

# Counting by Systematic Listing

## *Contemporary Math (MAT-130)*

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Problems 1-5 involve the club {Allan, Bill, Cathy, David, Evelyn}. List and count the different ways the club can elect each group of officers. No one can hold more than one office.

1. A president and a secretary.
2. A president and a secretary if the president must be a woman and the secretary a man.
3. A president, vice president, and treasurer all three are men.
4. A president and treasurer if both cannot be the same gender.
5. A president, vice president, and treasurer if all are women.

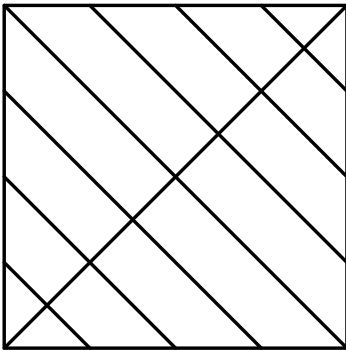
List and count the number of ways to roll two dice and get a sum of the following.

6. 4
7. 7
8. 2 or 12
9. Less than 6
10. Greater than or equal to 10

11. Construct a tree diagram showing all the possible gender arrangements for a couple that has three children.

Use your diagram from problem 11 to answer the following questions.

12. How many ways are there to have exactly 2 boys?
13. How many ways are there to have exactly 2 girls?
14. How many ways to have all boys?
15. How many ways to have at least 1 girl?
  
16. A group of 5 people sit in a circle and everyone shakes hands once. How many handshakes occur?
17. How many triangles (of any size) in the figure?



18. List and count all the two digit numbers that can be made with the digits {1, 2, 3}.
19. A soccer league has 7 teams. What is the minimum number of games that must be played so each team plays every other team twice?
20. List and count all three digit numbers where the sum of the digits equals 3.

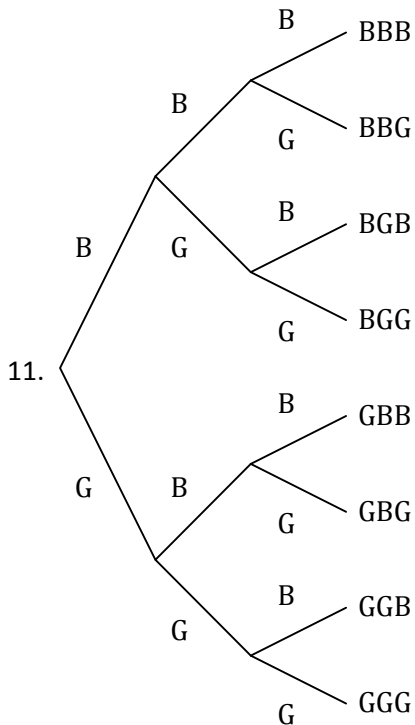
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**Solutions:**

1.  $\{AB, AC, AD, AE, BA, BC, BD, BE, CA, CB, CD, CE, DA, DB, DC, DE, EA, EB, EC, ED\}$  20 ways
2.  $\{CA, CB, CD, EA, EB, ED\}$  6 ways
3.  $\{ABD, ADB, BAD, BDA, DAB, DBA\}$  6 ways
4.  $\{AC, AE, BC, BE, DC, DE, CA, CB, CD, EA, EB, ED\}$  12 ways
5. not possible
6.  $\{(1,3), (2,2), (3,1)\}$  3 ways
7.  $\{(1,6), (2,5), (3,4), (4,3), (5,2), (6,1)\}$  6 ways
8.  $\{(1,1), (6,6)\}$  2 ways
9.  $\{(1,1), (1,2), (2,1), (1,3), (2,2), (3,1), (1,4), (3,2), (2,3), (4,1)\}$  10 ways
10.  $\{(6,4), (5,5), (4,6), (6,5), (5,6), (6,6)\}$  6 ways



12. 3
13. 3
14. 1
15. 7
16. 10 handshakes
17. 26 triangles
18.  $\{11, 12, 13, 21, 22, 23, 31, 32, 33\}$  9 numbers
19. 42 games
20.  $\{111, 120, 102, 210, 201, 300\}$  6 numbers