

# Math 210

## Third Hour Exam

Name \_\_\_\_\_

**No calculators should be necessary for this exam**

Friday Nov. 10  
100

1. Some counting questions

a. (5 pts.) A **nybble** is a sequence of 4 bits. How many are there? What principle of counting are we using?

b. (5 pts.) A teacher gives a class a list of ten projects. Each student is to pick three of them. In how many ways can we do this?

c. (5 pts.) A committee is to be made up of two students (out of a class of 30), and 3 faculty (out of a pool of 10). In how many ways can the committee be constructed.

d. (10 pts.) A part number consists either of a five digit number or two letters followed by a three digit number. How many part numbers can we construct?

e. (10 pts.) Show that in any group of 7 distinct integers at least two have the same remainder when divided by 6.

f. (5 pts.) What is the coefficient of  $x^4y^6$  in the expansion of  $(x + y)^{10}$  ?

g. (5 pts.) What is the coefficient of  $x^4y^6$  in the expansion of  $(2x + y)^{10}$  ?

2. Some probability

a. (10 pts.) Throwing two dice, what is the probability of getting a sum of 6?

b. (5 pts.) Define  $P(A|B)$

c. (5 pts.) State Bayes' theorem

d. (10 pts.) Suppose that we know the following: The uninformed likelihood of getting a certain job is 20%. 30% of the staff in that job have a master's degree. Amongst those who do not have this job, only 1 in a hundred has a master's degree. Using Bayes' theorem, what is the likelihood of getting the job if you have a master's degree? (warning - all these numbers are made up).

e. (10 pts) What is the probability of drawing a five-card hand containing exactly two kings and two aces?

f. (5 pts.) What is a Bernoulli trial?

g. (5 pts.) How is tossing a coin a Bernoulli trial?

h. (5 pts.) Tossing five fair coins, what is the probability that we will get exactly three heads?

3. (5 pts.) Say something appropriate about one of the following:

- a) James Bernoulli
- b) Pierre-Simon Laplace
- c) Fibonacci (Leonardo of Pisa)
- d) G. Lejeune Dirichlet
- e) Blaise Pascal (say something more than to say that he was responsible for Pascal's identity)