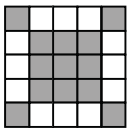
Sidewalk Patterns

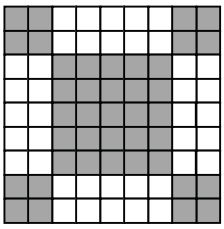
This problem gives you the chance to:
- work with patterns
- work out the n^{th} term of a sequence

In Prague some sidewalks are made of small square blocks of stone.

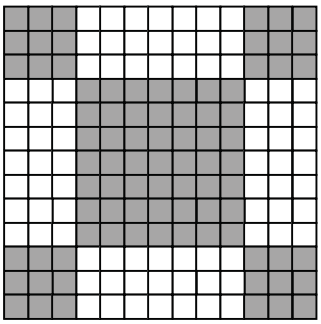
The blocks are in different shades to make patterns that are in various sizes.



Pattern number 1



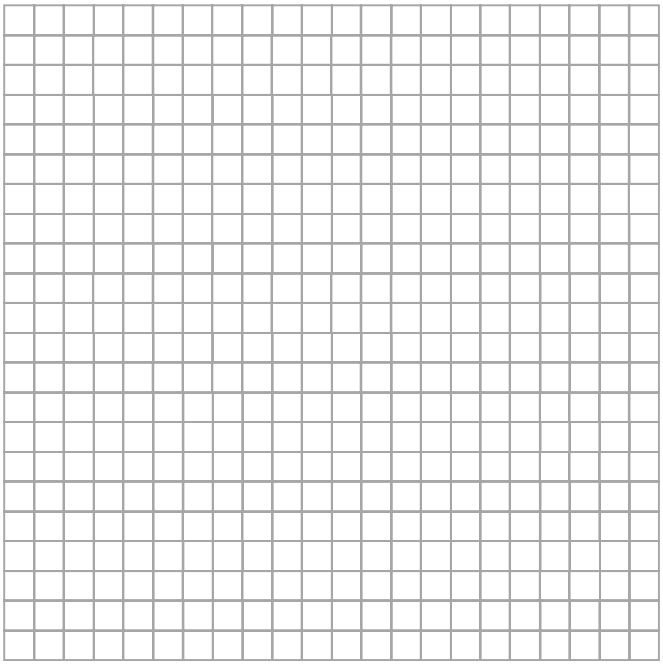
Pattern number 2



Pattern number 3

1. Draw the next pattern in this series.

You may not need to use all of the squares on this grid.



Pattern number 4

2. Complete the table below.

Pattern number, n	1	2	3	4
Number of white blocks	12	40		
Number of gray blocks	13			
Total number of blocks	25			

3. What do you notice about the number of white blocks and the number of gray blocks?

_____

4. The total number of blocks can be found by squaring the number of blocks along one side of the pattern.
   a. Fill in the blank spaces in this list.

   $25 = 5^2$ $\quad 81 =$ _____ $\quad 169 =$ _____ $\quad 289 = 17^2$

   b. How many blocks will pattern number 5 need?

   _____

   c. How many blocks will pattern number *n* need?

   _____

5. a. If you know the total number of blocks in a pattern you can work out the number of white blocks in it. Explain how you can do this.

   _____

   _____

   b. Pattern number 6 has a total of 625 blocks. How many white blocks are needed for pattern number 6? Show how you figured this out.

   _____

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Student A

4. The total number of blocks can be found by squaring the number of blocks along one side of the pattern.
   a. Fill in the blank spaces in this list.

   $25 = 5^2$ $81 = 9^2$ $169 = 13^2$ $289 = 17^2$

   b. How many blocks will pattern number 5 need?

   441 blocks

   c. How many blocks will pattern number *n* need?

   $(1+4n)^2$

Student C

4. The total number of blocks can be found by squaring the number of blocks along one side of the pattern.
   a. Fill in the blank spaces in this list.

   $25 = 5^2$ $81 = 9^2$ $169 = 13^2$ $289 = 17^2$

   b. How many blocks will pattern number 5 need?

   441

   c. How many blocks will pattern number *n* need?

   n^2

Student D

4. The total number of blocks can be found by squaring the number of blocks along one side of the pattern.
   a. Fill in the blank spaces in this list.

   $25 = 5^2$ $81 = 9^2$ $169 = 13^2$ $289 = 17^2$

   b. How many blocks will pattern number 5 need? 441

   c. How many blocks will pattern number *n* need? $(\text{previous}+4)^2$

Student F

4. The total number of blocks can be found by squaring the number of blocks along one side of the pattern.
   a. Fill in the blank spaces in this list.

   $25 = 5^2$ $81 = 9^2$ $169 = 13^2$ $289 = 17^2$

   b. How many blocks will pattern number 5 need? 441

   c. How many blocks will pattern number *n* need? $(n+4)^2$

Student A

5. a. If you know the total number of blocks in a pattern you can work out the number of white blocks in it. Explain how you can do this.

Divide the number of blocks by 2 and add half of one number to the other because the one has by 1 equals the number of white blocks.

b. Pattern number 6 has a total of 625 blocks. How many white blocks are needed for pattern number 6? Show how you figured this out.

312 blocks

$2\overline{)625}$ $312+\frac{1}{2}$

6
02
2
05
4

$312\frac{1}{2} + 3\frac{1}{2} = 625$

$-\frac{1}{2}$ $+\frac{1}{2}$

$312 + 313 = 625$

Student B

5. a. If you know the total number of blocks in a pattern you can work out the number of white blocks in it. Explain how you can do this.

you divide the total number of blocks by 2. Then add one to get the number of grey and that will make the white be one less than the greys.

b. Pattern number 6 has a total of 625 blocks. How many white blocks are needed for pattern number 6? Show how you figured this out.

312 white blocks

$2\overline{)625}^{312.5}$

$312 + 313 = 625$

whites greys

9

Student C

5. a. If you know the total number of blocks in a pattern you can work out the number of white blocks in it. Explain how you can do this.

You can figure out the number out white blocks because you know the grey blocks have one more you subtract and then see if that number is one less.

b. Pattern number 6 has a total of 625 blocks. How many white blocks are needed for pattern number 6? Show how you figured this out.

625 628 628 625 625 625 ← total
−301 −316 −266 −243 −312 −313 ← grey blocks
324 259 359 382 313 312 ← white blocks

312 blocks

Student E

5. a. If you know the total number of blocks in a pattern you can work out the number of white blocks in it. Explain how you can do this.

All you would need to do is you subtract one from the total and divide by 2 to get White blocks.

b. Pattern number 6 has a total of 625 blocks. How many white blocks are needed for pattern number 6? Show how you figured this out.

312 white blocks

625-1 = 624
624 ÷ 2 = 312
312

9