Counting problems involving "OR"                                NAME:

**For pages 1 and 2, you are asked for the number of successes only; you do *not* need to find complete probabilities.** The formulas will reflect this by using "*n*" instead of "*P*". We will move to finding probabilities on page 3.

We will work with the example of pulling one card from a poker deck.

A poker deck contains four suits: diamonds, hearts, spades, and clubs. The diamonds and hearts are red and the spades and clubs are black. Each suit has thirteen cards: Ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen, and King. This makes a total of 52 cards. A face card will be defined to be a Jack, Queen, or King. An even number means 2, 4, 6, 8, or 10.

1.) Let's investigate the outcomes where our card is a Spade <u>or</u> an even number. Follow the steps outlined below. **You are asked for the number of successes only; you do *not* need to find complete probabilities.**

a.) List out the cards that are Spades. How many are there? (Yes, I want you to write all 13 down but you may abbreviate.)

b.) List out the cards that are even numbers. How many are there? (From the whole deck, *not* just the Spades.)

c.) Which cards fall into *both* of these categories? How many are there?

d.) How many outcomes are a Spade <u>or</u> an even number? (This means I want to add the Spades, the even numbered cards, and those which happen to be both.) Make sure your answer follows the rule $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ where A represents the Spades and B represents the even numbered cards.

2.) Let's investigate the outcomes where our card is a face card or an even number. Follow the steps outlined below. **You are asked for the number of successes only; you do *not* need to find complete probabilities.**

a.) List out the face cards. Remember those are defined as Jacks, Queens, and Kings only. How many are there?

b.) List out the cards that are even numbers. How many are there?

c.) Which cards fall into *both* of these categories? How many are there?

d.) How many outcomes are a face card or an even number? (This means I want to add the face cards, the even numbered cards, and those which happen to be both.) Notice we *could* use the rule $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ where A represents the face cards and B represents the even numbered cards. However, the intersection ( $A \cap B$ ) is empty so we can just find $n(A \cup B) = n(A) + n(B)$ .

We will now focus on probabilities, *not* just the number of successes. We will turn our attention to dice.

3a.) Consider rolling two distinguishable, fair, six-sided dice. Quickly form a two-way table showing the 36 possible outcomes. Label one die green and the other red.

For each question, use your sample space above to count how many successes exist for each situation and divide by the number of possibilities to find these probabilities. Denote those successes on the sample space you made above.

3b.) What is the probability that you roll a sum of 7?

3c.) What is the probability that the red die is 2?

3d.) What is the probability that you roll a sum of 7 <u>and at the same time</u> the red die is 2?

3e.) What is the probability that the sum is 7 <u>or</u> the red die is 2?

3f.) To find the successes in question 3*e*, which formula would apply (from questions 1*d* or 2*d*)? Explain why.