Name: _____

Solving Permutations and Combinations

The most important part of determining permutations and combinations is knowing which formula to use.

Permutation Formula *(when order matters)*	**Combination Formula** *(when order doesn't matter)*
$\frac{n!}{(n-r)!}$ *n = total number of items & r = number of items wanted* **EX:** How many ways can you choose first, second, and third place out of a group of 5 players? *It's a permutation, because order matters (1st is different from 2nd). n = total = 5 players r = wanted = 3 winners* $\frac{n!}{(n-r)!} = \frac{5!}{(5-3)!} = \frac{5 \cdot 4 \cdot 3 \cdot \cancel{2!}}{\cancel{2!}} = 5 \cdot 4 \cdot 3 = \boxed{60}$	$\frac{n!}{(n-r)!\,r!}$ *n = total number of items & r = number of items wanted* **EX:** How many ways can you choose a set of 3 winners out of 5 applicants to get a $50 gift card? *It's a combination, because order doesn't matter (they all get the same gift card). n = total = 5 players r = wanted = 3 winners* $\frac{n!}{(n-r)!\,r!} = \frac{5!}{(5-3)!\,3!} = \frac{5 \cdot 4 \cdot \cancel{3!}}{2 \cdot 1 \cdot \cancel{3!}} = \frac{20}{2} = \boxed{10}$

1. How many ways can you choose 8 songs out of 12 to put on a playlist?	2. How many ways can you arrange 2 paintings on the wall, if you have 6 paintings to choose from?	3. How many ways can you arrange 9 players in a batting order if there are 12 total players?
4. How many ways can you choose a team of 5 players, if the players are selected at random from a group of 10?	5. How many ways can you watch 3 movies, if you have 12 possible movies to watch?	6. How many ways can you buy 6 books, if your pile of options has 8 books in it?
7. How many groups of recordings are possible if you choose 2 shows to record out of 20 options?	8. How many ways can you pack 7 shirts for a vacation if there are 11 shirt options?	9. How many ways can you organize 5 appointments in a schedule, if you ... scheduling 5 total appointments? *Hint: It's possible to have a 0!. Like with an exponent of 0, it just equals 1.*

10. How many ways can you award 1st, 2nd, 3rd, and 4th place trophies if 9 people competed?	11. How many possibilities are there when you buy two chairs out of 11 possible options to put in the living room?	12. How many possibilities are there for choosing a group of 8 students to participate in a rally?
13. How many ways are there to play 12 songs from a playlist of 15?	14. How many ways are there to buy 4 video games from a stack of 10 choices?	15. How many possibilities are there to choose a President and Vice President from a set of 4 candidates?
16. How many ways can you eat 6 out of 8 candy bars, if you eat them one after the other?	17. How many possible ways are there to choose 3 out of 7 friends to go to a concert with you?	18. How many possibilities are there for 5 pens to randomly chosen out of a bag of 10 pens, if they are all chosen in one bunch?
19. How many ways can 3 songs be played on a guitar if the guitarist knows 15 songs?	20. How many ways can 6 pictures be displayed on a bookshelf, if there are 9 pictures to choose from?	21. How many ways can the top 2 students, out of 30, be chosen to receive a homework pass?