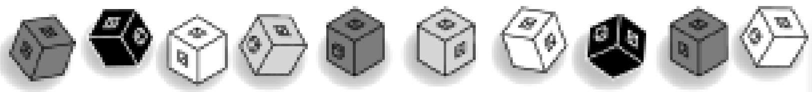
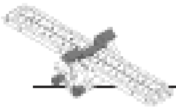
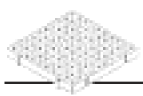


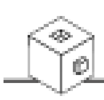
Activities



Balance



Blank Grid

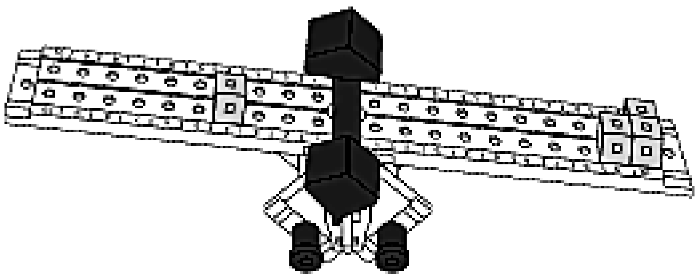


Interlocking Cubes

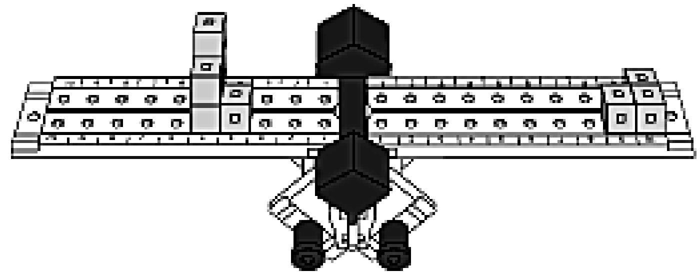
Multiplication/Division Grid

Square Root Equations

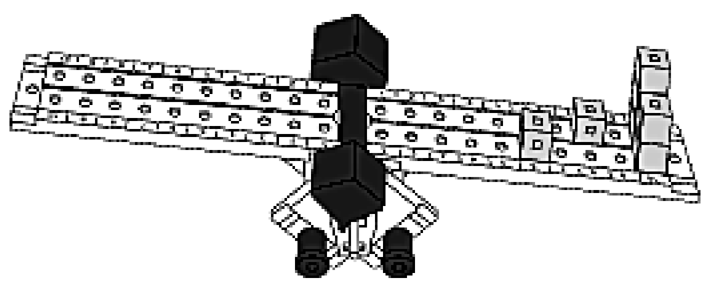
Once students have employed the balance to represent and solve two-step equations and to determine square roots of perfect squares, they will be able to represent and solve simple quadratic equations with an integral solution of the type $x^2 + 4 = 29$ or $x^2 - 8 = 56$. The solution steps for each of these equations is shown below.



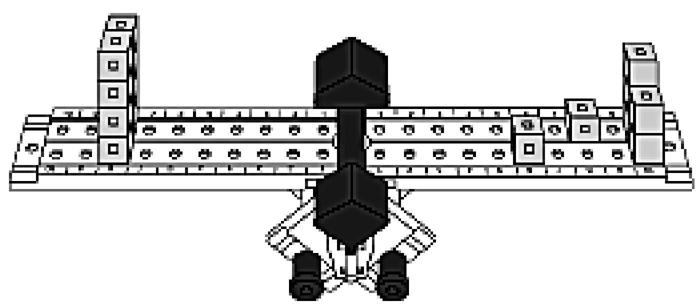
$x^2 + 4 = 29$



$5^2 + 4 = 29$; $x = 5$



$x^2 - 8 = 56$



$8^2 - 8 = 56$; $x = 8$

Square Root Equations sheet A contains equations in the form of $x^2 - 8 = 56$.

