

QUEENS COLLEGE
DEPARTMENT OF MATHEMATICS

Final Examination
2.5 Hours

Mathematics 110

Fall 2007

Answer all questions and show all work.

1. Consider the weighted voting system: [27: 15,10,2,1]
 - (a) Find the Banzhaf power distribution.
 - (b) Find the Shapley-Shubik power distribution.
 - (c) Determine which players are dictators, have veto power, or are dummies.

2. Consider the weighted voting system: [q: 13, 8, 7, 5, 3, 2].
 - (a) What is the smallest value that the quota q can be?
 - (b) What is the value of q if 75% of the votes are needed to pass a motion?
 - (c) How many sequential coalitions are possible?
 - (d) Find the total number of possible four player coalitions.

3. The grades on an exam are

86	69	93	81	79	80	36	71	63	90	67	68	96	84	77	83	89	81
87	42	75	72	45	75	71	68	54	53	99	60	66	55	87	94	95	66

 - (a) What is the range of this data set?
 - (b) Draw a histogram with the first class interval of 30-39.
 - (c) Identify the five number summary.
 - (d) Find the mean and standard deviation.

4. A population grows according to the logistic growth model with growth parameter of 2.8 and initial population of .9 .
 - (a) Find p_5 .
 - (b) What percent of the habitat's carrying capacity is taken up by the 21th generation?
 - (c) What does the logistic growth model predict in the long term for this population?
 - (d) Support this description by sketching an appropriate graph.

5. Bank A offers 5.30% annual interest compounded quarterly and bank B offers 5.25% annual interest compounded daily.
 - (a) Calculate the effective annual yield for each bank.
 - (b) \$20,000 is deposited to the bank which offers the higher effective annual yield. What will be the balance of the account after 15 years?

6. Suppose a pair of honest dice is rolled. Find the probability that
 - (a) the 2nd die is 3 less than the 1st die.
 - (b) the difference is more than 3 or less than 2.
 - (c) at least one die comes up even.
 - (d) at least one of the dice comes up "9".

7. The height of freshmen at a certain college has an approximately normal distribution with a mean of 67 inches and a standard deviation of 3.5 inches.
 - (a) Find the percent of heights above 67 inches.
 - (b) Find the percent of heights at most 60 inches.
 - (c) Find the percent of heights between 56.5 inches and 74 inches.
 - (d) If there are 7,000 freshmen, estimate how many freshmen are between 63.5 and 74 inches tall.

8. A die is tossed 1188 times. The number "6" comes up 152 times. Should you be suspicious about the honesty of the die with 95% certainty? How many times should the "6" come up for you not to be suspicious with 95% certainty? Explain.

9.
 - (a) Should a new election be ordered if there are 948 votes of which 150 are fraudulent and the winner's plurality is 21? Justify your answer.
 - (b) How big must a winner's plurality be for an election to be declared valid if 1,020 votes are cast and 88 are fraudulent?