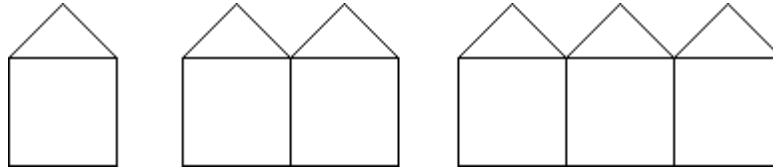


## Toothpick Houses

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Build or draw the following sequence of houses made from toothpicks.



- Fill in the following table:

Houses	1	2	3	4	7
Number of Toothpicks					

- See if you can come up with a way to predict the number of toothpicks needed to build any number of houses. Describe your method.
- Using your method, see if you can fill in the missing parts of the table:

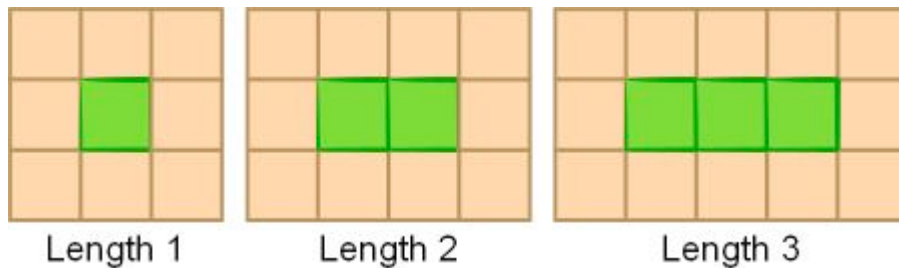
Houses	5	6	8	12	20	100			
Toothpicks							51	76	401

- How can you calculate the number of houses you can build if you know the number of toothpicks you have? Explain.
- How would you write your method for question 4 in symbols?

# Tiling Garden Beds

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Gardens are framed with a single row of tiles as illustrated here.  
 (A garden of length 3 requires 12 border tiles.)



- Fill in the table to show how many border tiles you would need for these different garden lengths:

Garden Length	1	2	3	6	8
Number of Border Tiles					

- Use whatever patterns you notice to figure out how many border tiles you would need for a garden of length:
  - 15
  - 30
  - 100
- Describe a way (in words) to find the number of border tiles for any garden length.
- Write an expression that represents your method for finding the number of border tiles, given the garden length.
- Test your method! How long is the garden if the number of border tiles is:
  - 72 tiles?
  - 106 tiles?
  - 432 tiles?

**Solutions for Toothpick Houses**

1)

Houses	1	2	3	4	7
Number of Toothpicks	<b>6</b>	<b>11</b>	<b>16</b>	<b>21</b>	<b>36</b>

2) Your answers will certainly vary here. You might notice that:

- a) the number of toothpicks increases by 5 each time;
- b) the ones digit will always be either 1 (if house number is even) or 6 (if house number is odd); the tens digit will be half that of the house number if the house number is even – if the house number is odd, it will be half of the previous even house number;
- c) the number of toothpicks will be 5 x the house number + 1 or **5H + 1**
- d) the number of toothpicks will be 6 x the house number – the previous house number (for example: 6 (1) – 0 = 6; 6(2) – 1 = 11; 6(3) – 2 = 16; 6(4) – 3 = 21; etc. or **6H – (H-1) or 5H + 1**.

3)

Houses	5	6	8	12	20	100	<b>10</b>	<b>15</b>	<b>80</b>
Toothpicks	<b>26</b>	<b>31</b>	<b>41</b>	<b>61</b>	<b>101</b>	<b>501</b>	51	76	401

4) Your answers will vary. See #2 above.

5) See 2c and 2d above. 2b does not easily lend itself to a symbolic expression.

**Solutions Tiling Garden Beds**

1)

Garden Length	1	2	3	6	8
Number of Border Tiles	8	10	12	18	22

2) a. 36      b. 66      c.206

3) Double the length of the garden, then add six more tiles. **Why does this work?** One way to look at the pattern is like this: The rows above and below the garden tiles double the number of tiles in the garden bed. The two sets of 3 tiles on either end add six.

4) If the garden length is L, one expression could be 2L + 6.

5) a) 33      b) 50      c) 213



You can find each of these values by subtracting 6 then dividing by 2.

## Math Translation Guide

The chart below gives you some of the terms that come up in a lot of word problems. Use them in order to translate or “set-up” word problems into equations.

English	Math	Example	Translation
What, a number	$x, n, \text{etc.}$	Three more than a number is 8.	$n + 3 = 8$
Equivalent, equals, is, was, has, costs	=	Danny <b>is</b> 16 years old. A CD <b>costs</b> 15 dollars.	$d = 16$ $c = 15$
Is greater than Is less than At least, minimum At most, maximum	$>$ $<$ $\geq$ $\leq$	Jenny <b>has more</b> money than Ben. Ashley’s age <b>is less than</b> Nick’s. There are <b>at least</b> 30 questions on the test. Sam can invite <b>a maximum</b> of 15 people to his party.	$j > b$ $a < n$ $t \geq 30$ $s \leq 15$
More, more than, greater, than, added to, total, sum, increased by, together	+	Kecia has 2 <b>more</b> video games than John. Kecia and John have a <b>total</b> of 11 video games.	$k = j + 2$ $k + j = 11$
Less than, smaller than, decreased by, difference, fewer	-	Jason has 3 <b>fewer</b> CDs than Carson. The <b>difference between</b> Jenny’s and Ben’s savings is \$75.	$j = c - 3$ $j - b = 75$
Of, times, product of, twice, double, triple, half of, quarter of	x	Emma has <b>twice</b> as many books as Justin.  Justin has <b>half</b> as many books as Emma.	$e = 2 \times j$ or $e = 2j$  $j = c \times \frac{1}{2}$ or $j = e/2$
Divided by, per, for, out of, ratio of ___ to ___	$\div$	Sophia has \$1 <b>for</b> every \$2 Daniel has.  The <b>ratio of</b> Daniel’s savings to Sophia’s savings is 2 to 1.	$s = d \div 2$ or $s = d/2$  $d/s = 2/1$

### Example 1

Jennifer has 10 fewer DVDs than Brad.

Step 1:  $j$  (has) =  $b$  (fewer) – 10

Remember, the word “has” is an equal sign and the word “fewer” is a minus sign, so:

Step 2:  $j = b - 10$