

## ACTIVITY 1

# Pyramid Math

### Materials:

- paper
- transparency master
- activity master

**Overview:** This creative practice activity facilitates discovery of number patterns and develops number sense. The activity works great with both positive and negative numbers and decimals and fractions. Because it can be designed to be self-checking, it is easy for the teacher and engaging for the students.

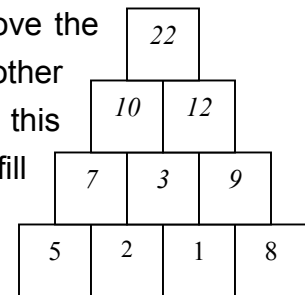
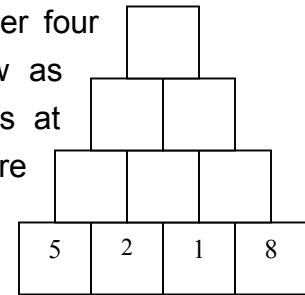
**Vocabulary:** commutative property

## PROCEDURE

### Skills:

- Addition and subtraction of integers, decimals, and fractions
- Finding patterns

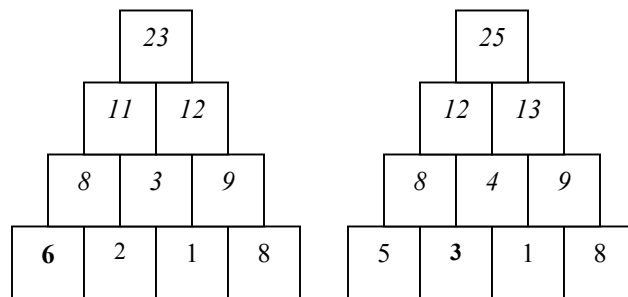
- 1 Display the transparency master and enter four numbers in the cells of the bottom row as shown. (Use single-digit whole numbers at first so students can focus on the structure of the problem instead of stumbling on the computation at this point.) To solve the pyramid, an adjacent number pair is added. The sum is written in the box above the number pair. This is repeated for the other number pairs in the bottom row. Then this process is repeated for the second row to fill the third row. Finally the number pair in the third row is added to get the final top number as shown.



- 2 Since each sum is based on the sums below, all students should get the same answer in the top cell. Thus they only need to check the top answer. If that is correct, all other cells are likely correct too.
- 3 Now try another pyramid using new numbers. Students will catch on to the process quickly and will be eager to check their answer with those of their classmates. (No more correcting papers!)
- 4 As students understand how the problems work, introduce appropriate numbers. If you are studying decimals, throw in a few decimal points. If you have covered integers, use some negative numbers. Fractions make these problems much more difficult. Try one yourself before asking the students to do one.

We suggest beginning with like denominators. Or you could use fractions that have a fairly small common denominator. For example,  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{1}{2}$ , and  $\frac{3}{4}$  can all use fourths for a common denominator.

- 5 Try to make slight variations in the arrangement and values of the numbers to help children focus on the number sense involved. For example, in the first problem if we increase the five by one, making it a six, the top number also increases by one, but if we change the two to a three, the top number increases by three.



Is this always true when we add one to a cell? What would happen if we added two to the first or second cell of the bottom row? What happens when we do this to a five-row pyramid? As students answer these questions they will develop number sense.

- 6 Ask students to change the order of the numbers in the bottom row of a pyramid. How does this affect the top cell? Is the result always the same? How does the commutative property affect this result?
- 7 If everyone puts the same number in the top cell of a blank pyramid, will everyone get the same bottom row by working backwards? Why or why not?
- 8 Introduce subtraction by using Pyramid Math 6 in which other cells are filled in. You can create one of your own easily, or have students create them for their classmates to solve.

- 9 Explore what happens when all odd numbers or all even numbers are used. What if all four cells in the bottom row contain the same number? What patterns occur?



### Journal Prompts:



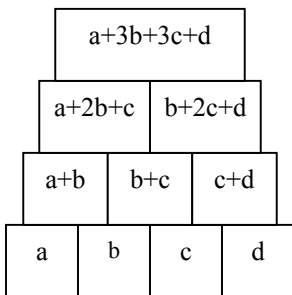
If you rearrange the numbers on the bottom row of a pyramid, will you always get the same numbers on top? Why or why not? What can you predict about the number on the top of a four-row pyramid if all the starting numbers are equal? Does the number of rows in the pyramid affect this? In what way?

