1. You have 10 pennies, 5 quarters, 12 dimes, and 8 nickels. How many ways can you choose five coins (with repetition)? What if you begin with 100 of each coin?

2. A florist is designing a bouquet of flowers using lilies, roses, dahlias, peonies, and tulips.
   (a) How many ways are there for her to build a bouquet with 12 flowers?
   (b) How many ways are there for her to build a bouquet with 100 flowers?
   (c) 24 flowers with at least three of each kind?
   (d) 20 flowers with at least two dahlias and no more than four roses?

3. How many different strings can be made from rearranging the letters in the following strings?
   (a) REARRANGE
   (b) HAHAHAHA
   (c) AHAHAHAHA

4. I am packing chicken nuggets into little cardboard boxes at my Namesake Fastfood Establishment ^{TM}. I have 36 indistinguishable chicken nuggets and 6 indistinguishable cardboard boxes. How many ways are there for me to distribute the nuggets if every box must have at least 5 nuggets?

5. A mom is packing suitcases for her quadruplets to go on a week-long trip. The kids share 45 shirts, 40 pairs of pants, and 100 socks.
   (a) How many ways are there for her to pack 7 shirts, 7 pants, and 14 socks in each suitcase (4 suitcases) if the suitcases are distinguishable?
   (b) How many ways are there to distribute 28 shirts, 28 pants, and 56 socks if the 4 suitcases are indistinguishable?
   (c) If the shirts are identical, the pants are identical, and the socks are identical, but the suitcases are distinguishable?
   (d) Every suitcase gets 28 items of clothing which are indistinguishable, but the suitcases are distinguishable?

6. Create a problem that uses combinations (no repetition), a problem that uses combinations with repetition, and a problem that uses permutations.

1. You have 10 pennies, 5 quarters, 12 dimes, and 8 nickels. How many ways can you choose five coins (with repetition)? What if you begin with 100 of each coin?

   (a) C(4+5-1, 5)=56. 5-combination from a set with four elements (with repetition). Since we had at least 5 of each coin to begin with, our count does not change when we increase the starting number of coins.

2. A florist is designing a bouquet of flowers using lilies, roses, dahlias, peonies, and tulips.
   (a) How many ways are there for her to build a bouquet with 12 flowers?
   (b) How many ways are there for her to build a bouquet with 100 flowers?
   (c) 24 flowers with at least three of each kind?
   (d) 20 flowers with at least two dahlias and no more than four roses?

   (a) 1820 = C(5+12-1, 12).
   (b) 4598126 = C(5+100-1, 100).
   (c) 715. 24-(3*5) = 9. C(5+9-1,9) = 715.
   (d) 4935. 20 - 2(dahlias) = 18. C(4+14-1,14)+ C(4+15-1,15) + C(4+16-1,16) + C(4+17-1,17) + C(4+18-1,18) = 680 + 816 + 969 + 1140 + 1330 = 4935.

3. How many different strings can be made from rearranging the letters in the following strings?
   (a) REARRANGE
   (b) HAHAHAHA
   (c) AHAHAHAHA

   (a) 15120 = C(9,3)*C(6,2)*C(4,2)*C(2,1)*C(1,1).
   (b) 70 = C(8,4)*C(4,4).
   (c) 126 = C(9,5)*C(4,4) (= C(9,4)*C(5,5)).

4. I am packing chicken nuggets into little cardboard boxes at my Namesake Fastfood Establishment ^{TM}. I have 36 indistinguishable chicken nuggets and 6 indistinguishable cardboard boxes. How many ways are there for me to distribute the nuggets if every box must have at least 5 nuggets?

(a) 11. 36-5(6) = 6. For the remaining 6, we have the following options:
6;
5, 1;
4, 2; 4, 1, 1;
3, 3; 3, 2, 1; 3, 1, 1, 1;
2, 2, 2; 2, 2, 1, 1; 2, 1, 1, 1, 1;
1, 1, 1, 1, 1, 1.

5. A mom is packing suitcases for her quadruplets to go on a week-long trip. The kids share 45 shirts, 40 pairs of pants, and 100 socks.
   (a) How many ways are there for her to pack 7 shirts, 7 pants, and 14 socks in each suitcase (4 suitcases) if the suitcases are distinguishable?
   (b) How many ways are there to distribute 28 shirts, 28 pants, and 56 socks if the 4 suitcases are indistinguishable?
   (c) If the shirts are identical, the pants are identical, and the socks are identical, but the suitcases are distinguishable?
   (d) Every suitcase gets 28 items of clothing which are indistinguishable, but the suitcases are distinguishable?

(a) $\left(\frac{45!}{7!7!7!7!17!}\right)\left(\frac{40!}{7!7!7!7!12!}\right)\left(\frac{100!}{14!14!14!14!44!}\right)$

(b) $\left(C(45,28)\sum_{j=1}^{4}\frac{1}{j!}\sum_{i=0}^{j-1}(-1)^i\binom{j}{i}(j-i)^{28}\right)$
$\times\left(C(40,28)\sum_{j=1}^{4}\frac{1}{j!}\sum_{i=0}^{j-1}(-1)^i\binom{j}{i}(j-i)^{28}\right)$
$\times\left(C(100,56)\sum_{j=1}^{4}\frac{1}{j!}\sum_{i=0}^{j-1}(-1)^i\binom{j}{i}(j-i)^{56}\right)$

(c) $C(4+28-1,28)\times C(4+28-1,28)\times C(4+56-1,56)$

(d) 1. (28 is an exact number going in each of the four!)

6. Create a problem that uses combinations (no repetition), a problem that uses combinations with repetition, and a problem that uses permutations.

(a) Answers should vary :)