

Finding the number of outcomes:

SOLUTIONS

• Multiplication Counting Principle: If there are a ways of doing something and b ways of doing another thing, then there are a · b ways of performing both actions.

Stated another way, the number of possible outcomes can be found by multiplying the number of choices at each step.

• Permutation: A way of calculating the number of possible arrangements in a specific order. The number of outcomes when order matters.

• Factorial: Finding the number of outcomes when order matters and you are using ALL of a given number of items.

• Combination: A way of calculating the number of outcomes when order doesn't matter.

Find the number of outcomes in each situation.

1. A teacher returned from being absent and read the note left by the substitute. In the note the substitute specified that all 20 students in 4th hour were disruptive. As punishment, the teacher decides to select five of them to spend two hours after school picking up trash around the school. How many different ways could a group of five students be chosen?

Combination - order students are chosen doesn't matter

$${}_{20}C_5 = 15,504 \text{ ways to choose 5 of 20 students}$$

2. You want to design a 30 minute workout. For the first 10 minutes, you will choose an aerobic exercise from running, biking, jumping rope, or kickboxing. For the next 10 minutes, you will choose a strength exercise from bench press, squat, dead lift, military press, or curls. For the final 10 minutes you choose to stretch using one of 3 different stretching routines. How many different workouts are possible?

Mult. Count. princ. $\rightarrow \frac{4}{\# \text{ aerobic}} \cdot \frac{5}{\# \text{ strength}} \cdot \frac{3}{\# \text{ stretch}}$

$$= \boxed{60} \text{ different workouts}$$

3. In a band class the best trumpet player is given "1st seat", next best is given "2nd seat", and so on until all six trumpet players are assigned seats depending on their performance. How many ways could these six seats be assigned?

Mult Count princ $\rightarrow \underline{6} \cdot \underline{5} \cdot \underline{4} \cdot \underline{3} \cdot \underline{2} \cdot \underline{1}$

or Factorial $\rightarrow 6!$

or Permutation $\rightarrow {}_6P_6$

because order of seating is important

$$= \boxed{720}$$

different ways to seat 6 trumpet players

4. The tennis team has 13 players. They use a van and an SUV to get to the next match. The van can hold eight players. How many ways can the coach choose eight of the players to ride in the van?

Combination order in which 8 to ride in van is NOT important

$${}_{13}C_8 = \boxed{1287} \text{ ways to choose 8 of 13 tennis players}$$

5. There are 15 applicants for four jobs: Computer Programmer, Software Tester, Manager, and Systems Engineer. How many ways could these four jobs be filled?

Since jobs are different it's like saying order is important

Permutation

$${}_{15}P_4 = \boxed{32,760} \text{ ways these 4 jobs could be filled}$$

6. An ice cream shop advertises 21 different flavors; how many different 3-scoop dishes of ice cream can you order?

Combination - order in which you get the scoops of ice cream is NOT important

$${}_{21}C_3 = \boxed{1330} \text{ different 3-scoop dishes}$$

7. You are taking a five-question quiz that is organized in the following way.

Question #1: True or False

Question #2: Multiple Choice. choices are: A, B, C, D

Question #3: Yes or No

Question #'s 4&5: Multiple Choice. choices are: A, B, C, D, E

How many different ways can these five questions be answered?

mult. Count. princ

$$\begin{array}{ccccc} \frac{2}{\text{Quest \#1}} & \cdot & \frac{4}{\text{Quest \#2}} & \cdot & \frac{2}{\text{Quest \#3}} & \cdot & \frac{5}{\text{Quest \#4}} & \cdot & \frac{5}{\text{Quest \#5}} \end{array}$$

$$= \boxed{400} \text{ different ways to answer the 5 questions}$$