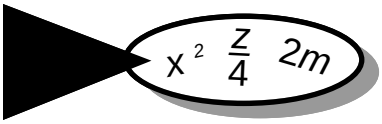


Table of Contents

7 How to • • • • • • • • • • • • Work with Permutations and Combinations

Facts to Know

Permutations

- A permutation is an arrangement of items in a particular order.
- If you change the order of the items, you produce another permutation.

Sample A

Arrange the letters X, Y, and Z as many different ways as you can.

X, Y, Z	Z, X, Y	Y, Z, X
Y, X, Z	X, Z, Y	Z, Y, X

There are six different permutations using those three letters.

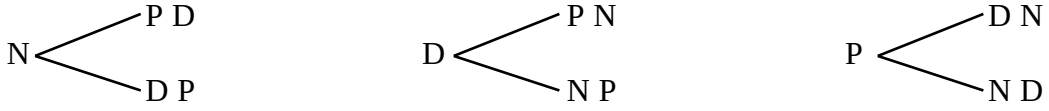
The items are the same, but the order is different.

Tree Diagrams

A tree diagram can be used to illustrate all the possible permutations.

Sample B

How many different ways can you arrange a nickel (N), a dime (D), and a penny (P)?



Factorials

- A factorial can be used to determine the number of permutations involved with the order of objects.
- A factorial is identified by an exclamation mark (!). 3! is read as "three factorial."

3! means 3 x 2 x 1 which equals 6.

Sample C

How many ways can you arrange 4 coins: quarter, dime, nickel, and penny?

Four coins can be written as 4! (four factorial)

4! = 4 x 3 x 2 x 1 = 24

Four coins can be arranged in order in 24 different ways.

Combinations

- A combination is an arrangement of items where the order does not matter.

  In a combination, for example, XYZ is the same as ZYX or YZX.

- The counting principle is used to determine the number of possible combinations.

  If one event can happen in *A* ways and a second event can happen in *B* ways, both events can happen in *A* times *B* ways.

Sample D

You have three shirts (one red, one green, one blue) and two pairs of shorts (one blue and one green). How many different outfit combinations can you wear?

3 (shirts) x 2 (pairs of shorts) = 6 (different outfits)

7 Practice • • • • • • Working with Simple Probability

Permutations and **combinations** are very useful in studying probability. They can be used to figure out all the possible things that can happen in a given situation.

What is the probability of two heads landing when you flip two coins, a penny and a nickel, at one time?

Possible outcomes: penny (head); nickel (head)
penny (tail); nickel (tail)
penny (head); nickel (tail)
penny (tail); nickel (head)

Probability of two heads: 1 in 4 or 1/4

Directions: Use the information on page 29 to help you do these problems. List the possible outcomes for each problem. The first one is done for you.

1. What is the probability of a penny landing heads when you flip it?

   Possible outcomes: *head or tail*

   Probability of heads: *1 in 2 or 1/2*

2. What is the probability of rolling a 4 with one die?

   Possible outcomes: _____

   Probability of rolling a 4: _____

3. What is the probability of rolling a 6 with one die?

   Possible outcomes: _____

   Probability of rolling a 6: _____

4. What is the probability of rolling a 4 or a 6 with one die?

   Possible outcomes: _____

   Probability of rolling a 4 or 6: _____

5. A black cloth bag holds one red marble, one green marble, one blue marble, and one black marble. All are the same size. Without looking into the bag, what is the probability of drawing a black marble from the bag?

   Possible outcomes: _____

   Probability of drawing the black marble:

   _____

6. What is the probability of drawing either the black or the blue marble from the bag?

   Possible outcomes: _____

   Probability of drawing the black or blue marble: _____

7. What is the probability of drawing a white marble?

   Possible outcomes: _____

   Probability of drawing a white marble:

   _____

8. What is the probability of drawing either the black, the green, or the blue marble from the bag?

   Possible outcomes: _____

   Probability of drawing the black, green, or blue marble: _____

9. What is the probability of one head and one tail landing when you flip two coins, a penny and a nickel, at the same time?

   Possible outcomes: _____

   Probability of one head and one tail:

   _____

