LESSON MAKER PRO

Triangle to Teams

Use Pascal's Triangle to count possible groups.

HIGH SCHOOL · FM.R.A.15

FM.R.A.15 "Develop and apply connections between Pascal's Triangle and combinations."

NAME _____ DATE _____

THE BIG IDEA

In Pascal's Triangle, row n starts and ends with 1. Each number inside a row is the sum of the two numbers directly above it. Counting positions from 0 on the left, the number in position k of row n is C(n,k), the number of ways to choose k items from n items.

WORKED EXAMPLE

Use the printed rows to find C(5,2). Show how its entry is formed.

PASCAL'S TRIANGLE

Row n	Entries from left to right, starting at position 0
3	1, 3, 3, 1
4	1, 4, 6, 4, 1
5	1, 5, 10, 10, 5, 1

1. Go to row 5 and count to position 2, starting at 0.
2. The two entries above that position are 4 and 6.
3. Add them: 4 + 6 = 10.

Answer: C(5,2) = 10

PRACTICE 6 problems

1 Use the printed row to find C(6,3).

PASCAL'S TRIANGLE

Row n	Entries from left to right, starting at position 0
6	1, 6, 15, 20, 15, 6, 1

ANSWER _____

2 Use the printed row to find C(7,4).

PASCAL'S TRIANGLE

Row n	Entries from left to right, starting at position 0
7	1, 7, 21, 35, 35, 21, 7, 1

ANSWER _____

3 Find C(8,2) by adding the two entries above it in Pascal's Triangle: 7 and 21.

ANSWER _____

4 Find C(9,3) by adding the two entries above it in Pascal's Triangle: 28 and 56.

ANSWER _____

5 C(10,7) equals C(10,3) because the two positions are equally far from the ends of row 10. If C(10,3) = 120, find C(10,7).

ANSWER _____

6 Row 11 begins 1, 11, 55. Find C(11,9) and briefly explain how you know.

ANSWER _____

_____

APPLY IT Show your work

1 A student is making a playlist with 8 songs and wants to feature 3 of them. How many different groups of 3 songs could the student choose? The order of the songs does not matter.

WORK SPACE

ANSWER _____

2 A gaming club has 9 members. It will choose 2 members to test a new game together. How many different pairs could it choose?

WORK SPACE

ANSWER _____

CHALLENGE One step up

In row 11 of Pascal's Triangle, position 4 contains 330 and position 5 contains 462. Find C(12,5). Explain in one sentence how you found it.

WORK SPACE AND ANSWER

Triangle to Teams

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Use the printed row to find C(6,3).	**20**
2	Use the printed row to find C(7,4).	**35**
3	Find C(8,2) by adding the two entries above it in Pascal's Triangle: 7 and 21.	**28**
4	Find C(9,3) by adding the two entries above it in Pascal's Triangle: 28 and 56.	**84**
5	C(10,7) equals C(10,3) because the two positions are equally far from the ends of row 10. If C(10,3) = 120, find C(10,7).	**120**
6	Row 11 begins 1, 11, 55. Find C(11,9) and briefly explain how you know.	**55. Position 9 matches position 2 from the other end of row 11.**

PART 2 · APPLY IT

1. **56 groups** The count is C(8,3). In row 8 of Pascal's Triangle, position 3 is 56.
2. **36 pairs** The count is C(9,2). This entry is C(8,1) + C(8,2) = 8 + 28 = 36.

CHALLENGE

C(12,5) = 330 + 462 = 792 because the two adjacent entries directly above position 5 add to make that entry.

For problem 6, accept any explanation that uses the symmetry C(11,9) = C(11,2). In the word problems, groups and pairs are unordered.