Combinatorics Problems

KMHS Varsity Fall 2017

1. How many ways can we select three people from a group of eight people to form a committee?

2. I flip a fair coin eight times. In how many ways can I flip exactly five heads?

3. How many ways are there to select a Chair and a Vice-Chair for a committee from among a group of eight people?

4. Determine the coefficient of x^3 in the expansion of $(x+1)^8$.

5. Determine the coefficient of x^5y^3 in the expansion of $(x+y)^8$.

6. How many groups of two or three people may be formed from a group of 7 people?

7. Find the coefficient of x^5 in the expansion of $(1+x+x^2+x^3+\dots)^4$.

8. I'm having a party, and I want to buy five bottles of soft drink. The store only sells four types of soft drinks. How many ways can I choose bottles for my party?

9. How many three-digit numbers can be formed from the set {1,2,3,4,5,6,7,8} which have its digits in strictly decreasing order?

Suppose five girls and three boys are to stand in line (problems 10–17 use this setting).

10. Boys cannot stand next to each other.

11. Boys must stand next to each other.

12. Girls cannot stand next to each other.

13. Girls must stand next to each other.

14. There must be a girl at each end of the line.

15. There must be a boy at each end of the line.

16. Two specific girls refuse to stand next to each other.

17. Two specific girls refuse to stand next to each other and one boy refuses to stand on either end of the line.

18. Suppose five girls and three boys are to stand in a circle. In how many distinct ways can they do this?