

Lesson on Permutations and Combinations

Do Now: Distribute Do Now and ask students to complete the tree diagrams to show the different ways that marbles can be selected from two collections if the two marbles are listed in a specific order: collection A, collection B.

Lesson: Distribute activity sheet to each student. Distribute the problems for groups of students to work on. Try to assign all four problems to the class. If class is too small you may want to assign problems 1 and 2 first to see how students progress through the two problems. Some students should complete problem 1 and others complete problem 2.

Bring students back together after they have formed the various cube arrangements.

Read the two problems over and discuss the answer presented by the students. Have students notice that there are more answer to problem 2 than problem 1 and more answer to problem 4 than problem 3. Discuss why this difference appears. (In problems 1 and 3 as long as the same letters are in the grouping there is only one grouping. For example if ABC is in the group, than BCA is not a different group, etc.)

When are there more solutions to the problem. (When each position is assigned a description, then mixing up the letters creates a new group.)

Start with problem 2. Notice there are 24 ways to form the committee. Arrange the groups as shown on the solution page. Help students see that ABC can be placed in a committee 6 ways. Have students see that this pattern is repeated for the other columns. Relate this to problem 1.

Study problems 3 and 4 in a similar way.

Describe the condition that is true that produces more groups. Describe the condition that is true to produce less groups.

Inform students that problems 1 and 3 describe combinations and problems 2 and 4 describe permutations.

Problem 2 can be found by doing $4 \times 3 \times 2$ or four choices for the first position, 3 choices for the second position, and 2 choices for the third position. Looking at the pattern of groups there are $3 \times 2 \times 1$ ways to put the three letters together. So grouping the groups by six creates 4 permutations.

A similar argument can be done with problems 3 and 4 if time permits.