Mathletes Problem of the Week #20

Trapezoidal Numbers

This week, we will explore **trapezoidal numbers**. A trapezoidal number is a number that can be drawn using a series of dots that form a trapezoid. The dots are lined up in rows, where each row is one dot longer than the one above it. Sometimes these numbers are called **staircase** numbers because the rows look like a staircase. For example, we can see above that 12 is a trapezoidal number because we can arrange 12 dots into three rows: 3 + 4 + 5. Similarly, 7 is a trapezoidal number because we can arrange 7 dots into two rows: 3 + 4. Try out these trapezoidal number challenges!

a) What numbers can be written as two-row trapezoidal numbers (like 7)? How many can you find? Do they share any characteristics? Can you write an expression for them that you could use to find more?
b) What numbers can be written as three-row trapezoidal numbers (like 12)? How many can you find? Do they share any characteristics? Can you write an expression for them that you could use to find more?
c) What about four-row, five-row, or six-row trapezoidal numbers? Can you find some of those? Can you find a general expression for those?
d) Can the number 100 be written as a trapezoidal number? If so, can it be written as a trapezoidal number in more than one way?
e) What numbers cannot be written as trapezoidal numbers? What do they have in common?

Solutions & Explanations: (Try one or try them all! Record your answers below, on the back or a separate sheet of paper.)

Name _____ **Class** _____

(First and last name, please!) **Solutions due: May 15th**