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

## CHECKPOINT:

A team of FIVE basketball players is going to be chosen from NINE people trying out.

How many possible different teams can be made by choosing FIVE of the NINE players?

## REACH:

An ice-cream shop has TEN flavors.

How many unique THREE-scoop desserts can be made using these TEN flavors?

## LAUNCH

**1** **A family wants to adopt THREE cats to help control a mouse problem in their garage.**

**An animal shelter has FIVE cats to choose from:**

**Abby** **Bernie** **Coraline** **Dallas** **Emma**

**How many different THREE-cat teams are possible from among these FIVE?**

SKILL REVIEW

**2** **Solve:** $\frac{12!}{9!}$

**3** **How many different ways can the letters A-B-C-D-E be rearranged?**

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

**W, X, Y, Z**

**be arranged, if you know that the letter Z must come last?**

**5** **How many different FOUR-digit PINs can be made by selecting from the letters shown?**

**A, B, C, D, E, F, G**

**The word *combination* means a unique arrangement of things where the order DOES NOT matter, as in selecting 3 cats to take home. It doesn't matter the order in which they are selected; Abby, Bernie, Coraline is the same as Coraline, Bernie, Abby.**

**This is different from *permutations*, where the order does matter. Sinec order DOES matter with *permutations*, when arranging two or more things, there will always be more *permutations* possible than *combinations*.**

6 **How many *combinations* can be made by choosing 3 of the 4 cards shown?**

7 **How many *permutations* can be made by arranging 3 of the 4 cards shown?**

**8** **A pizzeria offers 10 different toppings:**

| | |
|---|---|
| Pepperoni | Pineapple |
| Olives | Sausage |
| Mushrooms | Peppers |
| Tomatoes | Artichoke |
| Ham | Bacon |

**How many different THREE-topping pizzas can be created, if no topping can be repeated?**

$$_{10}C_3$$

**This means: compute $_{10}P_3$, and then divide by another 3!.**

## PRACTICE

**Simplify each combination.**

9 $_7C_3$

10 $_8C_3$

11 $_{12}C_1$

12 $_5C_5$

13 $_7C_4$

14 $_{10}C_3$

15 $_8C_5$

16 Lou has EIGHT books, and wants to bring THREE on vacation. How many different THREE-book combinations can be made?

LOOKING AHEAD

17 A florist offers FIVE kinds of flowers:

HINT: The answer is NOT 10

**Roses Carnations Lillies Irises Tulips**

Jeff wants to buy THREE flowers for a small vase. How many different combinations are possible, if it is ok to repeat?

## CONCLUSION

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

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

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

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

$$ {}_9C_3 $$

## CONCLUSION

Looking Ahead

**19** **A license plate is to be created using THREE numbers, followed by THREE letters.**

**How many different license plates can be made following this pattern?**

Instructional Objectives **EXIT TICKET** Standard 18.0.4

**Students will be able to compute combinations and solve combination story problems.**

**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 FOUR-person relay teams can be selected from a group of 12 runners trying out?**

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