

# Permutations and Combinations Worksheet

Find the number of possibilities (you must show the set up).

1. The ski club with **ten** members is to choose **three** officers captain, co-captain & secretary, how many ways can those offices be filled? 1 720

Specific Position  
Permutation

$$n = 10$$

$$x = 3$$

$${}_{10}P_3 = \frac{10!}{7!}$$

2. The company Sea Esta has **ten** members on its board of directors. In how many different ways can it elect a president, vice-president, secretary and treasurer? 2 5,040

Specific position  
Permutation

$$n = 10$$

$$x = 4$$

$${}_{10}P_4 = \frac{10!}{6!}$$

3. For a segment of a radio show, a disc jockey (Dr. Jams) can play **4** songs. If there are **8** to select from, in how many ways can the program for this segment be arranged? 3 1,680

$$n = 8$$

$$x = 4$$

$${}_{8}P_4 = \frac{8!}{4!}$$

Keyword for Permutation

4. Suppose you are asked to list, in order or preference, the three best movies you have seen this year. If you saw **10** movies during the year, in how many ways can the **three** best be chosen and ranked? 4 720

$$n = 10$$

$$x = 3$$

$${}_{10}P_3 = \frac{10!}{7!}$$

keyword for permutation

5. In the Long Beach Air Race **six** planes are entered and there are no ties, in how many ways can the first three finishers come in? 5 120

first three  
keyword for Permutation

$$n = 6$$

$$x = 3$$

$${}_{6}P_3 = \frac{6!}{3!}$$

6. In a production of *Grease*, **eight** actors are considered for the male roles of Danny, Kenickie, and Marty. In how many ways can the director cast the male roles? 6 336

$$n = 8$$

$$x = 3$$

$${}_{8}P_3 = \frac{8!}{3!}$$

7. **Seven** bands have volunteered to perform at a benefit concert, but there is only enough time for **four** of the bands to play. How many lineups are possible? 7 840

$$n = 7$$

$$x = 4$$

$${}_{7}P_4 = \frac{7!}{3!}$$

Keyword for permutation

8. An election ballot asks voters to select **three** city commissioners from a group of **six** candidates. In how many ways can this be done?

8 20

$$\begin{array}{l} n = 6 \\ x = 3 \end{array} \quad 6C_3 = \frac{6!}{3!3!} \quad \text{nothing specific combination}$$

9. A **four**-person committee is to be elected from an organization's membership of **11** people. How many different committees are possible?

9 330

$$\begin{array}{l} n = 11 \\ x = 4 \end{array} \quad 11C_4 = \frac{11!}{4!7!} \quad \text{nothing specific combination}$$

10. You are on your way to Hawaii (Aloha) and of **15** possible books your parents say you can only take 10. How many different collections of **10** books can you take?

10 3,003

$$\begin{array}{l} n = 15 \\ x = 10 \end{array} \quad 15C_{10} = \frac{15!}{10!5!} \quad \text{nothing specific combination}$$

11. There are **12** standbys who hope to get on your flight to Hawaii, but only **6** seats are available on the plane. How many different ways can the 6 people be selected?

11 924

$$\begin{array}{l} n = 12 \\ x = 6 \end{array} \quad 12C_6 = \frac{12!}{6!6!} \quad \text{nothing specific combination}$$

12. To win the small county lottery, one must correctly select **3** numbers from **30** numbers. The order in which the selection is made does not matter. How many different selections are possible?

12 4,060

$$\begin{array}{l} n = 30 \\ x = 3 \end{array} \quad 30C_3 = \frac{30!}{3!27!} \quad \text{nothing specific combination}$$

Identify the following as **Permutations**, **Combinations** or **Counting Principle** problems. (no need to solve)

1. In a race in which six automobiles are entered and there are not ties, in how many ways can the first four finishers come in?

$$n=6$$

$$x=4$$

$$6P_4 = \frac{6!}{2!}$$

1. 360

2. The model of the car you are thinking of buying is available in nine different colors and three different styles (hatchback, sedan, or station wagon). In how many ways can you order the car?

$$\frac{9}{\text{Color}} \cdot \frac{3}{\text{style}} = 27$$

2. 27

3. A book club offers a choice of 8 books from a list of 40. In how many ways can a member make a collection?

$$n=40$$

$$x=8$$

$$40C_8 = \frac{40!}{8!32!}$$

3. 76,904,685

4. A medical researcher needs 6 people to test the effectiveness of an experimental drug. If 13 people have volunteered for the test, in how many ways can 6 people be selected?

$$n=13$$

$$x=6$$

$$13C_6 = \frac{13!}{6!7!}$$

4. 1,716

5. From a club of 20 people, in how many ways can a group of three members be selected?

$$n=20$$

$$x=3$$

$$20C_3 = \frac{20!}{3!17!}$$

5. 1,140

6. From the 30 pictures I have of my daughter's first birthday, my digital picture frame will only hold 3 at a time.

- a. How many different groups of 3 pictures can I put on the frame?

$$30C_3$$

a. 4,060

- b. What if I just wanted to fill the first three places with my favorite, best smile and best smashing of the cake?

$$30P_3$$

b. 24,360

7. A popular brand of pen is available in three colors (red, green or blue) and four tips (bold, medium, fine or micro). How many different choices of pens do you have with this brand?

$$\frac{3}{\text{color}} \cdot \frac{4}{\text{tips}}$$

7. 12

8. A corporation has ten members on its board of directors. In how many ways can it elect a president, vice-president, secretary and treasurer?

$$10P_4$$

8. 5,040

9. For a segment of a radio show, a disc jockey can play 7 songs. If there are 12 songs to select from, in how many ways can the program for this segment be arranged?

$$12P_7$$

9. 495

10. How many different ways can a director select 4 actors from a group of 20 actors to attend a workshop on performing in rock musicals?

$$20C_4$$

10. 4,845

11. What if the director in #28 wanted to fill positions of lead, supporting actor, extra 1 and extra 2?

11. \_\_\_\_\_

12. From the 20 CD's you bought this past year, you plan to take 3 with you on vacation. How many different sets of three CD's can you take?

$$20C_3$$

12. 1,140