In the questions 1-2 below suppose that a “word” is any string of seven letters of the alphabet, with repeated letters allowed.

1. How many words begin with A or B and end with A or B?

2. How many words have exactly one vowel used exactly once?

3. What is the probability of two rolls of a fair die adding up to 11?

4. What is the conditional probability of a family of 4 children having exactly 2 boys, given that the second child is a girl?

5. How many permutations of the seven letters $A,B,C,D,E,F,G$ do not have vowels on the ends (That is, a vowel on either end or both ends is bad)?

6. Find the number of permutations of the word CORRECT.
In the questions 7-9 below nine people (Ann, Ben, Cal, Dot, Ed, Fran, Gail, Hal, and Ida) are in a room. Five of them stand in a row for a picture.

7. In how many ways can this be done if both Ed and Gail are in the picture?

8. In how many ways can this be done if Ann and Ben are in the picture, but not standing next to each other?

9. In how many ways can this be done if both Ed and Gail are in the picture, and Ed is to the right of Gail?

In the questions 10-14 below consider all bit strings of length 12.

10. How many begin with 110?

11. How many begin with 11 and end with 10?

12. How many begin with 11 or end with 10?

13. How many have exactly four 1s?

14. How many bit strings of length 12 have equal numbers of 0s and 1s?
15. A shop sells 5 kinds of doughnuts. Mom sends you to buy two dozen. You must buy at least 10 maple bars, and exactly 2 French Curlers. How many ways can you do that?

16. Assume that you have 50 pennies and three jars, labeled A, B, and C. In how many ways can you put the pennies in the jars, assuming that the pennies are identical?

17. If the permutations of 1,2,3,4,5,6 are written in lexicographic order, with 123456 in position #1, 123465 in position #2, etc., find the permutation immediately after 246531.

18. Find the next four largest 4-combinations of the set \{1,2,3,4,5,6,7,8\} after \{1,5,6,8\}.

19. What is the probability of a flush, given 5 cards of a standard 52 card deck? A flush means that all 5 cards are of the same suit.

20. A lottery consists of 7 balls being pulled out of an urn of balls labeled 1 to 50. To win the grand prize, you must guess which 7 balls will be pulled, where order does not matter and there is no repetition. What is the probability of winning the grand prize?

21. The previous lottery has a second prize that can be won by guessing exactly 6 of the 7 correctly. What is the probability of winning the second prize?