

Square Pattern Power

Build square arrays and explain the next odd-number increase

GRADE 6 • 6.NS.3.b

6.NS.3.b "Recognize and represent patterns of perfect squares not to exceed 202, by using concrete and pictorial models."

NAME _____

DATE _____

BUILD UNDERSTANDING

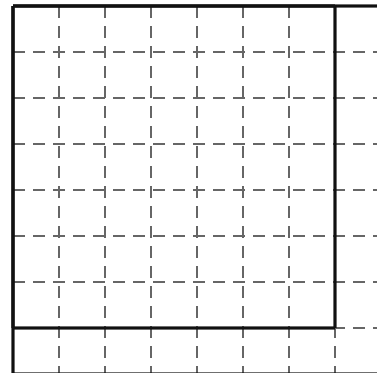
A square array has the same number of unit tiles in every row and column. Squaring a number multiplies it by itself. To grow an n -by- n square, add n tiles on the right, excluding the new corner, and $n + 1$ along the bottom, including that corner. Correct limit: 20 squared (400). The quoted standard lost its exponent formatting. Use grid paper or counters; draw your models here.

WORKED EXAMPLE

The solid outlines show a 7-by-7 square growing to 8 by 8. How does the new L explain the total?

1. The old square has $7 \times 7 = 49$ tiles.
2. Add 7 on the right without the new corner, then 8 below including it: 15 new tiles.

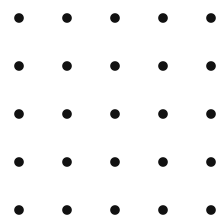
Answer: $49 + 15 = 64$: add 7 on the right without the corner and 8 below including it.



Each small square is 1 unit tile

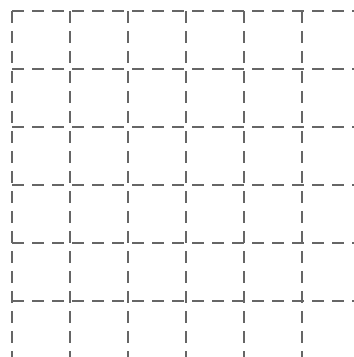
PRACTICE 4 problems

- 1** Use this array to write a multiplication sentence and a squared number. Explain what the exponent 2 means.



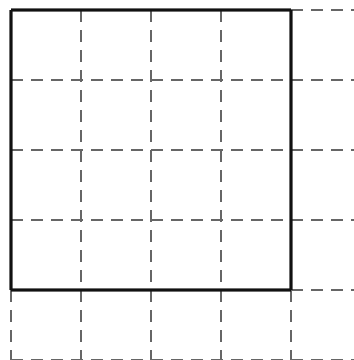
Each dot represents one tile

- 2** Outline a 4-by-4 square on the grid. Label its side length and record its total. Use equal rows and columns to justify.



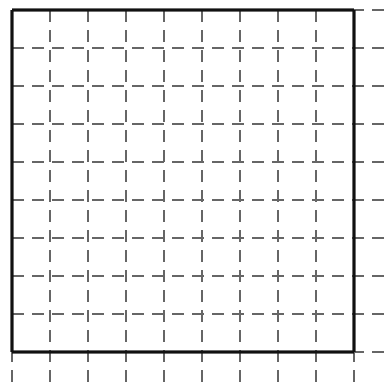
Each small square is 1 unit tile

- 3** The solid outline encloses 4 by 4 tiles. Extend it to 5 by 5. Mark the new L-shaped part and count its tiles.



Each small square is 1 unit tile

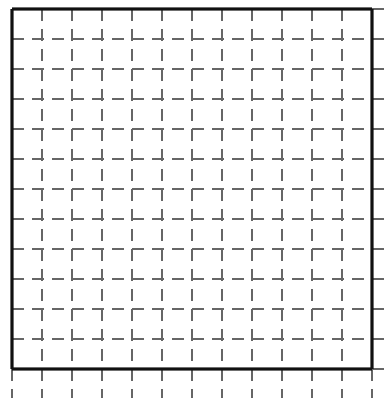
- 4** Extend the solid 9-by-9 square to 10 by 10. Outline the new boundary and explain the increase without counting every tile.



Each small square is 1 unit tile

APPLY IT Show your work

- A mosaic grows from 12-by-12 to 13-by-13 tiles.
- 1** Outline the larger square and label the added L. Find the increase and new total.



