Date Completed: _____
Mentor Initials: _____

Counting (Basic)

1. James and Theresa own a sandwich shop. They offer 4 kinds of bread, 6 kinds of meat, and 5 kinds of cheese. Each type of sandwich has a combination of exactly 3 ingredients: 1 bread, 1 meat, and 1 cheese. How many types of sandwiches are possible?

A. 15
B. 24
C. 40
D. 55
E. 120

2. Among a group of 30 athletes, 17 athletes play lacrosse, 12 athletes play water polo, and 5 athletes play lacrosse and water polo. How many of the 30 athletes do NOT play lacrosse or water polo?

A. 5
B. 6
C. 7
D. 12
E. 17

3. The 3 statements below are all true for the elements of sets A, B, C, and D.

I. All elements of B are elements of C.
II. All elements of D are elements of A.
III. No elements of A are elements of C.

Which of the following statements *must* be true?

A. No elements of B are elements of D
B. No elements of B are elements of C
C. All elements of B are elements of D
D. All elements of C are elements of A
E. All elements of D are elements of C

4. Peter is choosing an outfit for dinner. An outfit consists of 1 pair of pants, 1 hat, 1 pair of dress shoes, and 1 dress shirt. He has 4 pairs of pants, 3 hats, 2 pairs of dress shoes, and 5 dress shirts. How many different outfits is Peter choosing from?

A. 4
B. 12
C. 14
D. 28
E. 120

5. The mayor of Bigfork is deciding how to assign the 7 council members to a row of 7 seats. From how many different arrangements can she choose?

A. 28
B. 49
C. 81
D. 5,040
E. 823,543

6. Minh will take physics, precalculus, and French next year. Minh will have 1 of the 2 teachers who teach French, 1 of the 4 teachers who teach physics, and 1 of the 5 teachers who teach precalculus. From among these 11 teachers, how many possibilities are there for Minh's 3 teachers for the 3 classes?

A. 11
B. 22
C. 40
D. 120
E. 240

7. Leisurely Reads is adding a new phone line. The phone company says that the first 3 digits of the phone number must be 555, but the remaining 4 digits, where each digit is a digit from 1 through 9 (this phone company is partial to non-zero digits), can be chosen by Leisurely Reads. How many phone numbers are possible?

A. $5(9^4)$
B. $5^3(9^4)$
C. $5^3(10^4)$
D. 9^4
E. 10^4

8. A company prints contest codes on its fun-size bags of candy. Each 5-character code consists of the letter B followed by the letter Q followed by 3 of the digits 0 through 9. The digits may repeat. Which of the following expressions gives the number of different 5-character codes that are possible?

A. (1)(1)(10)(10)(10)
B. (2)(1)(10)(9)(8)
C. (2)(1)(10)(10)(10)
D. (2)(2)(10)(9)(8)
E. (2)(2)(10)(10)(10)

9. In a window display at an art supply store, there are 4 spots for 1 painting each. To fill these 4 spots, Zakir has 8 paintings to select from. Selecting from the 8 paintings, Zakir can make how many possible display arrangements with 1 painting in each spot?

A. 4
B. 8
C. 1,680
D. 4,096
E. 16,777,216

10. The application for a license plate states that the license plate number has 3 letters followed by a 4-digit number, for example, ABC1234. The letters O and I and the digit 0 cannot be part of the license plate number. Any of the other letters may be used up to 3 times and any of the other digits may be used up to 4 times. Which of the following expressions represents how many different license plate numbers are possible?

A. (24)(23)(22)(9)(8)(7)(6)
B. (24)(23)(22)(10)(10)(10)(10)
C. (24)(24)(24)(9)(9)(9)(9)
D. (26)(25)(24)(10)(9)(8)(7)
E. (26)(26)(26)(10)(10)(10)(10)

11. At a school picnic, 1 junior and 1 senior will be selected to lead the activities. If there are 150 juniors and 90 seniors are the picnic, how many 2-person combinations of 1 junior and 1 senior are possible?

A. 60
B. 90
C. 150
D. 240
E. 13,500

12. In the United States, phone numbers begin with a 3-digit area code. Now, there are restrictions on some of the digits, but in the future, as more and more area codes are needed, the restrictions may need to be lifted. If, in the future, the only restriction is that the first digit cannot be 0, how many area codes will be possible?

A. 27
B. 30
C. 720
D. 729
E. 900

13. There are 8 points in a plane, and no 3 of the points are collinear. These 8 points, taken 2 points at a time, determine how many distinct lines?

A. 8
B. 16
C. 24
D. 28
E. 56

14. The employees at a hotel reservation center assign a 9-digit confirmation number (CN) to each customer making a reservation. The first digit in each CN is 7. The other 8 digits can be any digit 0 through 9, and digits may repeat. How many possible 9-digit CNs are there?

A. 9^8
B. 10^7
C. 8^9
D. 8^{10}
E. 10^8

15. Consider sets A, B, C, and D such that C is a subset of B, and D is a subset of A. Whenever x is an element of C, x *must* be an element of:

A. A
B. B
C. A and B
D. B and D
E. A, B, and D