

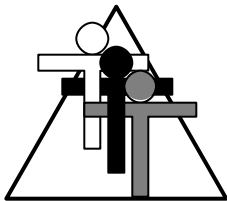
The King's Pathway

An Exploration in
Algebra, Geometry, and Number Skills

By Brad Fulton

A Unit from
The Pattern and Function Connection

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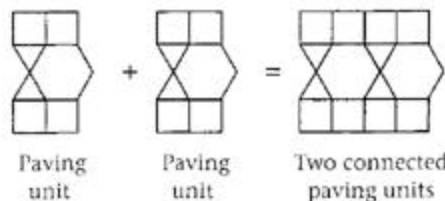
An amusement park has asked you to design the "King's Pathway" through the park. The pathway is to be built by repeating a pattern for 100 steps.

Use pattern blocks to design a geometric pathway. You must use at least three different shapes to create your design. A complete example is shown at the end of this worksheet.

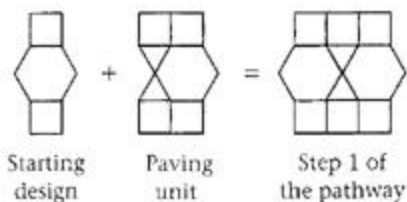
Here are the names of the shapes used in a set of pattern blocks:



1. Begin by finding a paving unit. This is a group of tiles that will connect without spaces.



2. Next you may wish to construct a starting design that differs from the paving unit. This makes the functions more advanced, which greatly pleases the park's administration.

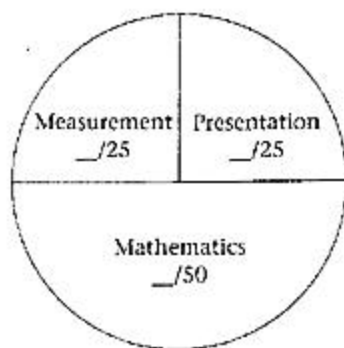


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WORKSHEET 11 (Continued)

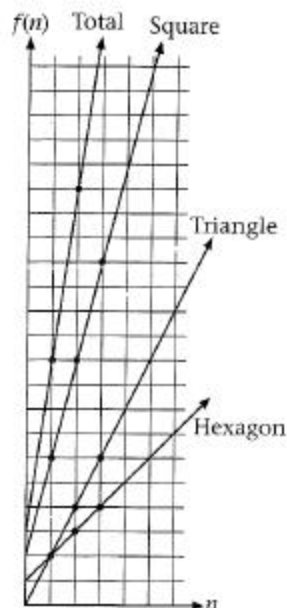
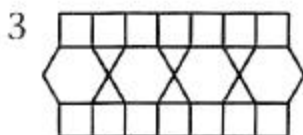
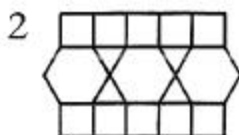
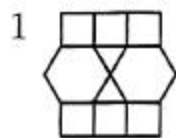
3. On drawing paper, trace pattern blocks to show your pathway for steps 1, 2, and 3. Make your drawings as neatly as possible and label each step. Color the pathway using a different color for each type of shape. You don't have to use the same colors that the pattern blocks use.
4. Construct a T-table for each shape you have used and for the total number of pattern blocks. Label each T-table with its correct geometric name. Find the algebraic pattern and write a formula. Calculate how many tiles would be used to create the one-hundredth repetition of your path.
5. Graph the functions for the number of each shape and the total number of pattern blocks. Use colored pencils to match each graph with your drawing of the pathway.
6. You will be graded using the following scale:

| | |
|--------------------------|------------------|
| Accuracy of Measurement: | 25 points |
| Quality of Presentation: | 25 points |
| Mathematics: | <u>50 points</u> |
| Total: | 100 points |



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The King's Pathway (Example)

