LESSON MAKER PRO

Order Matters

Count arrangements when each choice has its own position.

HIGH SCHOOL · FM.AC.A.8.b

FM.AC.A.8.b "Using application-based problems, calculate the number of permutations of a set with n elements. Calculate the number of permutations of r elements taken from a set of n elements."

NAME _____ DATE _____

THE COUNTING RULE

When order matters and you cannot reuse an item, each position has one fewer choice than the position before it. To arrange every item, multiply all the way down to 1. To fill only some positions, stop after you have multiplied one factor for each position.

WORKED EXAMPLE

Nine runners finish a race. How many different ways can they fill first, second, and third place?

1. There are 9 choices for first place.
2. After that, there are 8 choices for second place and 7 for third place.
3. Multiply: 9 × 8 × 7 = 504.

Answer: 504 ways

PRACTICE 6 problems

1 How many ways can you arrange 4 different books in a row?

ANSWER _____

2 You choose 2 of 5 games to play, one before the other. How many different game orders are possible?

ANSWER _____

3 A club has 6 members. How many ways can it assign one member to be president and a different member to be treasurer?

ANSWER _____

4 How many ways can 7 different songs be ordered in a playlist that uses every song?

ANSWER _____

5 You have 8 different photos and choose 2 for the first and second spots on a page. How many arrangements are possible?

ANSWER _____

6 A display has a top spot and a bottom spot. If you have 10 different stickers, how many ways can you fill the spots without reusing a sticker?

ANSWER _____

APPLY IT Show your work

1 Your school is making a club video. There are 6 volunteers, and the video needs one host and one interviewer. No one can do both jobs. How many ways can the roles be assigned?

WORK SPACE

ANSWER _____

2 A student group has 7 different photos from an event. Its profile page has 4 photo slots in a row. How many ways can the group choose and order photos for the slots without repeating a photo?

WORK SPACE

ANSWER _____

CHALLENGE One step up

You have 6 different songs and want to put 4 of them in order for a short playlist. Your friend's favorite song must be included. How many playlists are possible? Explain your reasoning.

WORK SPACE AND ANSWER

Order Matters

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	How many ways can you arrange 4 different books in a row?	**24**
2	You choose 2 of 5 games to play, one before the other. How many different game orders are possible?	**20**
3	A club has 6 members. How many ways can it assign one member to be president and a different member to be treasurer?	**30**
4	How many ways can 7 different songs be ordered in a playlist that uses every song?	**5040**
5	You have 8 different photos and choose 2 for the first and second spots on a page. How many arrangements are possible?	**56**
6	A display has a top spot and a bottom spot. If you have 10 different stickers, how many ways can you fill the spots without reusing a sticker?	**90**

PART 2 · APPLY IT

1. **30 ways** There are 6 choices for host and then 5 choices for interviewer. Multiply 6 × 5 = 30.
2. **840 ways** The four slots have 7, 6, 5, and 4 choices in order. Multiply 7 × 6 × 5 × 4 = 840.

CHALLENGE

240 playlists. Choose one of 4 positions for the required song, then fill the other positions in 5 × 4 × 3 ways. That gives 4 × 5 × 4 × 3 = 240.

For the challenge, also accept subtracting the playlists that omit the required song from all possible playlists: 360 − 120 = 240. Equivalent multiplication methods are valid throughout.