Practice Problems for Test 3
Math 103
Spring 2002

You must show your work on all questions to qualify for credit. On multiple-choice questions, be sure to choose the letter corresponding to your answer now; I will not change your grade later if you have worked the problem correctly but chosen the wrong letter.

1.) How many subsets has the set $S = \{ \text{Mary, John, Fred} \}$?

2.) If three fair coins are tossed and two fair dice are thrown, how many outcomes are possible?

   (a) 18
   (b) 864
   (c) 288
   (d) 12

3.) Social Security numbers have nine digits. How many social security numbers are possible?

   (a) $9^{10}$
   (b) $2^{10}$
   (c) $10^2$
   (d) $10^9$

4.) An urn contains three red balls and five black balls. The red balls are numbered 1 through 3, and the black balls are numbered 1 through 5. If I reach in and draw out two balls, in how many different ways could I get one of each color?

   (a) 3
   (b) 5
   (c) 15
   (d) 8
   (e) 1

5.) How many three-digit numbers can be written using the digits 0,1,2,3,4, and 5? (Repetitions are allowed, but the first digit cannot be 0.)

   (a) 125
   (b) 216
   (c) 18
   (d) 180
6.) How many of the three-digit numbers that can be written using the digits 0, 1, 2, 3, 4, and 5 (where repetitions are allowed, but the first digit cannot be 0) are multiples of 5? [Hint: what does a number have to end with to be a multiple of 5?]

(a) 60  
(b) 180  
(c) 120  
(d) 240

7.) Seven people are waiting to play on a tennis court. The recreation director will call out their names two at a time. In each pair, the first person called will serve to the second person called. How many different choices does the director have when calling the first two players?

(a) 7!  
(b) 14  
(c) 49  
(d) 42

8.) How many distinguishable permutations are there of the letters in the word PSYCHOPOESIS?

(a) 12!  
(b) 2!3!2!  
(c) \( \frac{12!}{2!3!2!} \)  
(d) \( \frac{2!3!2!}{12!} \)

9.) A committee of fourteen people wishes to select a subcommittee of four. In how many different ways can this be done?

(a) \( \binom{14}{4} \)  
(b) \( P(14,4) \)  
(c) 56  
(d) 14 \cdot 4!
10.) A committee of six men and eight women wishes to select a subcommittee of four. In how many different ways can this be done if the subcommittee must have at least two women on it?

(a) \( \binom{12}{4} \)

(b) \( P(8, 2)C(12, 2) \)

(c) \( C(8, 2)C(6, 2) \)

(d) \( P(8, 2)P(6, 2) \)

(e) \( \binom{8}{2} \binom{12}{2} \)

11.) In how many different ways can a five-card hand be dealt (from a standard deck) that contains two aces, two kings, and one card less than a 5?

(a) \( \binom{4}{2} \binom{4}{2} \cdot 12 \)

(b) \( \binom{52}{2} \binom{50}{2} \cdot 12 \)

(c) \( \binom{52}{2} \binom{48}{2} \cdot 12 \)

(d) \( \binom{52}{2} \binom{4}{2} \binom{4}{2} \cdot 12 \)

12.) Is it true that \( C(n-1, r) = C(n, r-1) \) for any \( n \) and \( r \)? Why, or why not?

13.) The nine starting players on the baseball team and the five starting players on the basketball team are to line up for a group photo, with all the members of the baseball team on the left. In how many ways can this be done?

(a) \( 2^{14} \)

(b) \( 5!9! \)

(c) \( \binom{5}{5} \binom{9}{9} \)

(d) \( 14! \)

14.) A promoter has thirty tickets to a show. In how many ways can he divide these equally among three valued clients?

(a) \( P(30, 30) \)

(b) \( 2^{30} \)

(c) \( \binom{30}{10} \binom{20}{10} \binom{10}{10} \)

(d) \( C(30, 30) \)

15.) How many different one-card hands (dealt from a standard deck) have either a king or a heart?

16.) How many different two-card hands (dealt from a standard deck) consist either of a pair of aces or of two red cards?
17.) If $A$ is a set and $n(A) = 25$, how many different 10-element subsets has $A$?

18.) Susie has four friends, to each of whom she wishes to give one book. She has ten different books to choose from. How many different selections can she make?

19.) Four phones are to be selected from among fifty to be checked for defects. In how many different ways can this be done?

20.) License numbers consist of three letters followed by three digits. How many different license numbers are there in which at least one letter is repeated?

21.) $C(9, 3) =$

   (a) 84
   (b) 504
   (c) 0.7
   (d) 60480

22.) A true-false test has thirty questions. If students need not answer questions, in how many ways can the answer sheet be filled in?

   (a) $2^{30}$
   (b) $30^2$
   (c) $C(30, 30)$
   (d) $P(30, 30)$
   (e) $3^{30}$
   (f) $30^3$