### Homework:



Use one of the accompanying activity masters or tailor one to your students' needs using one of the blank masters.

### Taking a Closer Look:



There is a way of predicting the top of the pyramid without solving all the rows. This leads students into the algebra involved in the process. For example, let's assume that we are going to solve a four-row pyramid. The bottom cells contain four numbers called a, b, c, and d as shown. It follows that the second row contains three sums which are a + b, b + c, and c + d respectively. The third row contains these two sums:

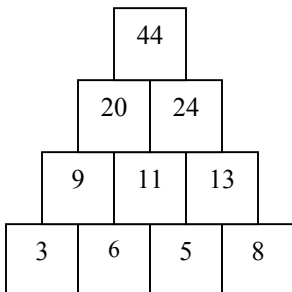
$$(a + b) + (b + c) \text{ and } (b + c) \text{ and } (c + d)$$

These simplify into a + 2b + c and b + 2b + c. Adding these to get the top row gives a + 3b + 3c + d.

Now let's start with four numbers: a = 3, b = 6, c = 5, and d = 8.

Using the formula, the top answer should be:

$$\begin{aligned} a + 3b + 3c + d &= \\ 3 + 3(6) + 3(5) + 8 &= \\ 3 + 18 + 15 + 8 &= \\ 44 & \end{aligned}$$



