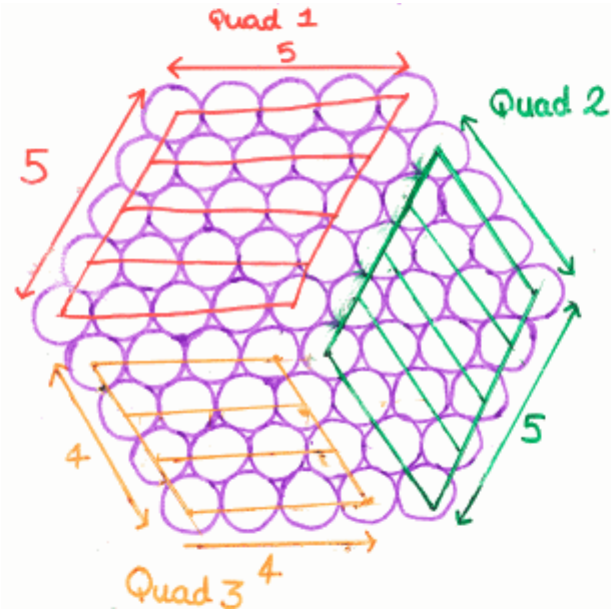
Steel Cables

Here is some work done on the problem 'Steel Cables' by Group 1. Can you explain their reasoning?



Size	Quad 1	Quad 2	Quad 3	T
2	2×2	2×1	1×1	7
3	3×3	3×2	2×2	19
4	4×4	4×3	3×3	37
5	5×5	4×5	4×4	61
6	6×6	6×5	5×5	91
10	10×10	10×9	9×9	271
n	$n\times n$	$n\times(n-1)$	$(n-1)^2$	?
	$\uparrow$ n^2	$\uparrow$ n^2-n	$\uparrow$ n^2-2n+1	

$$T = n^2 + n^2 - n + n^2 - 2n + 1$$

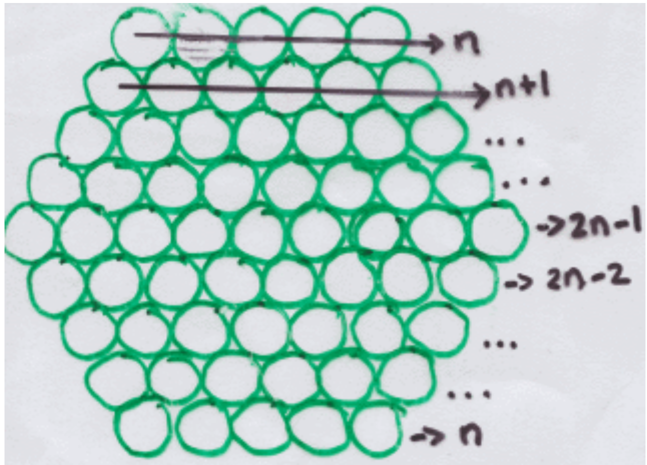
$$\Rightarrow 3n^2 - 3n + 1$$

or

$$3n(n-1) + 1$$

Steel Cables

Here is some work done on the problem 'Steel Cables' by Group 2. Can you explain their reasoning?



To find the sum you must add up all the rows:

$n + 2n-1 = 3n-1$

$n+1 + 2n-2 = 3n-1$

$n+2+2n-3 = 3n-1$

$\vdots \quad \vdots \quad = \text{" "}$

$2n-1 + n = 3n-1$

$3n-1$ is the sum of two of the rows so there are n pairs of $3n-1$:

$n(3n-1)$

BUT we repeated $2n-1$. When there is only one of this, so take away the extra $2n-1$

$n(3n-1) - 2n-1$

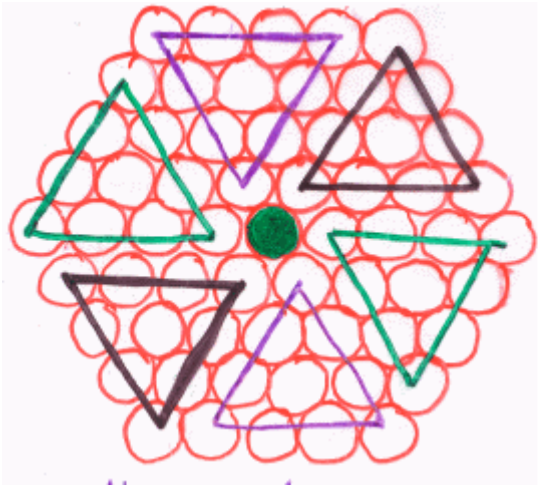
Simplify it:

$= 3n^2 - n - (2n-1)$

$= 3n^2 - n - 2n + 1$

$= 3n(n-1) + 1$

Here is some work done on the problem 'Steel Cables' by Group 3. Can you explain their reasoning?



We noticed there are always 6 triangles in a hexagon - all equal

The areas of these triangles are triangular numbers

The formula for triangular no = $\frac{n(n+1)}{2}$

However, the side of one of these triangles is not 'n' but one less so the length of the side of the triangle) $n-1$

Substitute this into the formula instead of n :

$$\frac{(n-1)(n-1+1)}{2} = \frac{n(n-1)}{2}$$

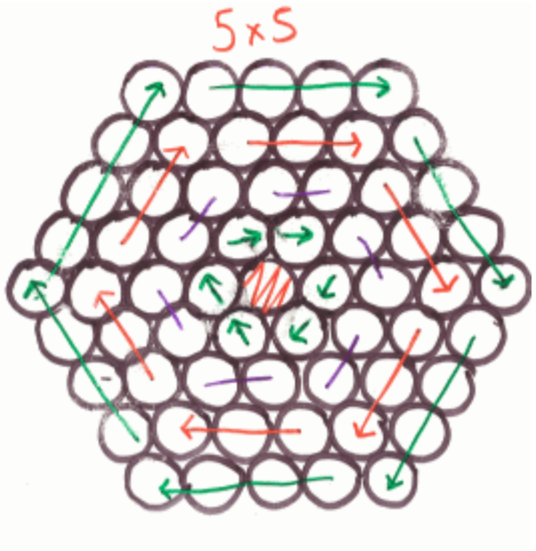
We know there are always 6 triangles in a hexagon so the total area will be

6 x triangle area + the extra one in the centre

$$6\left(\frac{n(n-1)}{2}\right)+1$$

$$\cancel{6}^{3}\left(\frac{n(n-1)}{\cancel{2}^{1}}\right)+1 = 3n(n-1)+1$$

Here is some work done on the problem ‘Steel Cables’ by Group 4. Can you explain their reasoning?



1

6×1

6×2

6×3

6×4

$\ldots$

$6(n-1)$

We noticed that the area of each ring followed this pattern. To find the total we needed to add the areas of each ring

$$1+6\times1+6\times2+6\times3\ldots6(n-1)=$$

$$1+6(1+2+3+4\ldots n-1)$$

$$1+6\left(\frac{n(n-1)}{2}\right)$$

$$\boxed{1+3n(n-1)}$$