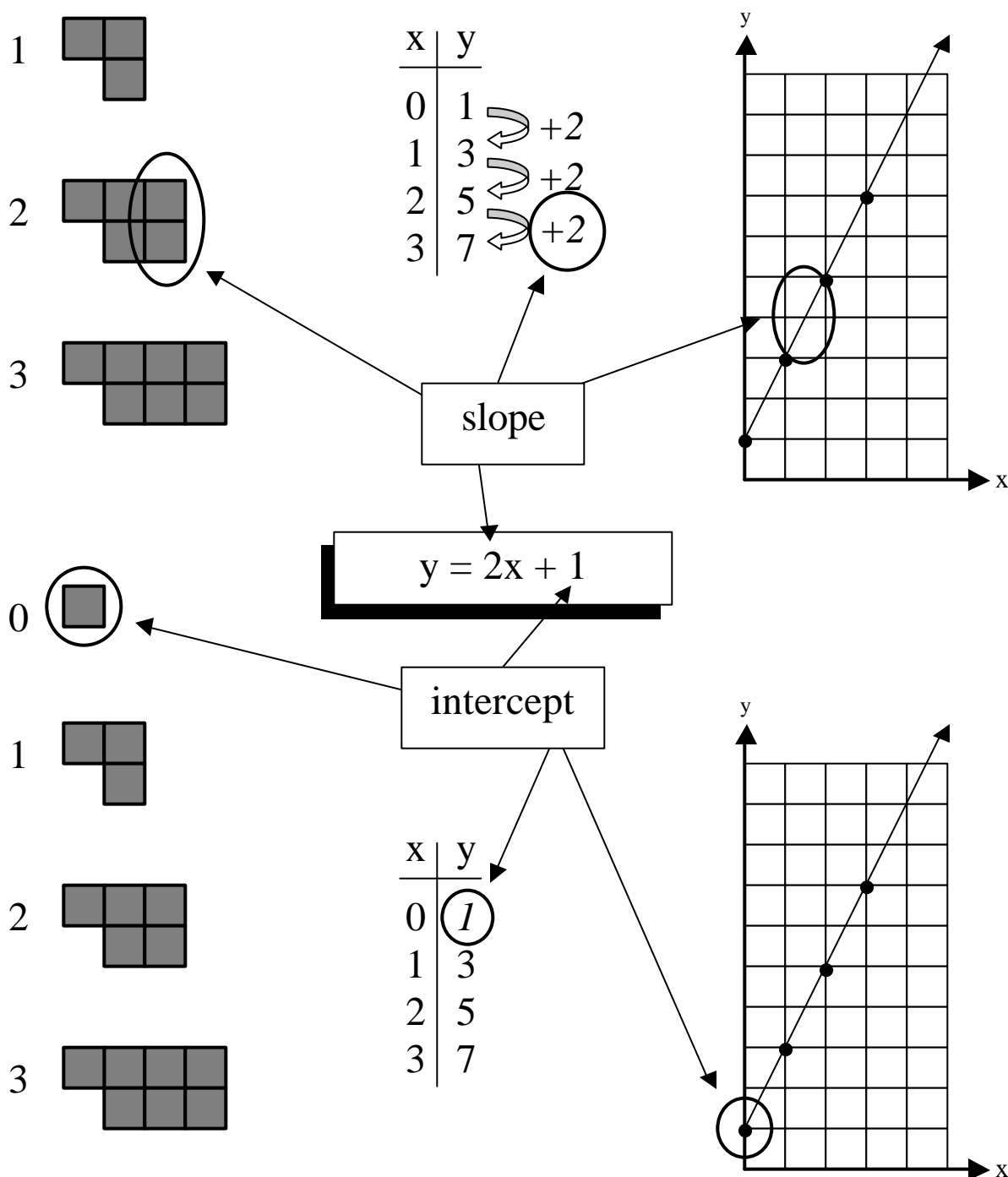


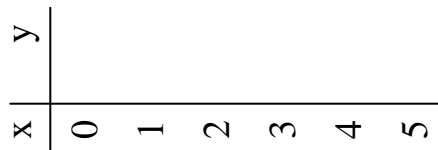
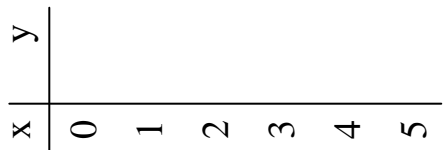
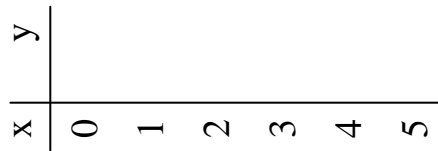
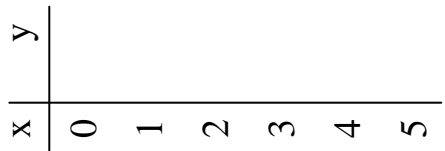
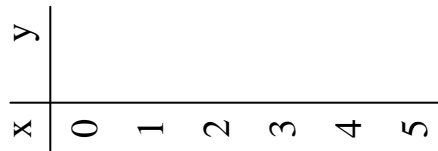
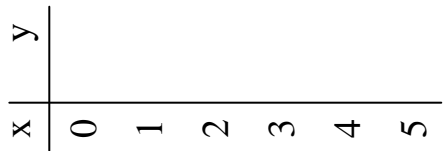
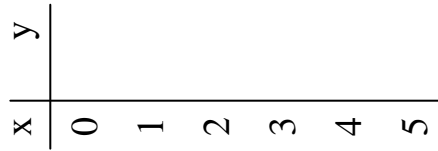
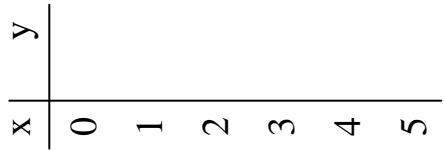
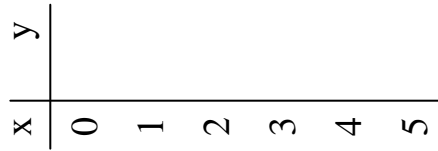
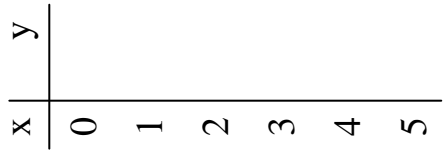
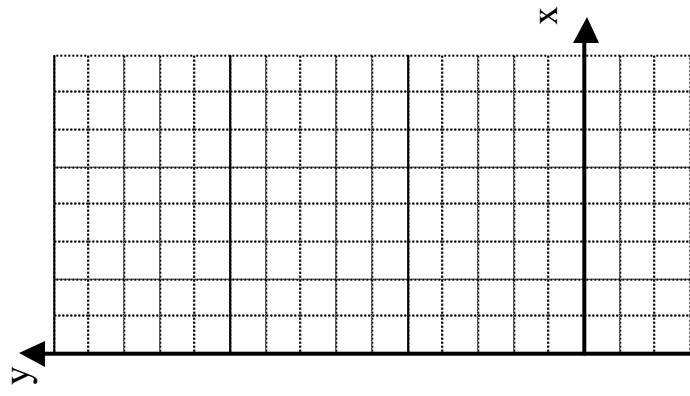
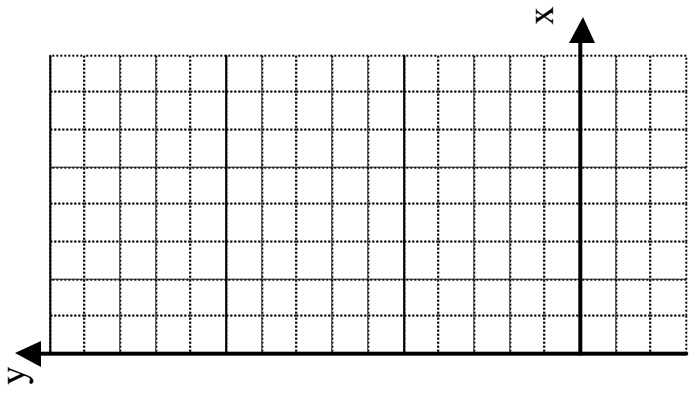
| Square | | Hexagon | | Triangle | | Total | |
|--------|----------|---------|---------|----------|--------|-------|----------|
