

## Race to the Top! Worksheet Answer Key

### Materials

75 Kapla® blocks      test weight      measuring tape

### Design

1. In the space below, draw a picture of the free-standing, weight-bearing tower you want to build. Label the horizontal members. Label the vertical members.

*Answer:* Expect drawings to vary by student and design. The best drawings show the detail of what one tower level looks like as well as how the levels fit together. Students need not draw all 75 blocks, but it is best if they draw a few levels—enough to be able to indicate a pattern to determine how many levels they can build. Also make sure both vertical and horizontal members are labeled in the drawing; the best drawings identify the members in just one level, so the drawing is not too cluttered.

2. What shapes are you using in your design?

*Answers will vary; expected answers include rectangles, squares and triangles.*

3. Your tower will most-likely use repeating shapes for each level.  
From your design, how many blocks will you use per level?

*Answers will vary per students' designs; expect a range from 1 to 10.*

4. Since you have only 75 blocks, how many levels can you make?

*Answers will vary per students' designs. Expect students to calculate the number of levels based on the number of blocks they plan to use per level. For example, if the design uses five blocks per level, they will be able to make 15 levels ( $75/5 = 15$ ). If the design uses six blocks per level, they will be able to make 12 levels ( $75/6 = 12.5$ ). Expect students to round down since they will most likely not be able to support weight if a level is incomplete.*

## Redesign

5. In the space below, draw a picture of your final design below.  
Label the horizontal and vertical members.

*Answer:* Expect drawings to vary by student and design. The best drawings show the detail of what one tower level looks like as well as how the levels fit together. Students need not draw all 75 blocks, but it is best if they draw a few levels—enough to be able to recognize a pattern to determine how many levels they need to build. Also make sure both vertical and horizontal members are labeled in the drawing; the best drawings identify the members in just one level so the drawing is not too cluttered.

6. How many total blocks did you use in your design?

*Answers will vary; expected answer is between 1 and 75. Students count their blocks to get the answer.*

7. What was your tower's height in centimeters?

*Answers will vary; heights can reach 175 cm or greater; expect measurements in cm.*

8. How many blocks did you use per level?

*Answers will vary; expected answer is between 1 and 10. Students count their blocks to get the answer.*

Number of levels?

*Answers will vary, but expect values similar to the answer to question #4. Students count levels to get the answer.*

9. Did you make changes to your original design? Explain why and how that affected your new tower.

*Answers will vary per design and student.*

*Example answer:* “We initially designed our tower to have five blocks per level so we could have a taller tower with more levels. But once we started constructing the first three levels, we found that it was unsteady with five blocks. So we decided to add another block as a vertical member to each level to support the horizontal members in the levels above. We ended up having six blocks per level, which resulted in only 12 levels. The number of levels was less than our initial prediction based on five blocks per level, but our final tower was able to be free-standing and weight-bearing, unlike our initial design. By providing more support with vertical members, we were able to increase the height of our tower and still make it able to support weight.”