Tulsa Girls' Math Circle
Counting Problems—Blue Group
October 4, 2016

1. Two tour guides are leading six tourists. The guides decide to split up. Each tourist must choose one of the guides, but with the stipulation that each guide must take at least one tourist. How many different groupings of guides and tourists are possible?

2. How many diagonals in a convex n-gon?

3. How many six-digit numbers have at least one even digit?

4. In each of the cases below, we ask how many ways there are to place the chess pieces on a standard chessboard so they cannot attack each other:
   a. Two bishops
   b. Two knights
   c. Two queens

5. How many cards are there in a standard SET deck? (without actually counting the cards!)

6. How many different SETS are there in a deck of standard SET cards?

7. How many three-alike, two-alike, one-alike and all different SETS there are? (A three-alike SET would be: all red, all solid, all squiggles, different numbers.)

8. If the coefficients A and B of the equation of a straight line $Ax + By = 0$ are two distinct digits from the numbers 0,1, 2, 3, 6, 7, then how many distinct straight lines are there?

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9. Suppose that *a, b, c* in the equation of a straight line $ax + by + c = 0$ are three distinct elements of the set {-3, -2, -1, 0, 1, 2, 3} and the inclination of the straight line is an acute angle. Then how many distinct lines are there?

10. There are 3 rooms in a dormitory: a single, a double, and a quad. How many ways are there to assign 7 people to the rooms?

11. How many 10-digit numbers have at least 2 equal digits?

12. Given 6 vertices of a regular hexagon, in how many ways can you draw a path that hits all the vertices exactly once?

13. How many ways are there to arrange 5 red, 5 green, and 5 blue balls in a row so that no two blue balls lie next to each other?