| n | $f(n)$ | n | $f(n)$ | n | $f(n)$ | n | $f(n)$ |
| 0 | 2 | 0 | 1 | 0 | 0 | 0 | 3 |
| 1 | 6 | 1 | 2 | 1 | 2 | 1 | 10 |
| 2 | 10 | 2 | 3 | 2 | 4 | 2 | 17 |
| 3 | 14 | 3 | 4 | 3 | 6 | 3 | 24 |
| n | $4n + 2$ | n | $n + 1$ | n | $2n$ | n | $7n + 3$ |
| 100 | 402 | 100 | 101 | 100 | 200 | 100 | 703 |

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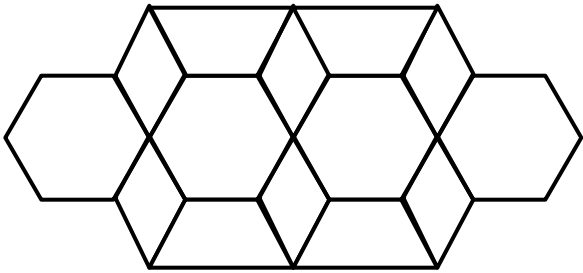
The Slope and Intercept Connections:

Here is an abbreviated diagram showing how the slope and y-intercept of a linear function can be derived from its picture, t-table, formula, and graph.

