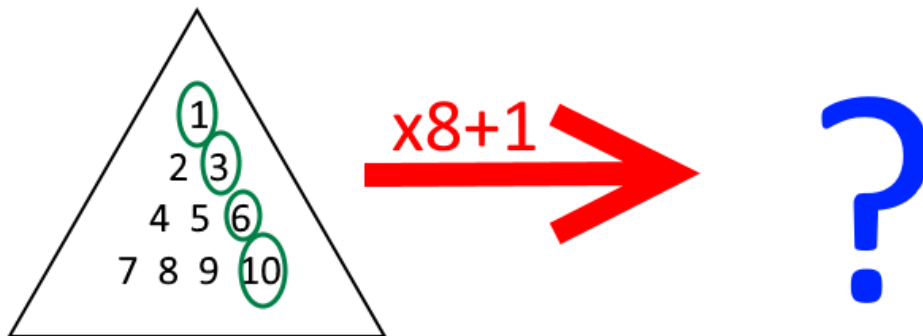


Alison started by choosing a triangular number, multiplied it by 8, and added 1. She noticed something interesting about her results...



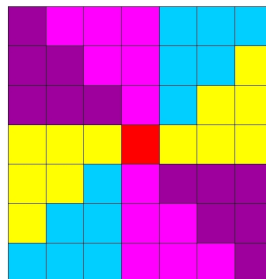
Try a few examples. Can you make a conjecture?

Once you've made a conjecture of your own, turn the page over to read what Alison noticed.

"If  $T$  is a triangular number,  $8T+1$  is a square number."

### Can you prove the conjecture?

Claire thought that she could use a picture to prove this conjecture. Can you use her picture to create another proof to show that the conjecture is true?



**I wonder if there are any integers  $k$  where  $8k + 1$  is a square number but  $k$  is not a triangular number...**

Can you prove that if  $8k + 1$  is a square number,  $k$  **must** be a triangular number?

Can you use your theorem to devise a quick way to check whether the following numbers are triangular numbers?

6214, 3655, 7626, 8656