### Assessment:

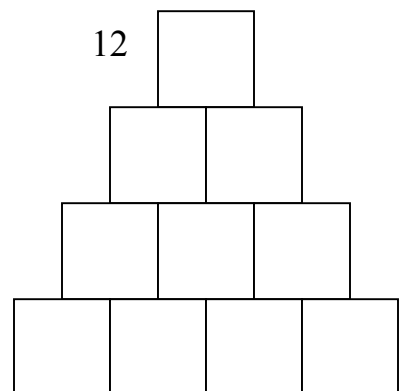
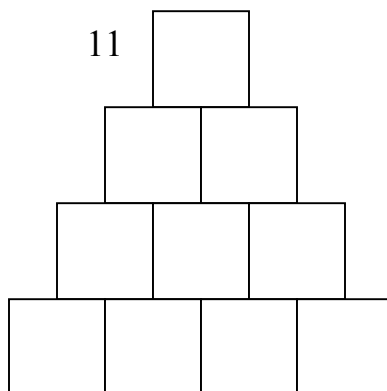
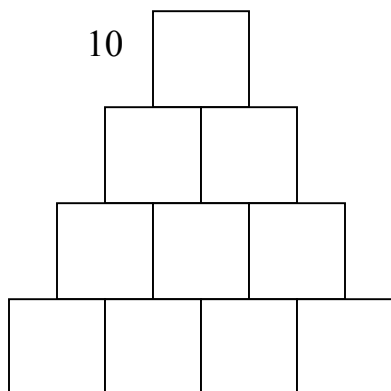
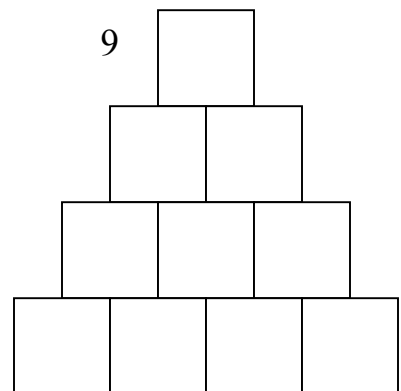
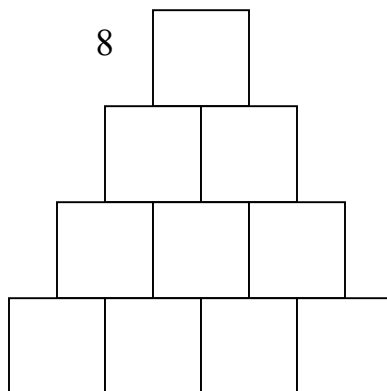
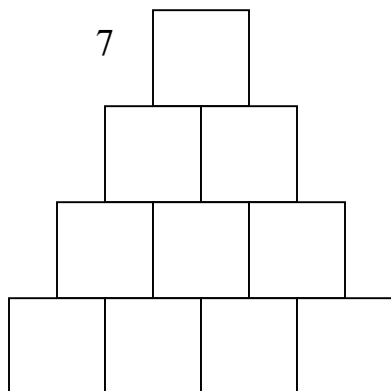
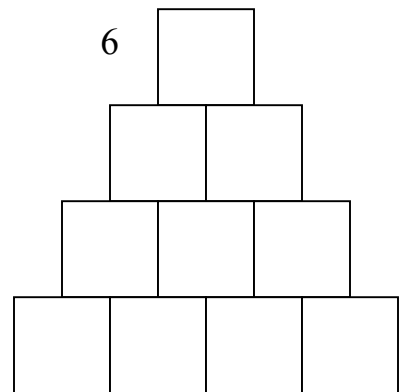
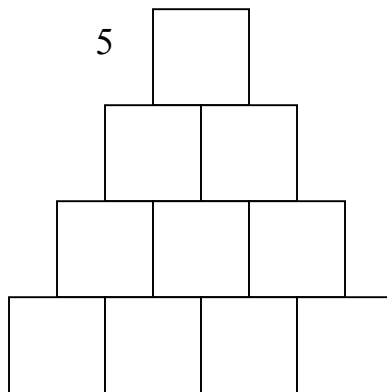
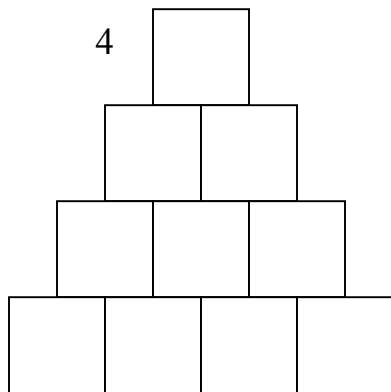
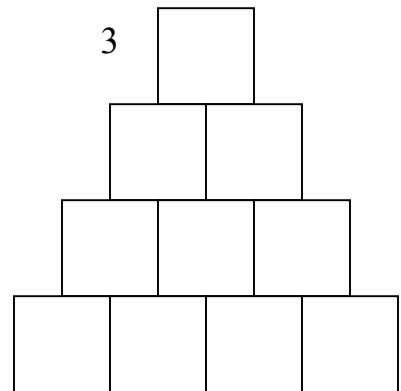
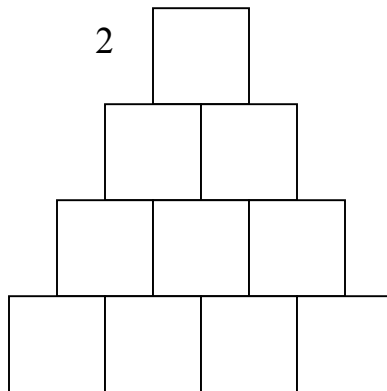
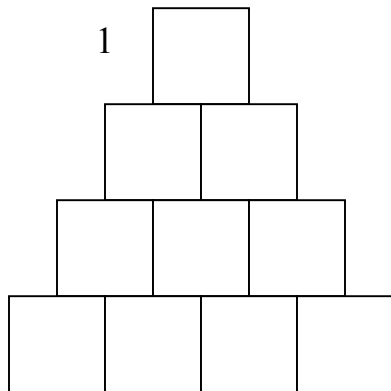


These activities can be made self-assessing by writing the answers at the bottom of the page. As students solve each pyramid, they can cross off the answers. If they get an answer that is not listed, they know they have made a mistake and can try again.