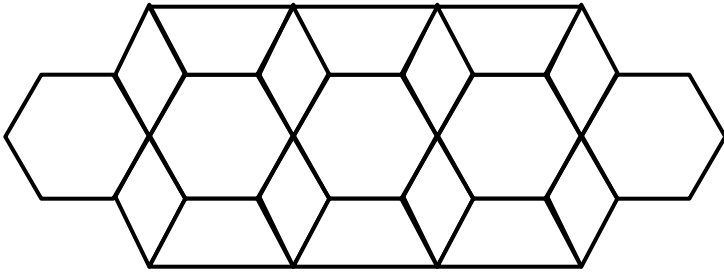




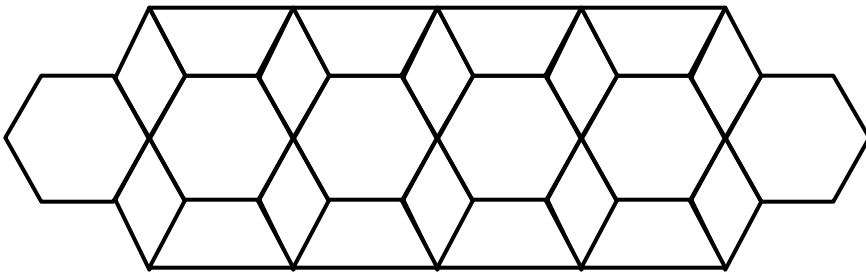
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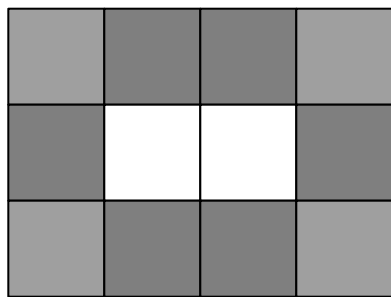
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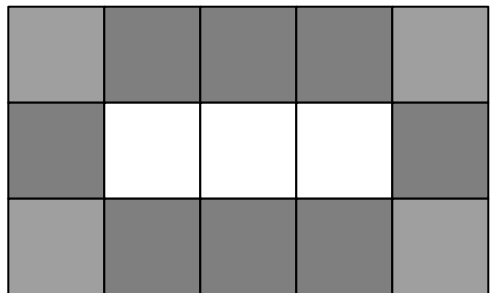
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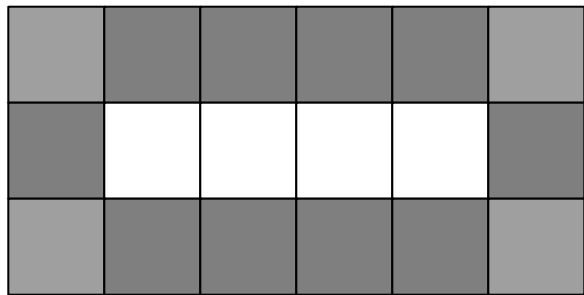
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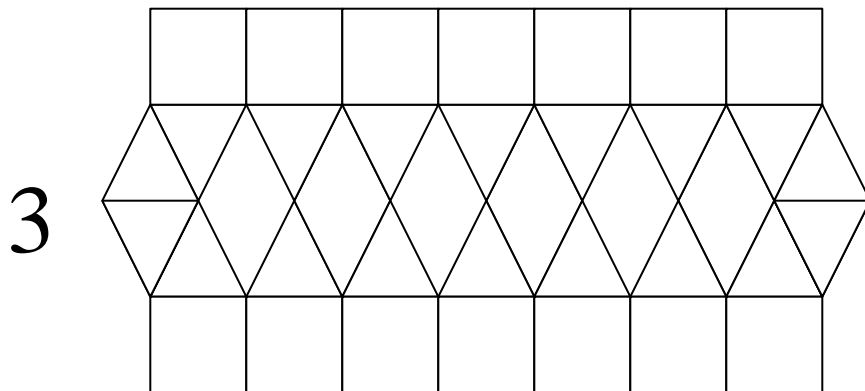
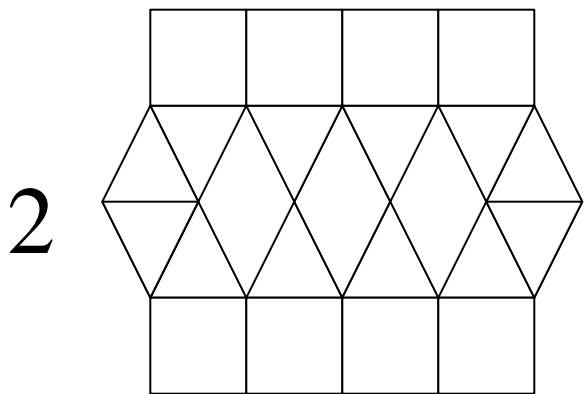
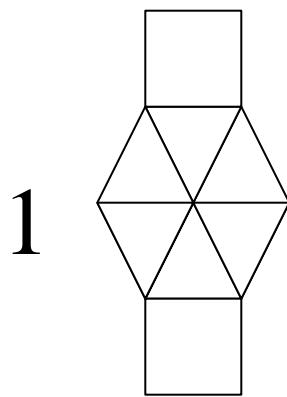


