Combinations and Permutations

Decide whether you would use the fundamental counting principle, a permutation or a combination to solve the following problems.

1) A bag of candy contains 12 pieces of candy. In how many ways can 5 pieces be selected?

2) If the Senate is to form a new committee of 5 members, in how many different ways can the committee be chosen if all 100 senators are available to serve on this committee?

3) The license plates in a certain state consist of 3 letters followed by 3 nonzero digits. How many such licenses are possible?

4) In how many ways can two kings be drawn from a deck of cards?

5) There are three boys and three girls at a party. In how many ways can they be seated in a row if they must sit alternating boy, girl, boy, girl?

6) In how many ways can a heart flush be obtained? (A heart flush is a hand of five hearts).

7) At Artist's Dance Studio, every man must dance the last dance. If there are five men and eight women, in how many ways can dance couples be formed for the last dance?

8) A shipment of a hundred TV sets is received. Six sets are to be chosen at random and tested for defects. In how many ways can the six sets be chosen?

9) If there are ten people in a club, in how many ways can they choose a dishwasher and a bouncer?

10) In how many ways can you be dealt two cards from an ordinary deck of cards?

11) In how many ways can five taxi drivers be assigned to six cars?

12) A night watchman visits 15 offices every night. To prevent others from knowing when he will be at a particular office he varies the order of his visits. In how many ways can this be done?

13) How many numbers between 1000 and 9999, inclusive, (a) contain no zeros? (b) contain no ones? (c) begin with an even digit and end with an odd digit?

14) A lock has a dial with 50 numbers on it. To open it, you must turn left to a number, right to a number, then left to a number. How many possibilities are there if (a) the 3 numbers must be different (b) the 3 numbers are not necessarily different?
15) A railway has 30 stations. On each ticket, the departure station and the destination station are printed.
   a) How many different kinds of tickets are there?

   (b) If a ticket could be used in either direction between two stations, how many different kinds of tickets would be needed?

16) If you have a $1 bill, a $5 bill, a $10 bill, and a $20 bill, how many different sums of money can you make using one or more of these bills?

17) The Pizza Place offers pepperoni, mushrooms, sausages, onions, anchovies, and peppers as toppings for their regular plain pizza. How many different pizzas can be made?

18) How many 5-digit numbers contain at least one 3? (Hint: How many contain no 3’s?)

19) A teacher must pick 3 high school students from a class of 30 to prepare and serve food at the junior high school picnic. How many selections are possible?

20) How many 6-letter "words" can be formed by using all of the letters of
   (a) the word RADISH?   (b) the word SQUASH?

21) A club with 42 members wants to elect a president, vice president, and a treasurer. From the other members, an advisory committee of 5 people is to be selected. In how many ways can this all be done?

22) A town council consists of 8 members including the mayor.
   (a) How many different committees of 4 can be chosen from this council?

   (b) How many of these committees will include the mayor?

   (c) How many will not include the mayor?

   (d) Verify that the answer to part (a) is the sum of the answers to part (b) and part (c).

23) There are 3 roads from town A to town B, 5 roads from town B to town C, and 4 roads from town C to town D. How many ways are there to go from A to D via B and C? How many different round trips are possible?

24) (a) How many 4-letter "words" can be formed by using the 8 letters of TRIANGLE?

   (b) How many of the "words" formed in part (a) have no vowels?

   (c) How many of the "words" formed in part (a) have at least one vowel?