Warm-Up: Symmetry

1. Reflect the points across the line on each graph.

a) [Graph with points a, b, c, d]

b) [Graph with points a, b, d, c]
c) 

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  d.
  a.
  b.
  c.
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d) 

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  c.
  b.
  a.
  d.
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2. First, reflect the marked points. Then, draw a reflection of these shapes across the vertical line.

a)

b)

6

c)
3. First, reflect the marked points. Then, draw a reflection of these shapes across the horizontal line.

a)  

b)  

c)
Part 1: Geometry With Toothpicks

1. Add 2 sticks to make another triangle of the same size. Draw where you added them.

Find 2 more different ways to make another triangle of the same size and draw it below.
2. Remove 2 sticks so that only 2 squares (and nothing else) are left. Cross out the sticks which you removed.

3. Use 7 sticks to create 3 equal triangles. Make a picture below.
4. Move 2 sticks so that 6 squares (and nothing else) are left. Cross out the sticks you moved and draw where you moved them to.

![Image of 9 squares]

5. How many squares do you see in the picture below?

Are they all the same size?

Remove 2 sticks so that 2 squares (and nothing else) are left. Cross out the sticks which you removed.

![Image of 4 squares]
6. How many squares do you see in the picture below?

Are they all the same size?

Remove 6 sticks so that 5 squares (and nothing else) are left. Cross out the sticks which you removed.

7. Move 3 sticks to create 4 equal triangles. Cross out the sticks you moved and draw where you moved them to.
8. This is Jane’s house. Jane loves spending time with Emily, so she builds Emily a house right next to hers. Make Emily’s house using 5 sticks and draw where you placed the sticks.

9. This is Frank the fish. Which way is he swimming?

Where are his fins? Draw a circle around them.

Where is his tail? Draw a box around it.
Frank wants to swim down to his reef to go to sleep. Make him swim downwards by moving 2 sticks. Cross out the sticks you moved and draw where you moved them to.

10. This is my dog, Spot. Spot sees a giant bear in front of him, so he gets scared and runs away. Move 2 sticks to make Spot run in the opposite direction. Cross out the sticks you moved and draw where you moved them to (this is a trick question!)
PART 2: Roman Numerals with Toothpicks

A student worked on some problems using Roman Numerals, but they are all incorrect.

1. Form these problems with sticks, then correct them by moving 1 stick.

*Note that + and - are NOT made out of sticks.

a. $IV + V = XI$  
   
   b. $III + III = IV$  
   
   c. $XV + I = XIV$  
   
   d. $VIII + V = XI$  
   
   e. $VII + XII = XXI$
2. Form these problems with sticks, then correct them by moving 1 stick to change ONLY the plus or minus sign. *Note that + and - are made out of sticks.

Example: $VI + IV = I$ \quad \rightarrow \quad VI - IV = II$

a. $X + IV = V$

b. $VII - III = IX$

c. $II - II = III$

d. $VI - IV = IX$

e. $XII + V = VI$
Challenge Questions

Put a + or - into the boxes to make the problems correct.

Example: $7 \underline{-} 6 \underline{+} 5 = 9 \underline{-} 4 \underline{+} 1$

Now you try!

1. $5 \underline{\_} 3 \underline{\_} 2 = 8 \underline{\_} 5 \underline{\_} 3$

2. $3 \underline{\_} 2 \underline{\_} 1 = 10 \underline{\_} 3 \underline{\_} 1$

3. $9 \underline{\_} 8 \underline{\_} 3 = 10 \underline{\_} 7 \underline{\_} 3$

4. $12 \underline{\_} 7 \underline{\_} 4 = 7 \underline{\_} 6 \underline{\_} 2$