Just In Time Quick Check
Standard of Learning (SOL) AII.12

Strand: Statistics

Standard of Learning (SOL) AII.12
The student will compute and distinguish between permutations and combinations.

Grade Level Skills:
- Compare and contrast permutations and combinations
- Calculate the number of permutations of *n* objects taken *r* at a time.
- Calculate the number of combinations of *n* objects taken *r* at a time.
- Use permutations and combinations as counting techniques to solve practical problems.
- Calculate and verify permutations and combinations using a graphing utility.

Just in Time Quick Check

Just in Time Quick Check Teacher Notes

Supporting Resources:
- VDOE Mathematics Instructional Plans (MIPS)
  - AII.12 - Permutations and Combinations (Word) / PDF Version
- VDOE Word Wall Cards: Algebra 2 (Word) | (PDF)
  - Fundamental Counting Principle
  - Permutation
  - Permutation (formula)
  - Combination
  - Combination (formula)

Supporting and Prerequisite SOL: N/A

SOL AII.12 - Just in Time Quick Check

1. Westfield High School is having a contest and needs a team with 5 students from Mr. Chapman's class. There are 20 students in Mr. Chapman's class.

   a) Does this represent a permutation or a combination? Explain your reasoning.

   b) How many different teams can be formed?

2. Eleven runners will compete in a race. Trophies will be awarded to the first- and second-place finishers.

   a) Does this represent a permutation or a combination? Explain your reasoning.

   b) How many ways can the runners finish in first and second place?

3. There are 14 members on the academic team. The academic team has 8 boys and 6 girls. The coach needs 3 boys and 1 girl for the academic team competition. How many different teams of 3 boys and 1 girl can be formed?

4. Create a problem that represents a permutation.

SOL AII.12 - Just in Time Quick Check Teacher Notes
Common Errors/Misconceptions and their Possible Indications

1. Westfield High School is having a contest and needs a team with 5 students from Mr. Chapman's class. There are 20 students in Mr. Chapman's class.

    a) Does this represent a permutation or a combination? Explain your reasoning.

    a) How many different teams can be formed?

    A common misconception some students may have is difficulty distinguishing the difference between a permutation and a combination. This may indicate that some students may see the word "different" and assume the scenario represents a permutation. When providing instruction about combinations, make sure students know that every object selected from the whole group has equal value/importance, i.e. same job, same title, etc. One strategy that may benefit students is to provide a visual representation of combination and permutations. Have three students volunteer to stand in a row in front of the classroom. Ask questions like -- How many groups of students are standing in front of the class? If the students rearrange themselves in a different order, does this change the number of groups of students standing in front of the class? Teachers may also wish to use the Word Wall cards as an anchor chart to benefit some students.

2. Eleven runners will compete in a race. Trophies will be awarded to the first- and second-place finishers.

    a) Does this represent a permutation or a combination? Explain your reasoning.

    b) How many ways can the runners finish in first and second place?

    Some students may have the misconception that this scenario is a combination. This may indicate that students do not understand the order of the runners finishing the race matters. These students would benefit from a discussion on events or circumstance when order matters. Have students compile a list of situations where the order of events matter. A teaching strategy that may benefit students is to provide a visual representation of combinations and permutations. Have three students volunteer to stand in a row in front of the classroom. Ask questions like -- How many groups of students are standing in front of the class? If the students rearrange themselves in a different order, does this change the number of groups of students standing in front of the class? If the first person called to the front of the room had a specific job (president), and each succeeding student held a different job (vice president, secretary, etc.), would the order in which they were called affect the outcome of our student council? Teachers may also wish to use the Word Wall cards as an anchor chart to benefit some students.

3. There are 14 members of the scholastic bowl team, 8 of whom are boys and 6 of whom are girls. The coach wants to play 3 boys and 1 girl in the next round. How many different teams of 3 boys and 1 girl could be formed to play the next round?

Some students may indicate there are 62 different teams. This would indicate these students understand the scenario is a combination, but they have incorrectly applied the Fundamental Counting Principle by adding the results instead of multiplying. Other students may answer there could be 1001 different teams. These students have a misconception about the value to use for "n" and the value to use for "r." These students understand taking 4 objects from 14 total objects but they missed that there are specific details about who can be selected. Discuss if 4 members were selected from the whole group of 14, they could all be boys. Students would benefit from exposure to scenarios that require the Fundamental Counting Principle. Teachers may also wish to use the Word Wall cards as an anchor chart to benefit some students.

4. Create a scenario that represents a permutation.

Some students may create a combination scenario where order is not important. These students may not include specific jobs or positions in their scenario. This may indicate that some students have difficulty distinguishing between permutations and combinations. Students may benefit from compiling a list of events where order matters. Teachers can also use the Word Wall cards as an anchor chart to benefit some students.