UW Math Circle
November 10, 2016

1. You have 10 labeled coins. How many way are there to arrange them?

2. (a) Now you put your 10 coins in a row. The coins could be facing with either the head or tails facing up. How many possible configurations of the coins are there? For example, $TTHHTHHHHH$ is one configuration, and $HHHTHTTTTH$ is another.

   (b) How many configurations are there with 3 tails? How about with 7 tails?

   (c) How many configurations are with either $0, 1, 2$, or 3 heads?

   (d) How many configurations are there with either $10, 9, 8$, or 7 heads?

   (e) How many configurations are there with either $0, 1, 2, 3, 4, 5, 6, 7, 8, 9$ or 10 heads? Where you you seen this number before?

3. If Steve has 10 coins, how many ways are there for him to arrange them in a sequence with exactly 5 heads if the first coin is must be a head? What if the first coin cannot be a head?

4. There are 16 pirates, one parrot, and one monkey on a pirate ship. They need to choose a captain and a first mate. If the parrot and monkey cannot be captain (but could be first mates), find the number of ways to choose a captain and a first mate from this group.

5. Sarah has one week's worth of dog treats: 2 bones, 2 biscuits, and 3 pieces of jerky. She gives her dog one treat each day. How many ways does Sarah have to distribute her treats?

6. Samuel the squirrel is collecting nuts for winter. He store the nuts in three different trees. If he has collected 10 nuts so far, how many ways are there for him to distribute them among the three trees? (He doesn't have to put nuts in all of the trees, for example he could put all in the first tree and none in the others.

7. A mail carrier delivers mail to the nineteen houses on the east side of Elm Street. The carrier notices that no two adjacent houses ever get mail on the same day, but that there are never more than two houses in a row that get no mail on the same day. How many different patterns of mail delivery are possible?