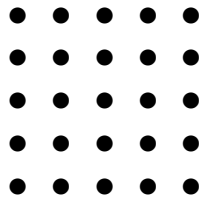


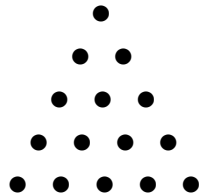
Triangle Numbers

You may know that square numbers are numbers you can arrange in a square of dots. For example **25** is a square number because it can be arranged as a square **5** dots wide and **5** dots long:



But did you know that dots can also be arranged in the shape of triangles to give triangle numbers?

We begin with a row with just one dot, then a row with two dots, then three and so on:



If we look at the first row, there is just **one** dot, so the first triangle number is **1**.

If we look at the first two rows, there are three dots altogether, so the second triangle number is **3**.

The first three rows give us **6** dots and so on. So the triangle numbers are:

1 3 6 10 15

Can you write down the next **10** triangle numbers?

Now here is a bit of algebra for you. Don't panic if you haven't done much algebra yet – I will explain everything as usual.

The formula for triangle numbers is $\frac{n(n+1)}{2}$

n stands for a number. If we want the fifth triangle number, **n** is **5**. If we want the tenth, **n** is **10** and so on.

All we have to do is to put the number for **n** in the formula.

$n + 1$ in the bracket means add 1 to n .

$n(n + 1)$ means multiply the bit in the bracket by n .

And the 2 in the denominator of the fraction means divide by 2.

Let's give it a go:

Suppose we want the 4th triangle number. That means that $n = 4$.

Put the number 4 for n in the bracket and add the 1. That gives us 5.

So the top row is now 4×5 . This equals 20, of course.

Lastly, we divide by the 2 to get 10. So the 4th triangle number is 10.

And it is! How easy is that.

Let's do it one more time. In the list above, we have the first 5 triangle numbers: (1, 3, 6, 10, 15).

Suppose we want to find the next one in the sequence. That is the 6th one, so we make $n = 6$.

Put $n = 6$ in the bracket and we get $n + 1$, which is 7.

Multiply that by n , so we have 6×7 . That is 42.

Lastly, divide by 2 to get 21.

So 21 is the sixth triangle number.

Use the formula to find the 7th triangle number.

Now you have the idea, can you use the formula to find the 20th triangle number?

Can you find the 50th?

Can you find the 124th ?

No Calculators

What is the **largest triangle number** you can find?