Math 110
Exam 3
Fall 2006

Justify all answers with neat and organized work. Clearly indicate your answers. 100 points possible.

The following formulas may or may not be useful.

$$ {}_nP_r = \frac{n!}{(n-r)!} \qquad {}_nC_r = \frac{n!}{(n-r)!r!} $$

A standard deck of cards has 52 cards.
There are 4 suits: spades, hearts, diamonds, clubs.
There are 13 ranks in each suit: Ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen, King.

The Jack, Queen, and King are called picture cards, or face cards.
The spades and clubs are black.
The hearts and diamonds are red.

$$ P(\text{not } E) = 1 - P(E) $$
$$ P(A \text{ or } B) = P(A) + P(B) \qquad (A, B \text{ mutually exclusive}) $$
$$ P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) \qquad (A, B \text{ not mutually exclusive}) $$

For this page, compute each expression (5 points each).

1. $\dfrac{12!}{6!}$

2. $\dfrac{201!}{198!}$

3. $(8-3)!$

For this page, compute each expression (5 points each).

4. ${}_{10}P_5$

5. ${}_8C_5$

6. ${}_8C_8$

7. ${}_{11}C_3 \cdot {}_8C_2$

8. $\dfrac{{}_6C_2 \cdot {}_8C_4}{{}_{14}C_6}$

9. (5 pts.) An ice cream store sells two drinks (sodas or milk shakes), in three sizes (small, medium, or large), and two flavors (vanilla or chocolate). In how many possible ways a customer can order a drink?

10. (5 pts.) License plates in a particular state display three letters followed by two numbers, such as ATZ-88 or BBC-01. How many different license plates can be manufactured for this state?

11. (5 pts.) Ann Jellik's parents give her a toy catalog that describes 100 toys. They ask Ann to list, in order of preference, her four favorite toys. In how many different ways can her four favorites be chosen and ranked?

12. (5 pts.) In how many distinct ways can the letters of the word KAUNAKAKAI be arranged?

13. (5 pts.) Ralph's Pizza has ten different kinds of topping they can put on their pizzas. How many different kinds of pizza could they make using four of the toppings?

14. (5 pts.) Using a 52-card deck, how many 6-card hands are possible that have two jacks, three queens, and one king?

15. (5 pts.) A single die is rolled twice. Find the probability of getting two numbers whose sum is 5.

16. (5 pts.) Eight movies (A, B, C, D, E, F, G, and H) are being scheduled for showing. The order of showing is determined by random selection. Find the probability that the schedule will have film D first, film E next-to-last, and film C last.

17. (5 pts.) A city council consists of seven Democrats and five Republicans. If a committee of five people is selected, find the probability of selecting three Democrats and two Republicans.

18. (5 pts.) A poker hand consists of five cards dealt from a shuffled deck of 52 cards. A diamond flush is a five-card hand consisting of all diamonds. Find the probability of being dealt a diamond flush.

19. (5 pts.) You draw one card from a 52-card deck. Find the probability of not drawing a club picture card.

20. (5 pts.) You draw one card from a 52-card deck. Find the probability of drawing a face card or a black card.

Optional bonus problem. (5 optional bonus points possible) Name the nine current justices of the Supreme Court of the United States. ($+\frac{1}{2}$ point for each correct name, $-\frac{1}{2}$ for each incorrect name, additional $+\frac{1}{2}$ point for all nine correct. If you miss more than you get right, then your bonus score is 0. First and last names required.)