PASCAL'S TRIANGLE If you arrange the values of ${}_nC_r$ in a triangular pattern in which each row corresponds to a value of n, you get what is called **Pascal's triangle**. Pascal's triangle is named after the French mathematician Blaise Pascal (1623–1662).

KEY CONCEPT *For Your Notebook*

Pascal's Triangle

Pascal's triangle is shown below with its entries represented by combinations and with its entries represented by numbers. The first and last numbers in each row are 1. Every number other than 1 is the sum of the closest two numbers in the row directly above it.

	Pascal's triangle as combinations	Pascal's triangle as numbers
$n = 0$ (0th row)	${}_0C_0$	1
$n = 1$ (1st row)	${}_1C_0 \quad {}_1C_1$	1 1
$n = 2$ (2nd row)	${}_2C_0 \quad {}_2C_1 \quad {}_2C_2$	1 2 1
$n = 3$ (3rd row)	${}_3C_0 \quad {}_3C_1 \quad {}_3C_2 \quad {}_3C_3$	1 3 3 1
$n = 4$ (4th row)	${}_4C_0 \quad {}_4C_1 \quad {}_4C_2 \quad {}_4C_3 \quad {}_4C_4$	1 4 6 4 1
$n = 5$ (5th row)	${}_5C_0 \quad {}_5C_1 \quad {}_5C_2 \quad {}_5C_3 \quad {}_5C_4 \quad {}_5C_5$	1 5 10 10 5 1

EXAMPLE 4 Use Pascal's triangle

SCHOOL CLUBS The 6 members of a Model UN club must choose 2 representatives to attend a state convention. Use Pascal's triangle to find the number of combinations of 2 members that can be chosen as representatives.

Solution

Because you need to find ${}_6C_2$, write the 6th row of Pascal's triangle by adding numbers from the previous row.

$n = 5$ (5th row) 1 5 10 10 5 1

$n = 6$ (6th row) 1 6 15 20 15 6 1

${}_6C_0 \quad {}_6C_1 \quad {}_6C_2 \quad {}_6C_3 \quad {}_6C_4 \quad {}_6C_5 \quad {}_6C_6$

▸ The value of ${}_6C_2$ is the third number in the 6th row of Pascal's triangle, as shown above. Therefore, ${}_6C_2 = 15$. There are 15 combinations of representatives for the convention.

GUIDED PRACTICE for Example 4

6. WHAT IF? In Example 4, use Pascal's triangle to find the number of combinations of 2 members that can be chosen if the Model UN club has 7 members.