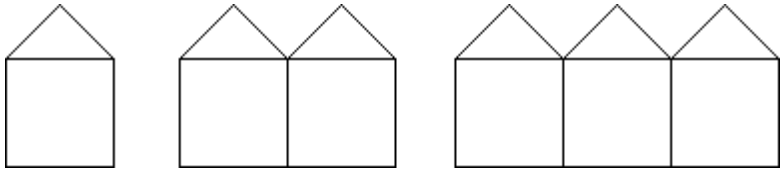
Toothpick Houses

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



1. Fill in the following table:

Houses	1	2	3	4	7
Number of Toothpicks					

2. 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.

3. Using your method, see if you can fill in the missing parts of the table:

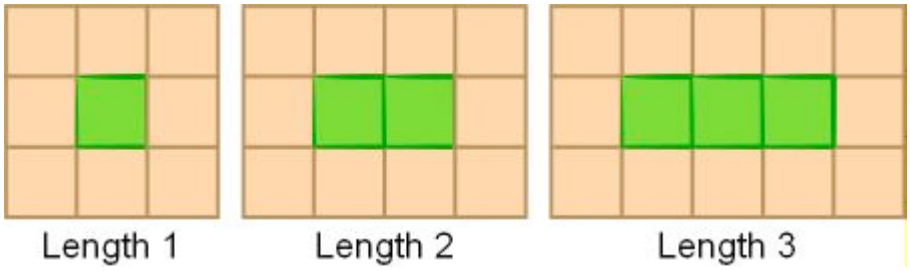
Houses	5	6	8	12	20	100			
Toothpicks							51	76	401

4. How can you calculate the number of houses you can build if you know the number of toothpicks you have? Explain.

5. How would you write your method for question 4 in symbols?

Tiling Garden Beds

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



1. 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					

2. Use whatever patterns you notice to figure out how many border tiles you would need for a garden of length:
   a. 15
   b. 30
   c. 100

3. Describe a way (in words) to find the number of border tiles for any garden length.

4. Write an expression that represents your method for finding the number of border tiles, given the garden length.

5. Test your method! How long is the garden if the number of border tiles is:
   a. 72 tiles?
   b. 106 tiles?
   c. 432 tiles?

Solutions for Toothpick Houses

1)

Houses	1	2	3	4	7
Number of Toothpicks	**6**	**11**	**16**	**21**	**36**

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	**10**	**15**	**80**
Toothpicks	**26**	**31**	**41**	**61**	**101**	**501**	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)

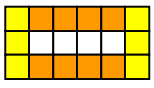
Garden Length	1	2	3	6	8
Number of Border Tiles	8	10	12	18	22

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,* etc.	Three more than a number is 8.	$n+3=8$
Equivalent, equals, is, was, has, costs	=	Danny **is** 16 years old. A CD **costs** 15 dollars.	$d=16$ $c=15$
Is greater than Is less than At least, minimum At most, maximum	> < ≥ ≤	Jenny **has more** money than Ben. Ashley's age **is less than** Nick's. There are **at least** 30 questions on the test. Sam can invite **a maximum** 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 **more** video games than John. Kecia and John have a **total** of 11 video games.	$k=j+2$ $k+j=11$
Less than, smaller than, decreased by, difference, fewer	-	Jason has 3 **fewer** CDs than Carson. The **difference between** 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 **twice** as many books as Justin. Justin has **half** 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 __	÷	Sophia has $1 **for** every $2 Daniel has. The **ratio of** 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: $j=b-10$