Perms and Combs?
ID: 12644

Activity Overview
Students will review the vocabulary and concepts of factorials, combinations, and permutations. The combination and permutation notation is presented, along with the factorials. Students will also use built-in commands to evaluate these expressions. The messy work with factorials should be left as class work so that more lengthy discussion can support its use. Some formative assessment questions are included in a LearningCheck file.

Topic: Factorials, Permutations, and Combinations
- *Simple scenarios are presented to count the number of arrangements of objects when order is important and the set is exhausted.*

- *The scenarios that are presented include a group of objects where not all items are chosen, but in which order is important.*

- *Finally, situations in which order is not important are offered.*

Teacher Preparation and Notes
- *It is expected that students already know the vocabulary associated with this activity. Use this file as review and reinforcement of the ideas of permutations, combinations, and factorials.*

- *Students will be expected to create organized lists for several situations. Organized listing on paper is a valuable tool for students to visualize the number of "ways" that objects can be arranged.*

- ***To download the LearningCheck file (.edc file) and student worksheet, go to education.ti.com/exchange and enter "12644" in the quick search box.***

Associated Materials
- *Alg1Week33_PermComb_Worksheet_TI84.doc*
- *Alg1Week33_PermComb.edc*

Suggested Related Activities
To download any activity listed, go to education.ti.com/exchange and enter the number in the quick search box.

- *Bewildered Babies (TI-84 Plus family) — 9975*
- *Permutations and Combinations (TI-84 Plus family) — 12601*
- *Permutations (TI-84 Plus family) — 10076*

Problem 1 – Introduction

A *LearningCheck* self-check file is included to determine your students' level of understanding of permutations and combinations. Distribute this file using TI-Navigator.

Discussion Questions

- *Why would arranging flowers in a vase NOT take order into account?*

- *Can the arrangement be diagramed or listed in an orderly way?*

- *Why does it matter in which order the vases go on a shelf? (It may only matter to the store owner, who seeks vases to be arranged by size, or it may matter to a photographer who wishes to see the different orderings before snapping some still life pictures.)*

Students are asked to draw all of the possible "arrangements" of the three shapes shown. Encourage an organized approach to the problem by practicing other similar problems. Have students place the circle first, then switch the triangle and the rectangle. Then, the triangle goes first, followed by the circle and rectangle. Then, switch the last two shapes. Continue until all 6 arrangements are drawn.

List the four letters A, B, C, and D in all the different orders that are possible. A similar activity to the preceding one.

   ABCD, ABDC, ACBD, ACDB, etc…

You may wish to introduce a tree diagram at this time to help those students who have trouble organizing their work and seem to miss or repeat certain orderings.

The factorial command can be found under the MATH **PRB** menu. It can also be found at the very top of the special characters in the [CATALOG] menu.

Problem 2 – Horse Races

Next, students will examine a scenario about a horse race. The race exhausts the set of horses, as every horse must finish and thus be placed into the ordering.

Students will work their way through the next two questions about the horse race. Remember, it may not matter to the horse who finishes first, but the owners sure do care!

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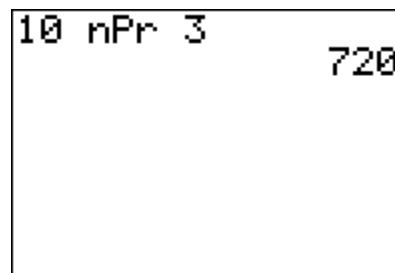
Brief instruction about permutations and combinations, along with formulas, is given. Students may compute both formulas and use the built-in combination and permutation commands.

Problem 3 – Combination Lock or Permutation Lock?

Students will explore combination locks. At first, there is a restriction on the 'combinations' so that no numbers are repeated.They will decide whether the 'combination' is actually a combination or a permutation.

Then, students will look at the scenario where repeats are allowed. The possible 'combinations' a combination lock are neither combinations or permutations, since repeats are typically allowed on a commercially sold "combination" lock. This is a nice discussion to have, about how sometimes vocabulary is used in less than precise ways. This problem can easily turn into a discussion of license plates in your state.
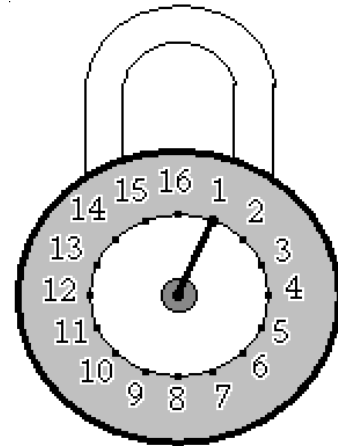
Additional Practice

Students are provided with several scenarios for extra practice. They will need to decide whether each scenario involves a combination or a permutation before solving. Students can either use formulas or built-in commands to answer these questions.

Extension – Tree Diagrams

Many scenarios can be drawn in a simple tree diagram in order to "see" the different choices. Problems that are much more complex can be simplified in this way to give students access to solving the problem. In this scenario, students will use a tree diagram to show the different orders that three services at a salon can be scheduled.