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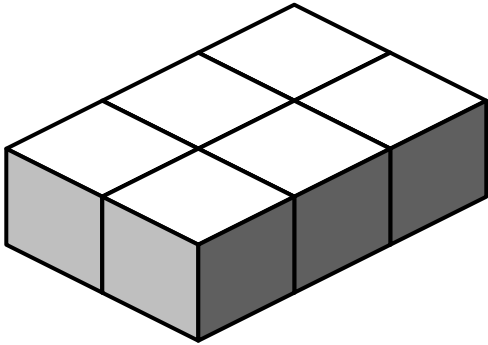


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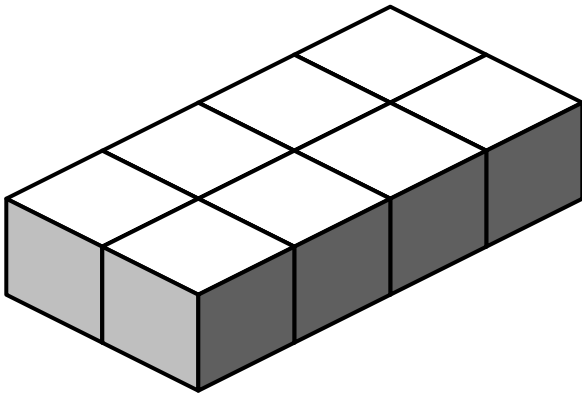




