LESSON MAKER PRO

Count the Possibilities

Choose when order matters, and when it does not.

HIGH SCHOOL · FM.AC.A

FM.AC.A "Complex counting problems can be solved efficiently using a variety of techniques."

NAME _____ DATE _____

ORDER OR GROUP?

If each position has a different role, count the choices for each position and multiply. If you are choosing a group with no assigned positions, divide by the number of ways to arrange the chosen members. Check for restrictions before you count.

WORKED EXAMPLE

A pizza shop offers 8 distinct toppings. How many different sets of 3 toppings can you choose?

1. Count ordered choices: 8 × 7 × 6 = 336.
2. Each set of 3 toppings can be ordered 3 × 2 × 1 = 6 ways.
3. Divide to remove repeats: 336 / 6 = 56.

Answer: 56 sets

PRACTICE 6 problems

1 Five finalists are assigned four different awards. Each finalist can receive at most one award. How many assignments are possible?

ANSWER _____

2 You have 6 different movies and can download 4. How many groups of movies can you choose?

ANSWER _____

3 From 7 different photos, you select 5 and place them in a row. How many rows are possible?

ANSWER _____

4 A club has 9 volunteers and needs a group of 4 for the same task. How many groups are possible?

ANSWER _____

5 From 10 different songs, you choose 6 and put them in a play order. How many playlists are possible?

ANSWER _____

6 You have 11 different stickers and choose 4 to put on your laptop. If placement does not matter, how many groups can you choose?

ANSWER _____

APPLY IT Show your work

1 Twelve students are organizing a school festival. They need one lead organizer, one assistant organizer, and a group of 2 hosts with the same role. No student can have more than one role. How many ways can they assign the roles?

WORK SPACE

ANSWER _____

2 A soccer club has 14 players, including 2 experienced defenders. How many groups of 5 players include at least one experienced defender?

WORK SPACE

ANSWER _____

CHALLENGE One step up

You are making a playlist of 4 songs from 10 different songs. Two of the songs are by the same artist, and you do not want both of those songs on the playlist. How many play orders are possible? Explain how you count them.

WORK SPACE AND ANSWER

ANSWER KEY

Count the Possibilities

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Five finalists are assigned four different awards. Each finalist can receive at most one award. How many assignments are possible?	**120**
2	You have 6 different movies and can download 4. How many groups of movies can you choose?	**15**
3	From 7 different photos, you select 5 and place them in a row. How many rows are possible?	**2,520**
4	A club has 9 volunteers and needs a group of 4 for the same task. How many groups are possible?	**126**
5	From 10 different songs, you choose 6 and put them in a play order. How many playlists are possible?	**151,200**
6	You have 11 different stickers and choose 4 to put on your laptop. If placement does not matter, how many groups can you choose?	**330**

PART 2 · APPLY IT

1. **5,940 ways** Choose the lead and assistant in 12 × 11 ways. Choose the hosts from the remaining 10 students in (10 × 9) / 2 ways, giving 12 × 11 × 45 = 5,940.
2. **1,210 groups** Subtract groups with neither experienced defender from all groups: (14 × 13 × 12 × 11 × 10) / (5 × 4 × 3 × 2 × 1) - (12 × 11 × 10 × 9 × 8) / (5 × 4 × 3 × 2 × 1) = 2,002 - 792 = 1,210.

CHALLENGE

4,368 play orders. There are 10 × 9 × 8 × 7 = 5,040 unrestricted orders. Orders containing both songs by that artist number 4 × 3 × 8 × 7 = 672, so 5,040 - 672 = 4,368.

Accept equivalent multiplication or division expressions. In the challenge, students may also count playlists containing neither or exactly one of the two songs.