Math 225          Quiz 3                    Name:_____

**For questions 1-5: You have a deck of cards (52 cards: 4 suits: hearts, spades, diamonds, and clubs, and 2,3,4,5,6,7,8,9,10,J,Q,K,A for each suit). You don't need to simplify the fractions.**

1.  If you select one card randomly, what is the probability that it will be the ace of hearts?
    1/52

2.  If you select one card randomly, what is the probability that it will be a diamond or a club?
    13/52+ 13/52 = ½

3.  If you select one card randomly, what is the probability that it will be a diamond or a king?
    13/52 + 4/52 – 1/52 = 16/52

4.  If you select two cards randomly <u>with replacement</u>, what is the probability that both of them will be a 10?
    (4/52)(4/52)

5.  If you select two cards randomly <u>without replacement</u>, what is the probability that both of them will be a 10?
    (4/52)(3/51)

6.  **Write the sample space:**
    A coin is flipped and a die is rolled at the same time.

    S = {T1, T2, T3, T4, T5, T6, H1, H2, H3, H4, H5, H6}

    What is the probability that the coin shows Tail and the dice shows an odd number?

    That is T1, T3, T5. So the probability is 3/ 12.

7.  **A multiple choice quiz has 5 questions with four choices for each question.**
    If a student just guesses all the answers, what is the probability that the student will get a 100% on the quiz?

    $(1/4)(1/4) \ (1/4) \ (1/4) \ (1/4) = (1/4)^5$

8.  **The probability distribution of a certain medical condition and the results of the medical test are given below. Use the table to answer the questions below.**

    |                | Have condition | Don't have condition | Total     |
    |----------------|----------------|----------------------|-----------|
    | Test positive  | 998            | 1,998                | 2,996     |
    | Test negative  | 2              | 997,002              | 997,004   |
    | Total          | 1000           | 999,000              | 1,000,000 |

a.  What is the probability that a randomly selected person has the condition?
    1000/1,000,000

b.  What is the probability that a randomly selected person tested positive?
    2996/1,000,000

c.  What is the probability that a person will be tested positive given he/she doesn't have the condition?
    1998/999,000

d.  What is the probability that a person has the condition given he/she tested positive?
    998/2996

e.  What is the probability that a person will be tested negative, given he/she has the condition?
    2/1000

9.  In a certain bank, previous records show that out of all prospective customers walking into the bank, 60 % open a checking account, 25% open a savings account and 15% open both accounts. Suppose a prospective customer is picked at random. What is the probability that this prospective customer will open a checking account OR a savings account?
    P(checking or savings) = P(checking) + P(savings) – P(checking and savings) \
    P(checking or savings) = 60% + 25% -15% = 70%

10. Suppose that a sample space S consists of four simple events: A, B, C, and D. That is S = {A, B, C, D}. If P(A) =0.4, P(B) = 0.1, P(C) = 0.2, what is P(D)?

    Since the probabilities must add up to 1, P(D) = 1 – (0.4 + 0.1 + 0.2) = 0.3

11. A club with 50 members wants to elect a president, a vice-president, and a treasurer. How many possible way can they select these officers?
    Since order DOES matter here, it's Permutation: $_{50}P_3$ = 117,600

12. A club with 50 members wants to send a 5-member committee to the national meeting. How many ways can they select the members for the committee?
    Since order DOES NOT matter here, it's Combination: $_{50}C_5$ = 2,118,760

13.    How many ways can the letters of ADDITIONALLY be arranged?

$$\frac{12!}{2!2!2!2!} = 29{,}937{,}600$$

14.    Determine whether the given procedure results in a binomial distribution. For those that are not binomial, identify at least one requirement that is not satisfied.

- Determining whether each of 3000 heart pacemakers is acceptable or defective.
     Binomial.

- Recording the number of children in 300 families.
     Not binomial: there are more than two outcomes.