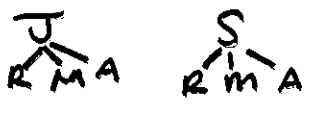
1. You have two pair of pants (jeans and slacks), and three shirts (red, maroon, or aqua colored) to choose from. How many different combinations of pants/shirts can you combine together?



6 OR Pants · Shirts = 2 · 3 = 6

2. Same problem as (1) above, but now add four different pairs of shoes. Now how many combinations of pants/shirts/shoes can you combine together? Try to get your answer without listing each and every possible choice! Organize the items, and look for a pattern.

Pants Shirts Shoes
2 · 3 · 4 = 24 different outfits

3. Take the word "CAT". How many different arrangements of the letters are there?

Watch Khan academy if uncomfortable with this

3 possible letters · 2 · 1
= 6 combinations

4. Take the word "SEAT". How many different arrangements of the letters are there?
Try to do this without listing every single combination.

4 · 3 · 2 · 1 = 24 combinations

5. ***Factorial Notation:*** **4! = 4 x 3 x 2 x 1**

a) Evaluate without a calculator: 4! = 24 Notice, same answer as the SEAT problem?

In your calculator, input the number, then go to MATH, scroll right to PRB, and choose option 4: !

b) Evaluate with a calculator: 9! = 362, 880

c) Evaluate with a calculator: 0! = 1

6. **Question:** How many ways can 5 students line up to wait in the lunch line?

5! = 120 ways

7. You have four yummy treats sitting on a plate: a radish, a beet, carrot and a yucca. The problem is, you can only eat two of them (share the other with little sibling)

How many different ways can you choose which treats you get to eat, and in which order?

Order matters: for example, you could eat the beet, then the radish.
OR, you could eat the radish, then the beet.

$4 \cdot 3 \cdot \cancel{2}$ for sibling $= 12$

Permutations: counting how many different ways you can arrange objects.

Notation: ${}_4\mathbf{P}_2$ means how many different ways can you take 4 objects and arrange them in two positions?

Calculator: input [4], go to MATH, scroll right to PRB, and choose option 2: ${}_n\mathbf{P}_r$, and then input [2]

Formula (on your reference sheet): ${}_4P_2 = \frac{4!}{(4-2)!} = \frac{4!}{2!} = \frac{4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1} = 4 \cdot 3 = 12$

8. Debit cards typically have 4 digit pin codes. Normally, you can repeat the numbers, such as 1147. However, the bank "*Easily Cracked Pin Codes*" only allows you to use each number once, using the digits 0 – 9.

Question: How many different possible pin codes can customers of this bank have?

So, there are 10 possible digits, and we only need 4 of them. **Order matters**: 5241 is different from 2541
Order matters, like the PIN code!

$10 \cdot 9 \cdot 8 \cdot 7$ OR ${}_{10}P_4 = 5,040$

9. How many different ways are there to rank the top 3 soccer teams in a region of 7 total teams?

${}_7P_3 = 210$ OR $7 \cdot 6 \cdot 5 = 210$

OR $\frac{7!}{(7-3)!} = \frac{7!}{4!} = 210$

Homework!

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