# Pyramid Math

Name \_\_\_\_\_

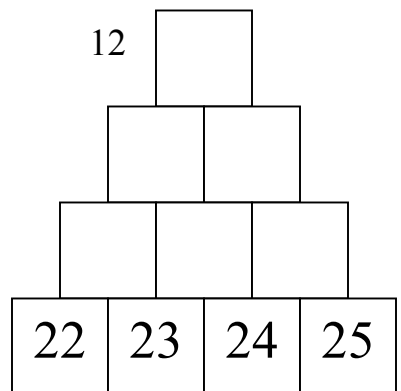
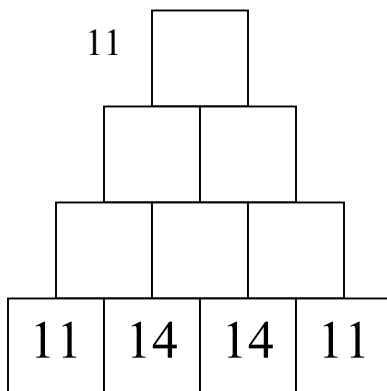
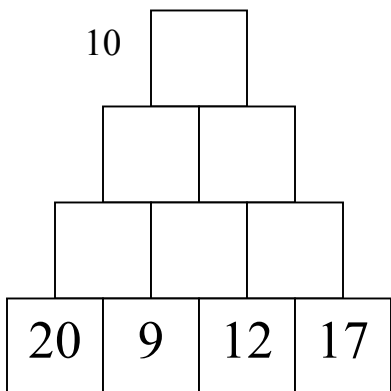
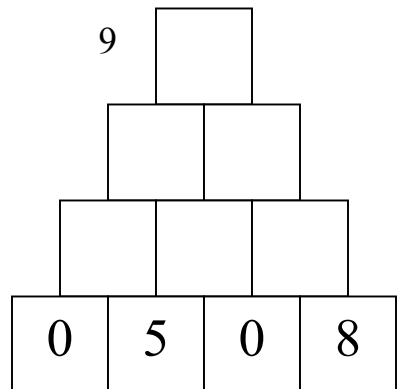
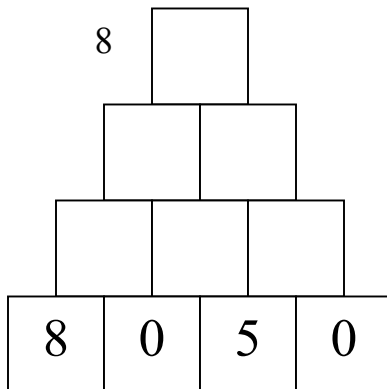
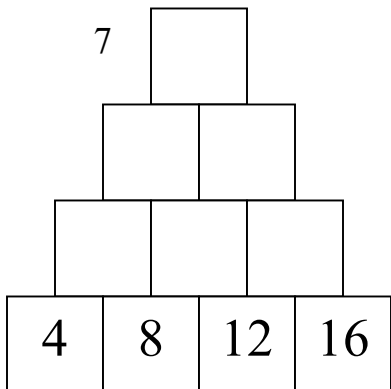
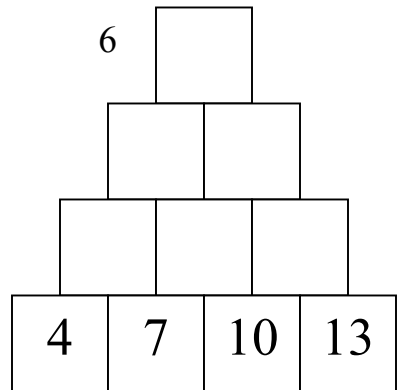
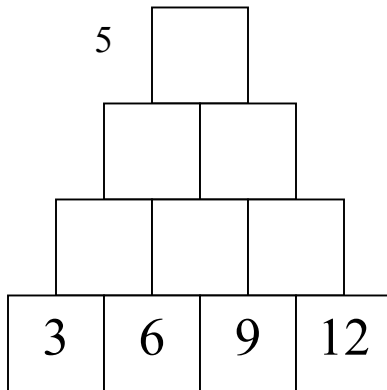
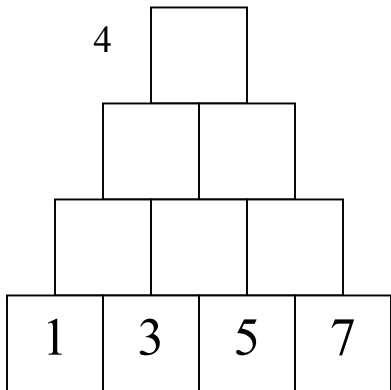
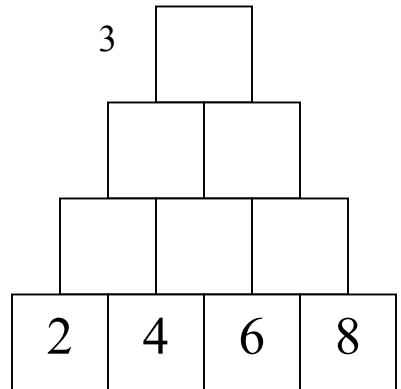
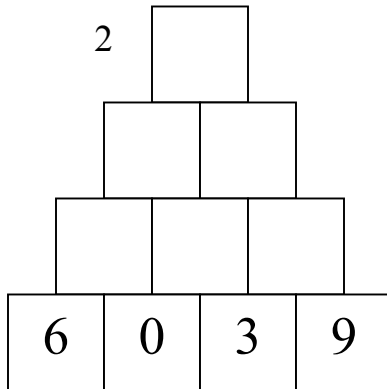
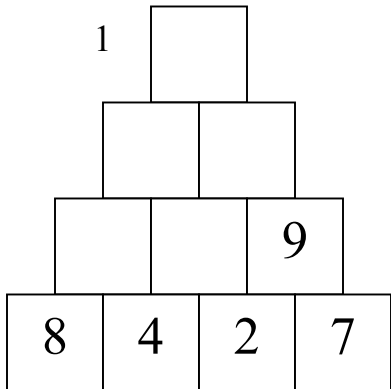
Add pairs of adjacent numbers and write their sums in the box above them. Keep going until you reach the top of the pyramid.



