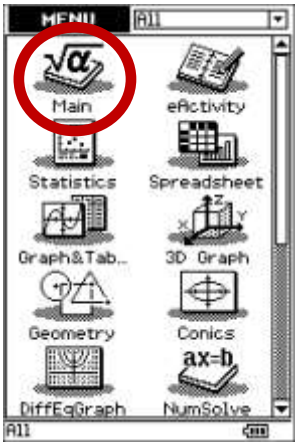
How many rectangles are there?

Problem 1: On the front solar panel, how many rectangles do you see?



Breaking the problem into a smaller one and building up again to answer the question.

The solar panel is 17×9, so let's start with a 1×1, then a 2×2, then a 3×3, … , 17×9.

This has only one 1×1 (a square), giving a total of 1.

There are four 1×1's and two 1×2's and two 2×1's and one 2×2, giving a total of 9.

There are nine 1×1's and six 1×2's and six 2×1's and four 2×2's and three 1×3's and three 1×3's and two 2×3's and two 3×2's and one 3×3 giving a total of 36.

Recording these results in a grid:

	1
1	1

Total 1

	1	**2**
1	4	2
2	2	1

Total 9

	1	**2**	**3**
1	9	6	3
2	6	4	2
3	3	2	1

Total 36

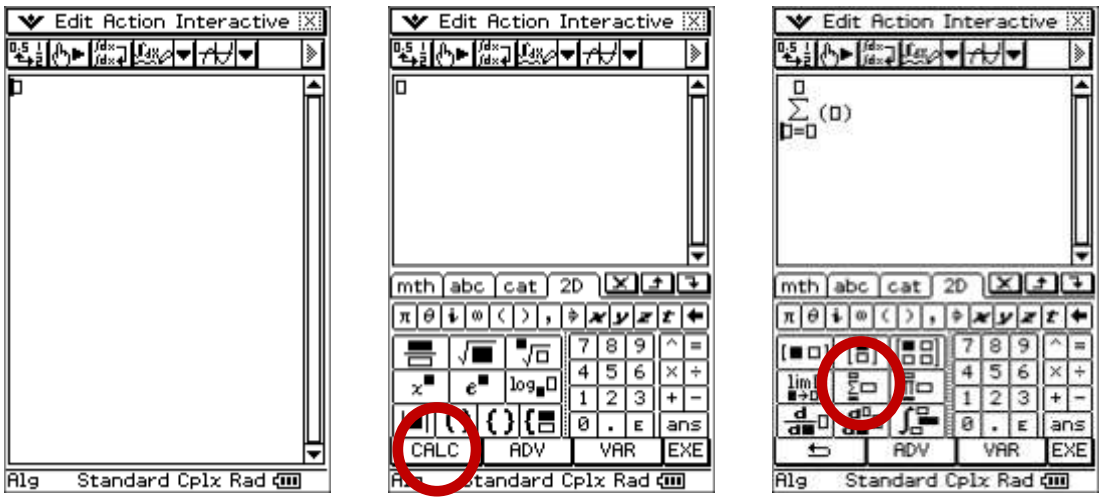
	1	**2**	**3**	**4**
1	16	12	8	4
2	12	9	6	3
3	8	6	2	2
4	4	3	2	1

Total 100

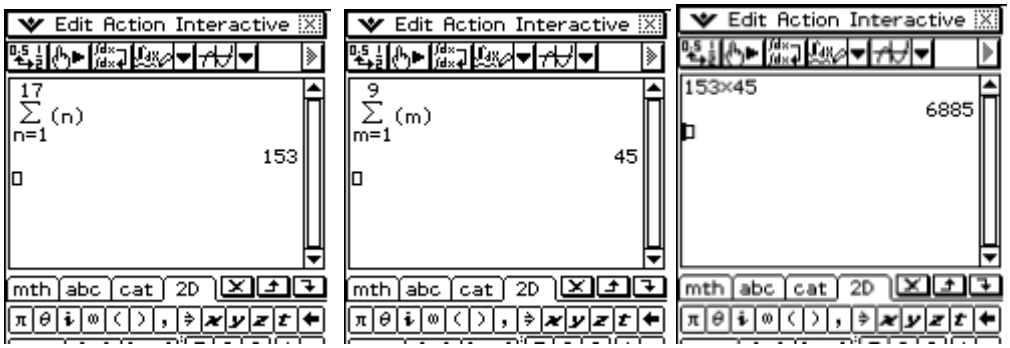
Looking for patterns:
$1 = 1 \times 1$ $\quad 9 = 3\times3 = (1 + 2) \times (1 + 2)$ $\quad 36 = 6\times6 = (1 + 2 + 3) \times (1 + 2 + 3)$
$100 = 10\times10 = (1 + 2 + 3 + 4) \times (1 + 2 + 3 + 4)$ etc,.

If you number the rows (1, 2, 3, … , n) and the number of columns (1, 2, 3, … , m) then add the number of rows 1 + 2 + 3 + … + *n*) and the number of columns (1 + 2 + 3 + … + *m*) then multiply these two results the answer is the total number of rectangles.
That is, $n \times m = (1 + 2 + 3 + 4 + \ldots + n) \times (1 + 2 + 3 + 4 + \ldots + m)$

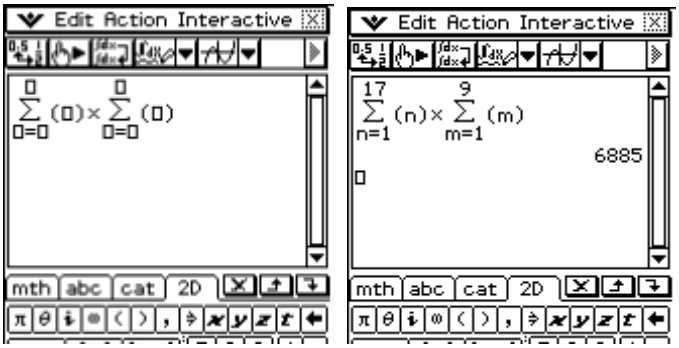
In **Main** select **2D**, then **CALC** and then the **sigma icon**.



Enter in the values for the solar panel dimensions.



OR both together…



Now generalize… Problem 2: How many rectangles do you see in an $n\times m$ rectangle?