

# [MORE PROBABILITY & COUNTING]

(§8.4 worksheet)

(RECAP)

When you are counting the number of outcomes in an event (the sample space) – it's important to know when order matters and when order does not matter. Suppose for a moment that we want to pick two letters from a group of three: A, B, and C.

When order matters, you are counting the *permutations*. In this case, there are 6 possibilities (listed below)

AB	AC	BC
BA	CA	CB

All of these outcomes are different, because *order matter* – and thus AC is different than CA, because they come in a different order.

When order does not matter, you are counting the *combinations*. We can use the list above (when order matters) to visually check off the repeated ones. When order does not matter, there is no difference between AC and CA – because they both have an A and a C. The whole bottom row cancels and we are left with three possibilities.

AB	AC	BC
<del>BA</del>	<del>CA</del>	<del>CB</del>

This is the basic idea we've been talking about - we also came up with a kind of "formula" (but not really) for counting when order matters and when order doesn't matter. Use your notes and your peers to help you complete this worksheet. You do not need to turn this in.

**[1.]** For the problem below, determine first if order matters in that situation, then determine the number of outcomes (the sample space size).

- Suppose you coach a middle school basketball team and that you have 11 kids on your team. How many different teams of 5 could you create as your "starting 5"? Assume there are no "positions".
- Suppose you coach high school cross country and your varsity girls team has 7 runners. How many different ways could they finish (for simplicity, assume your girls are the only contestants in the race – like maybe it's a tempo run/time trial practice!)
- Suppose you roll 4 dice. What is the sample space size? (This one can be tricky, think back on our 2 dice problem from section 8.2)
- Suppose you work at a pizza place and there are 15 different toppings you can put on a pizza. How many 3 topping pizzas can you make? Compare that number with how many 12 topping pizzas you can make.
  - Now find out how many 4 topping pizzas you can make and compare that to how many 11 topping pizzas you can make.
  - One more! Find out how many 5 topping pizzas you can make and compare that to how many 10 topping pizzas you can make. Do you see a pattern emerging?
  - What about pizzas in general? If you have 15 toppings, how many different pizzas can you make? We haven't looked problems like this before, but see what you can do!
- Suppose you are dealt 7 cards – how many different 7 card hands are possible?
- Suppose you're like me and you plan the order in which you eat colors of M&M's. If you have one of each color (brown, blue, green, yellow, orange, red) – how many different orderings are there?

[2.] Powerball is a lottery game where five white balls are drawn from the numbers 1-59 and one yellow ball is drawn from a second set of numbers that range from 1-35. To win the jackpot you need to make sure that the first five numbers on your ticket appear on the five white balls drawn and the last number on your ticket matches the yellow ball. What is the probability that you win the jackpot?

[3.] Suppose you are dealt 4 cards. What is the probability that you were dealt all 3's?

[4.] Suppose you are dealt 4 cards. What is the probability that you were dealt exactly three 2's?

[5.] Five card draw is a poker game where five cards are dealt to each player. Consider the situation where player one is dealt five cards, then player two is dealt five cards, and so on. These five cards are called your "hand". The object of the game is to have the highest "ranking" hand at the end. Given a deck of cards, the highest ranking hand is called a "Royal Flush," which consists of having an Ace, King, Queen, Jack, and 10 of all the same suit. If you are the first person dealt to, what is the probability that you were dealt a Royal Flush.

[6.] In five card draw, a straight flush is a hand where the cards are consecutive numbers all of the same suit. For example, a 10-high straight flush would consist of a 10, 9, 8, 7, and 6 of the same suit (hearts, or diamonds, or spades, or clubs). What is the probability that you are dealt a Royal Flush **or** a queen-high straight flush if you are the first person dealt to?

[7.] In the lottery game "Powerball", you chose five different #s (1-59) and one "powerball" (1-35).

- a) What is the probability that you win?
- b) What is the probability that the winning number contains the number 25 in the first 5 balls?