   29   30   34   35

   a)   Calculate the mode, range and mean.
   b)   Create a box and whisker plot.
   c)   Find the sample mean and standard deviation.
   d)   Create a frequency table with a class width of 6 (13-18.)
   e)   Create a pie chart using the frequency table from part d).

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5.   The Mathematics Department of a university has 28 new Teaching Assistants to be apportioned among the 4 most popular teachers based on the enrollment in their classes.

Teacher	Riggi	Schill	Hurwitz	Potter
Enrollment	104	93	130	121

   a)   Apportion the new TA's according to Hamilton's method.
   b)   Apportion the new TA's according to Lowndes' method.
   c)   Apportion the new TA's according to Webster's method.

6.   How many unique license plates of 2 letters followed by 3 numbers can be created if :
   a)   there are no restrictions?
   b)   repetitions of numbers are not allowed ?

7.   A bag contains 3 red and 2 green marbles.
   a)   One marble is picked at random, its color is noted and it is put back in the bag. Another marble is picked at random. Find the probability that both marbles are green.
   b)   Two marbles are picked at random without replacement. Find the probability that both marbles are green.

8.   An experiment has outcomes 1, 2, 3, 4, and 5 with probabilities as shown

$p(x)$	.09	.1	.29	?	.45
x	1	2	3	4	5

   a)   Find the missing $p(x)$.
   b)   Calculate the mean and standard deviation.
   c)   Construct the probability histogram. Carefully label the axes.