

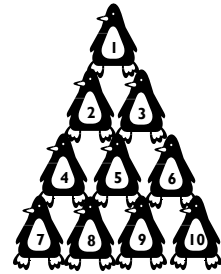
Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Penguin Formation

In the book **365 Penguins**, Dad tries all kinds of mathematical arrangements of the different number of penguins. He arranged them in 4 sets of 15 with each set arranged in a triangular formation like the picture on the right. But, this was not to last, because penguin #61 arrived quickly.

Suppose Dad decided to arrange the 61 penguins in one large triangular formation.

- Can 61 penguins make a perfect triangular formation (all the rows filled)?
- If not, how many more penguins does Dad need before this new idea will work?



Use numbers, words, pictures, and/or tables to explain your best mathematical thinking.

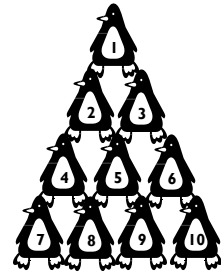
Name: Possible Solution Date: \_\_\_\_\_

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- I have to find out how many rows 61 penguins will make.
- I start adding up the rows starting with the top.
- $1 + 2 + 3 + 4 + 5 = 15$  penguins so I need a lot more!
- $15 + 6 + 7 + 8 + 9 + 10 = 55$  penguins so I have 10 rows filled.
- I only have 6 more penguins to put in the 11th row so it won't be filled.
- **ANSWER:** 61 penguins cannot make a perfect triangular formation because the bottom (11th) row will not be filled.
- The 11th row needs 11 penguins to fill it. I only have 6 so Dad needs 5 more penguins to make a perfect triangular formation.
- **ANSWER:** Dad needs 5 more penguins (66 in all) to make this idea work.