OBJECTIVE: **Students will be able to compute permutations and solve problems involving object ordering.**

CHECKPOINT:

A club with 10 people is electing a president, vice-president, and treasurer. How many different ways can a president, vice-president, and treasurer be selected from among the ten?

REACH:

Candice has 5 cards displaying the digits shown:

How many different 3-digit numbers can be created using Candice's cards?

1 **You are the judge at a dog show, and you must award a Gold, Silver, and Bronze ribbon to THREE dogs out of the field shown.**

How would you award the ribbons?

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2 **How many different ways can the medals be awarded?**

SKILL REVIEW

3 **Solve:** $\frac{10!}{7!}$

4 **How many different ways can EIGHT books be rearranged on a bookshelf?**

5 **How many different ways can the letters:**

A, B, C, D, E, F

be arranged, if you know that the letter A must come first?

From Lesson 6.02

The word *permutation* means a unique arrangement of things where the order matters. Each permutation is a different arrangement of the objects.

For example, if you have the digits 3, 4, 5, then the arrangements

345, 354, 453, 435, 543, 534

are all permutations of these objects. There are SIX ways in which these digits can be uniquely arranged, so these are the six permutations of the digits 3, 4, 5.

6 **How many permutations can be made from the letters in the word S-K-A-T-E-R?**

But what if you wanted to select only a small number of objects from a large set?

7 **For example, TEN gymnasts are competing for Gold, Silver, and Bronze medals. How many different ways can these THREE medals be awarded?**

In this case, you selecting from a set of TEN, but only creating permutations by arranging THREE of the "objects" at a time. To solve this, we use the notation:

$$_{10}P_3$$

This means: compute 10!, but only use the first THREE factors (10 x 9 x 8).

PRACTICE

Compute each factorial.

8 $_5P_3$

9 $_8P_2$

10 $_{12}P_1$

11 $_4P_4$

12 $_7P_4$

13 $_{10}P_3$

14 $_8P_5$

15 How many 4-digit passwords can be made selecting from the letters A-B-C-D-E-F-G-H, if each letter can only be used once per password?

LOOKING AHEAD

16 A pizzeria offers 5 toppings:

Pepperoni
Olives
Mushrooms
Tomatoes
Ham

How many different 3-topping pizzas are possible?

(HINT: the answer is NOT 60)

17 **Copy the formula that goes with *permutation notation*:**

Arrange *r* items from a set of *n* items:

$$ {}_nP_r = \frac{n!}{(n-r)!} $$

Use the formula, and show all work, to compute:

$$ {}_9P_6 $$

18 **Calvin has recorded EIGHT songs, and needs to create a demo CD with his best THREE songs.**
How many unique three-song demo CDs can be made using different combinations of these eight songs?

Instructional Objectives **Standard 18.0.3**

Students will be able to compute permutations and solve problems involving object ordering.

Were you 100% focused and engaged during today's lesson?

Yes | No | %

Rate your understanding of the instructional objective.

4	3	2	1	0
completely understand	mostly understand	understand a little	a bit confused	completely confused

Please take a minute to help me gauge your understanding by answering the following question.

How many different THREE-digit PINs can be made using only the letters:

A-B-C-D-E-F

if none can be repeated?

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