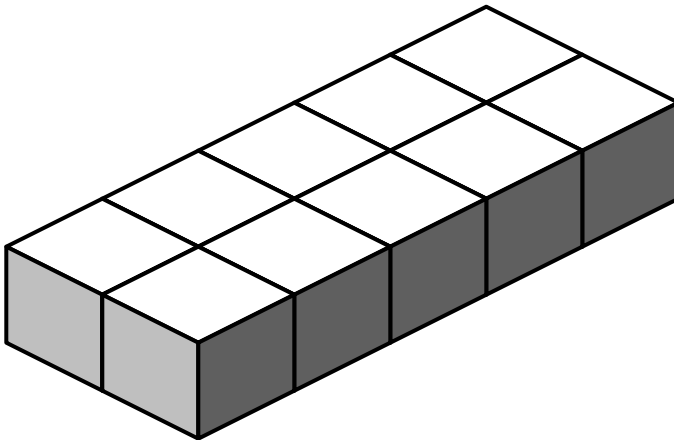
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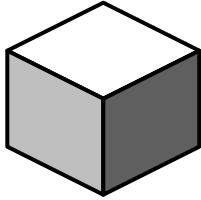
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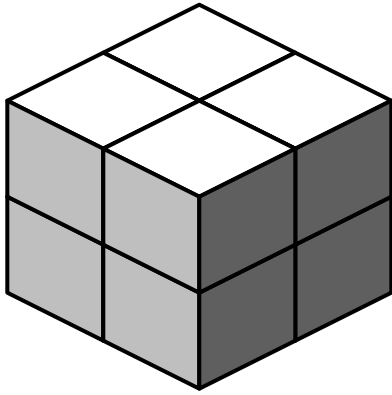
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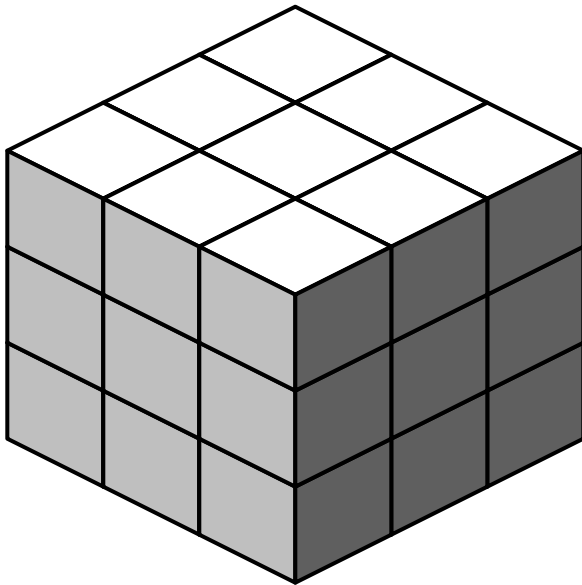
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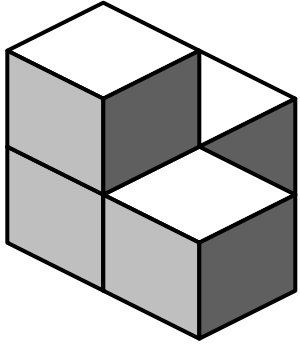
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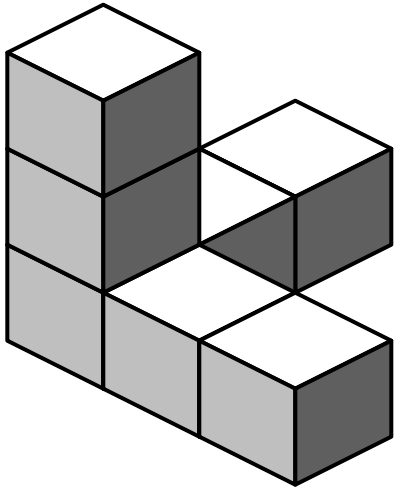
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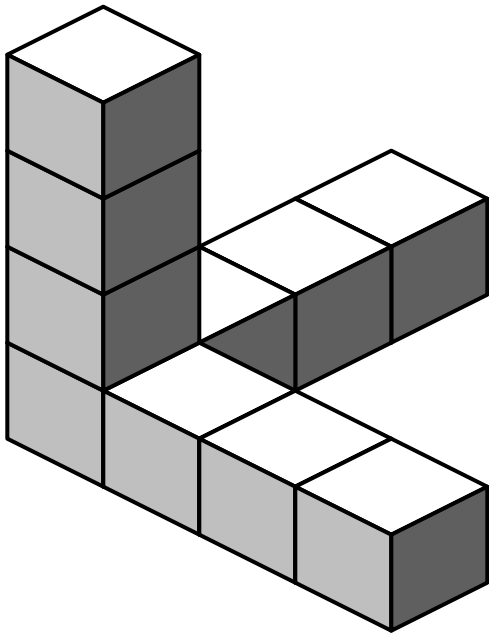
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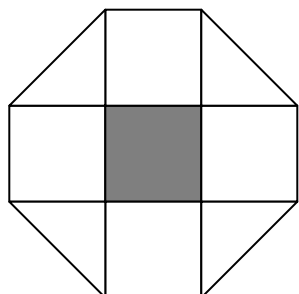
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3



1



Triangles

| x | y |
|---|---|
| 0 | |
| 1 | |
| 2 | |
| 3 | |
| 4 | |

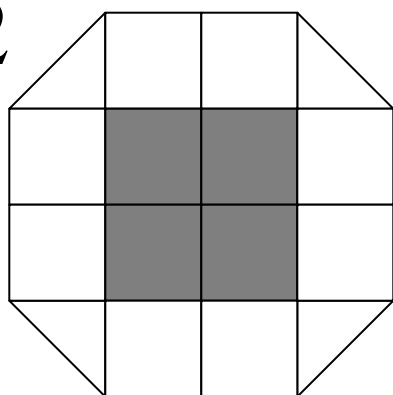
White squares

| x | y |
|---|---|
| 0 | |
| 1 | |
| 2 | |
| 3 | |
| 4 | |

Dark squares

| x | y |
|---|---|
| 0 | |
| 1 | |
| 2 | |
| 3 | |
| 4 | |

2



TOTAL

| x | y |
|---|---|
| 0 | |
| 1 | |
| 2 | |
| 3 | |
| 4 | |

3

