Unit 1 Review:

1. Fundamental multiplicative principle
2. Additive counting principle
3. Direct and indirect method
4. Identical items
5. Always together
6. Never together
7. Pascal's triangle
8. Pathways
9. expand binomials
10. Factorial, nPr Calculations

8. a) How many diagonals are there in

i) a quadrilateral?

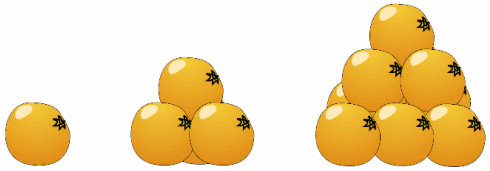
ii) a pentagon?

iii) a hexagon?

b) Find a relationship between entries in Pascal's triangle and the maximum number of diagonals in an n-sided polygon.

c) Use part b) to predict how many diagonals are in a heptagon and an octagon. Verify your prediction by drawing these polygons and counting the number of possible diagonals in each.

11. Application Oranges can be piled in a tetrahedral shape as shown. The first pile contains one orange, the second contains four oranges, the third contains ten oranges, and so on. The numbers of items in such stacks are known as **tetrahedral numbers.**



a) Relate the number of oranges in the nth pile to entries in Pascal's triangle.

b) What is the 12th tetrahedral number?

ACHIEVEMENT CHECK

Knowledge/Understanding	Thinking/Inquiry/Problem Solving	Communication	Application

8. At a banquet, four couples are sitting along one side of a table with men and women alternating.

a) How many seating arrangements are possible for these eight people?

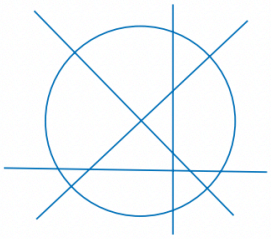
b) How many arrangements are possible if each couple sits together? Explain your reasoning.

c) How many arrangements are possible if no one is sitting beside his or her partner?

d) Explain why the answers from parts b) and c) do not add up to the answer from part a).

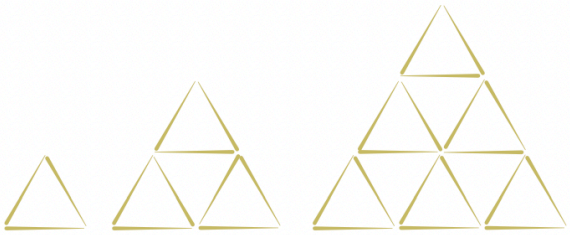
13. Inquiry/Problem Solving A straight line drawn through a circle divides it into two regions.

a) Determine the maximum number of regions formed by n straight lines drawn through a circle. Use Pascal's triangle to help develop a formula.



b) What is the maximum number of regions inside a circle cut by 15 lines?

16. Application Toothpicks are laid out to form triangles as shown below. The first triangle contains 3 toothpicks, the second contains 9 toothpicks, the third contains 18 toothpicks, and so on.



a) Relate the number of toothpicks in the nth triangle to entries in Pascal's triangle.

b) How many toothpicks would the 10th triangle contain?

Review: Organized Counting and Permutations
Application and Thinking

1. Nirmala coaches soccer for a local team. She has been given the go ahead to purchase new uniforms for the team. She brings four different jerseys, shorts in green, tan, and red, and a warm-up jacket with either a full zip front or a half zip front to the team for their consideration. From how many uniforms can the team choose?

2. Niall plays on the high school basketball team and keeps his runners in a bag in his locker. He has five pairs of runners that he uses regularly. He reaches into the bag to grab a pair of runners. In how many ways can he pull out two unmatched shoes, if there is no replacement of runners?

3. Jeff sails with a crew who travel extensively and must keep a variety of flags on board to fly, depending on the situation. Jeff must always fly at least two flags. He has five different flags available. If the order of the flags matters, how many different flag variations are possible?

4. If you have a standard deck of 52 cards, in how many different ways can you deal out 5 cards? 5 red cards? 4 queens?

5. Seven students are prepared to give a speech in the district public-speaking competition. In how many different orders can the students present their speeches?

6. There are 27 students in the mathematics competition. In how many ways can you choose the top 12 students? Assume the order of the students matters.

7. How many permutations are there of the letters in the word HIMALAYA?

8. In how many ways can the word CANADA be arranged if the consonants must always be in the order in which they occur in the word itself?

9. Elf is a monkey sitting at a keyboard that has only 26 keys, one for each letter of the alphabet. What is the probability that Elf will correctly type his own name with three keystrokes, assuming that he has an equal likelihood of striking any key at any time?

10. The five weakest teams of a basketball league, as determined by final season standings, randomly draw for draft positions. What is the probability that
    a) the weakest team will draft first, followed in order by the second and third weakest teams?
    b) the three weakest teams will draft first, second, and third in any order?

11. A graphing calculator is programmed to generate a number between 1 and 20.

    a) What is the probability that three consecutive prime numbers will be produced?
    b) What is the probability that at least one of the first three numbers will be prime?

12. a) Which is more likely: event *A*, drawing an ace, then a king, then a queen, or event *B*, drawing three consecutive aces? Assume that cards drawn are not returned to the pack. Explain how you determined your answer.
    b) How does your answer change if cards are returned after each draw?

13. What is the probability that 3 couples are seated beside one another around a circular table?

Answers

1. 24
2. 80
3. 320
4. 5 cards=**311 875 200, 5 red cards=7 893 600, 4 queens=24**
5. 5040
6. $\frac{27!}{15!} \sim 8.33 \times 10^{15}$
7. 6 720
8. 20
9. $\frac{1}{17\,576}$
10. a) $\frac{1}{60}$ **b)** $\frac{1}{10}$
11. a) 6.4% **b)** 78.4%
12. a) A is more likely
b) *A* and *B* equally likely;