# Pyramid Math 1

Name \_\_\_\_\_

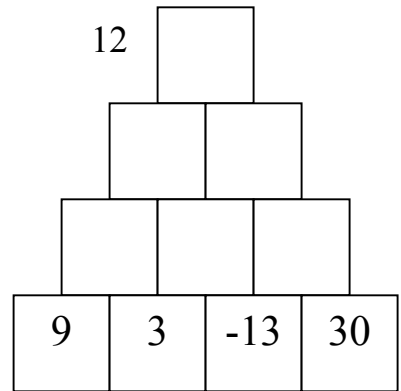
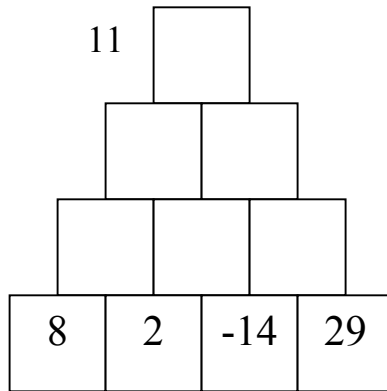
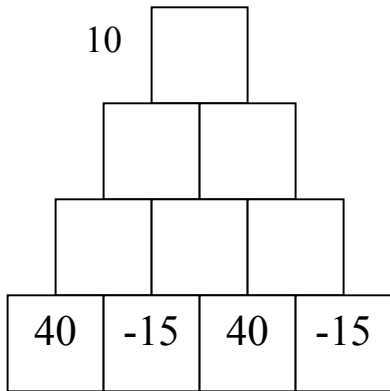
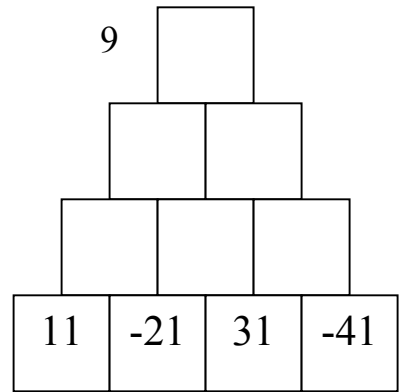
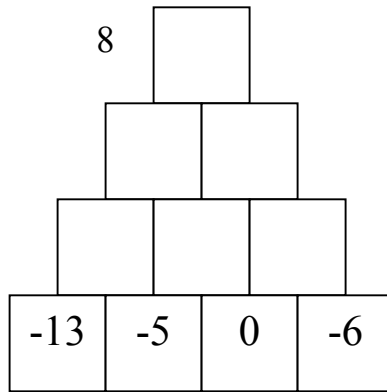
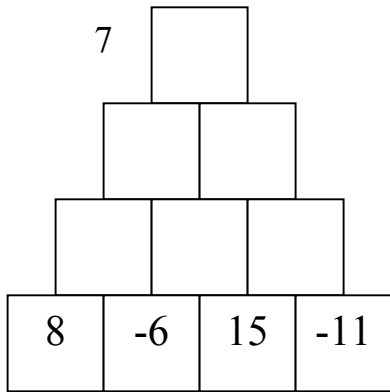
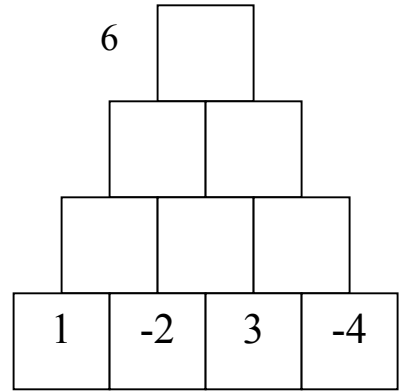
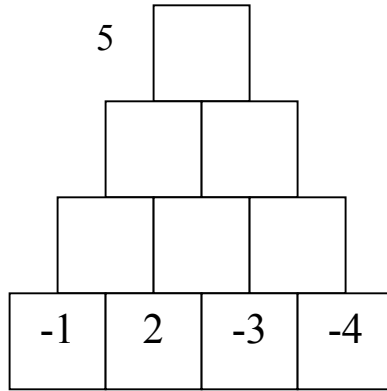
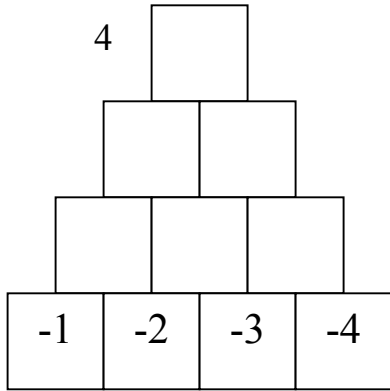
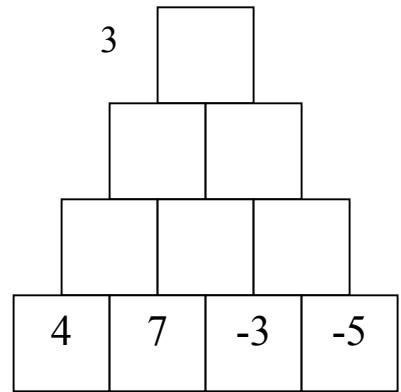
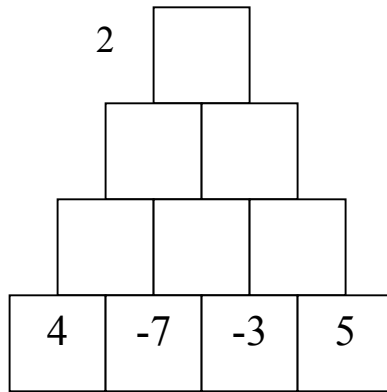
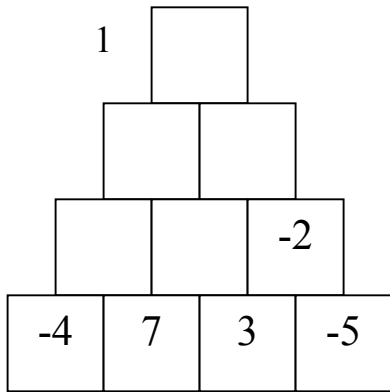
Add pairs of adjacent numbers and write their sums in the box above them as in the first example. Keep going until you reach the top of the pyramid.



# Pyramid Math 3

Name \_\_\_\_\_

Add pairs of adjacent numbers and write their sums in the box above them as in the first example. Keep going until you reach the top of the pyramid.



# Pyramid Math 6

Name \_\_\_\_\_

Each number is the sum of the two numbers below it. Work backward to fill in the bottom row.