Each small square is 1 unit tile

2

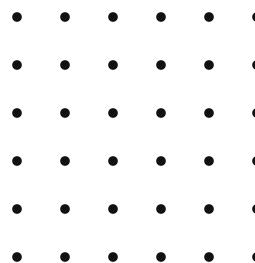
A 19-by-19 light panel gains one row and one column to become 20 by 20. Sketch the new boundary just outside the old one. Label the added strips and calculate the new total.



Old square: 19 tiles on each side

CHALLENGE One step up

Lena says 6 squared equals 12 because $6 + 6 = 12$. Use this square model to show the mistake and explain the correct total.



Each dot represents one tile

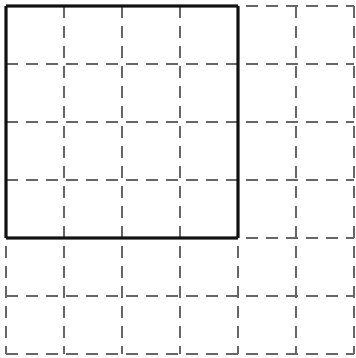
Source note: Virginia Mathematics SOL Overview of Revisions (2023), page 119, writes the limit as 20 with superscript 2, meaning 400. The quotation above lost the superscript. Require the actual outlined square or added L where asked. Model labels should show equal side lengths and count the new corner once. For the 20-by-20 panel, a labeled schematic is sufficient; students need not draw 400 separate lights. In the keys, N marks the new outside corner.

PRACTICE 1

$5 \times 5 = 25$, so 5 squared = 25. The two equal factors count rows and columns.

PRACTICE 2

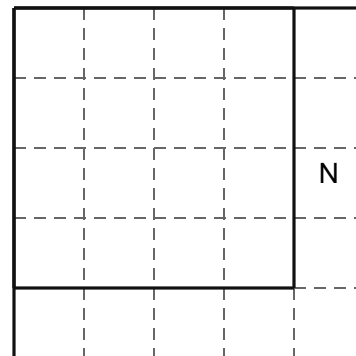
An outline encloses 4 rows of 4 tiles. Side length 4; 4 squared = 16 tiles.



Each small square is 1 unit tile

PRACTICE 3

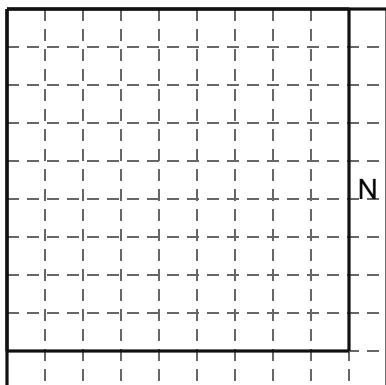
Add 4 on the right without the new corner and 5 below including it: 9 new tiles. Total: $16 + 9 = 25$.



Each small square is 1 unit tile

PRACTICE 4

Add 9 on the right without the new corner and 10 below including it: 19 more. Total: $81 + 19 = 100$.

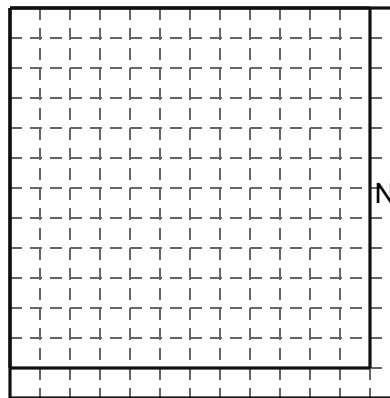


Each small square is 1 unit tile

APPLY IT 1

25 added; $144 + 25 = 169$ tiles.

Add 12 on the right without the new corner, then 13 below including it.

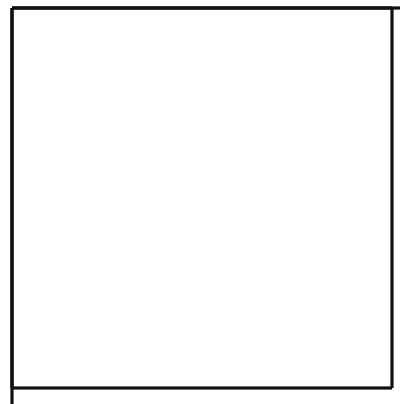


Each small square is 1 unit tile

APPLY IT 2

39 added; $361 + 39 = 400 = 20$ squared.

Add 19 on the right without the new corner, then 20 below including it: 39 more.



Old square: 19 tiles on each side

CHALLENGE

The array has 6 rows of 6, so 6 squared = $6 \times 6 = 36$. Adding 6 twice counts only two rows, not six.