

Tuesday, May 19, 2020

Begin: Outcomes, Probability, and Statistics

Multiplication Counting Principle:

Stated simply, it is the idea that if there are **M** ways of doing something and **N** ways of doing another thing, then there are **M•N** ways of performing both things.

Factorial: $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

Factorial is usually used if you are arranging **ALL** of the available items.

Finding the number of outcomes when the order they occur is important.

Permutation:

An arrangement of items when order **DOES** matter.

Permutation Formula: When order **DOES** matter

Ways to arrange a total of **n** items but only **r** of them at a time.

$${}_nP_r = \frac{n!}{(n-r)!} \quad \begin{array}{l} n = \text{total \# items} \\ r = \text{\# arranging at a time} \end{array}$$

$${}_7P_2 = 42$$

There are 42 ways of arranging 2 items at a time if there are 7 items to choose from

Many scientific and most graphing calculators can do Permutations. Look through your User's Guide.

I've also put a link to an online Permutation calculator on my blog in the "Helpful Math Resources and Math Links" page.

There are 5 people running a race.

Prizes are only awarded to the top three finishers?

In other words, how many ways can 1st, 2nd, and 3rd places be awarded to 5 people running in the race?

Multiplication Counting Principle: $5 \cdot 4 \cdot 3 = 60$

OR

Permutation: Arrangement of 5 things 3 at a time

$${}_5P_3 = 60$$

If there were 12 uniforms but only 8 players, how many ways could the uniforms be passed out?

Using a Permutation:

$${}_{12}P_8 = 19,958,400$$

You are playing Scrabble. You have 7 tiles to use.

1. In how many ways can you arrange all 7 of the tiles in front of you?

$$7! = 5040 \quad \text{or} \quad {}_7P_7 = 5040$$

2. If you can only play 3 at a time, find the number of ways you can arrange 3 of the 7 tiles on the board.

$$\underline{7} \times \underline{6} \times \underline{5} = 210 \quad \text{or} \quad {}_7P_3 = 210$$

Nine students are running for Student Congress offices. How many ways can the positions of President, Vice-President, and Secretary be filled?

"ORDER" is important so this is a Permutation.

$${}_9P_3 = 504 \quad \text{or} \quad \underline{9} \times \underline{8} \times \underline{7} = 504$$

There are 24 students in a class. If there are 30 seats how many different seating charts are possible?

"ORDER" is important so this is a Permutation.

$${}_{30}P_{24} = 3.68 \times 10^{29}$$

If there are only 24 seats available for this class, how many different seating charts are possible?

$$24! \quad \text{or} \quad {}_{24}P_{24} = 6.20 \times 10^{23}$$

How many different four digit sequences can you create using the digits from 0 to 9 if digits can repeat?

This isn't a Permutation because digits can repeat, use the Multiplication Counting Principle:

$$\underline{10} \times \underline{10} \times \underline{10} \times \underline{10} = 10,000$$

How many different four digit sequences can you create using the digits from 0 to 9 if digits CAN'T repeat?

This IS a Permuation: ${}_{10}P_4 = 5040$

or

$$\underline{10} \times \underline{9} \times \underline{8} \times \underline{7} = 5040$$

You want to decorate a wall in your room. You have the following to choose from:

- 5 family photos
- 9 sports photos
- 4 photos of cars

1. How many different ways can you pick one of each to put up on the wall?

This is the Multiplication Counting Principle.

$$\begin{array}{c} \underline{5} \\ \text{family} \end{array} \times \begin{array}{c} \underline{9} \\ \text{sports} \end{array} \times \begin{array}{c} \underline{4} \\ \text{cars} \end{array} = 180 \text{ different ways to pick on of each.}$$

You want to decorate a wall in your room. You have the following to choose from:

- 5 family photos
- 9 sports photos
- 4 photos of cars

2. You have room for only 3 photos but want them all to be of sports. How many ways can you arrange 3 of the sports photos to put up on your wall.

Permutation:

$${}_{9}P_3 = 504$$

OR

Mult Count Princ:

$$\underline{9} \times \underline{8} \times \underline{7} = 504$$

You want to decorate a wall in your room. You have the following to choose from:

- 5 family photos
- 9 sports photos
- 4 photos of cars

3. You rearrange your room and end up having room for 4 photos but instead want them all to be of cars. How many ways can you arrange all 4 of the car photos to put up on your wall.

Mult Count Princ: OR Factorial: OR Permutation:

$$\underline{4} \times \underline{3} \times \underline{2} \times \underline{1} = 24 \text{ ways}$$

$$4! = 24$$

$${}_4P_4 = 24$$

You can some more of Practice #28.

We'll finish the material tomorrow.

Practice #28 will be due on Thursday, May 21
by 10:00 pm.