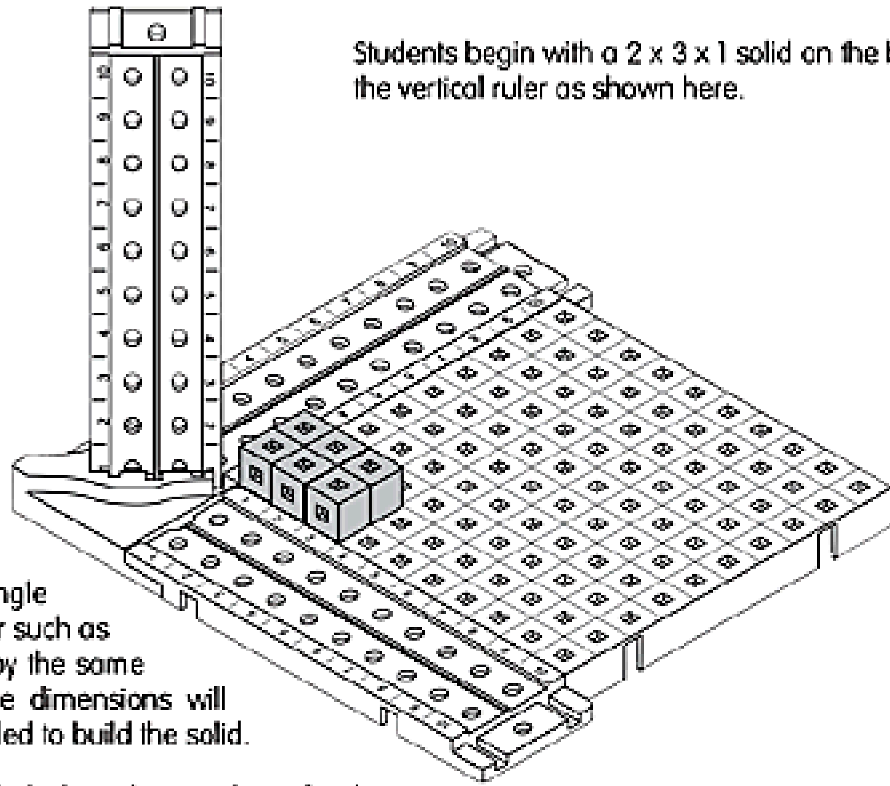
Sheet B contains equations in the form $x^2 + 7 = 56$.

Solutions:	Challenges:
Sheet A: 1. 7, 2. 6, 3. 8, 4. 3, 5. 5, 6. 8, 7. 4, 8. 3	**Sheet A:** 6
Sheet B: 1. 4, 2. 5, 3. 8, 4. 1, 5. 4, 6. 5, 7. 9, 8. 2	**Sheet B:** 4

Changing Dimensions

In this activity students explore the effect that changing a dimension length of a rectangular solid has on its volume, represented by the number of interlocking cubes needed to build the solid.

Students begin with a 2 x 3 x 1 solid on the blank grid with the vertical ruler as shown here.



They explore the changes by first doubling a single dimension. When any single dimension is increased by a factor such as 2, then the volume is increased by the same factor. Thus, doubling any of the dimensions will double the number of cubes needed to build the solid.

If two dimensions are doubled, then the number of cubes needed for the enlarged solid will be increased by a factor of 4.

Finally, if all three dimensions are doubled, then the volume of the solid will be increased by a factor of 8.

Solutions:

1. The number of cubes is increased by a factor of 2.
2. The number of cubes is increased by a factor of 4.
3. The number of cubes is increased by a factor of 8.

Challenge:

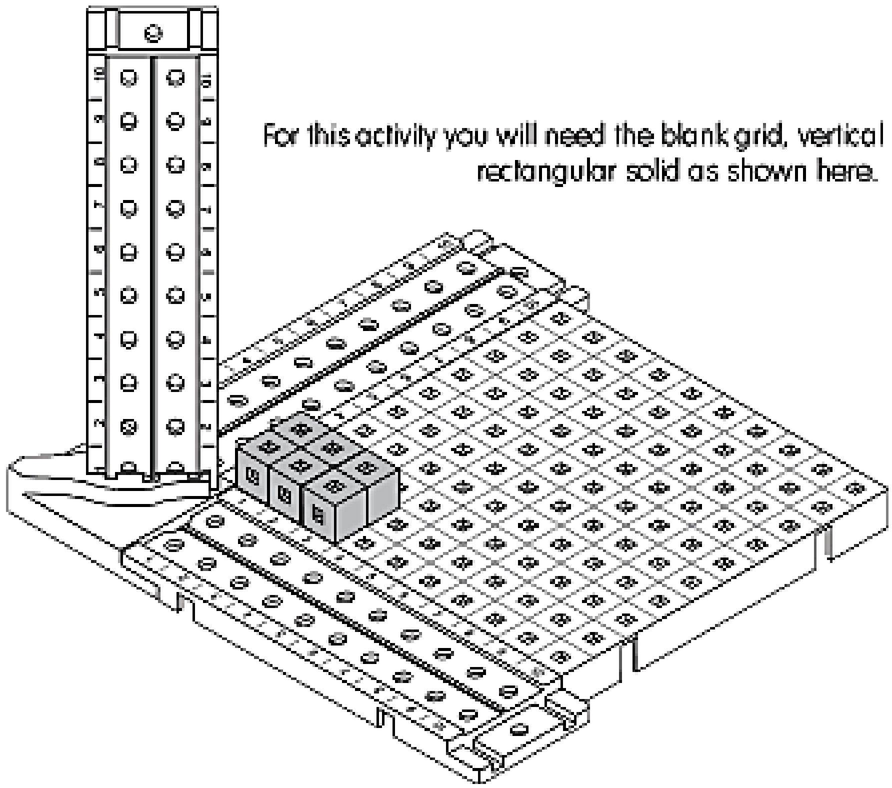
The challenge asks students to consider how dividing a dimension will affect its volume. As with the earlier explorations for this activity, a change in a single dimension will result in a change by the same factor in the volume. If the length of a solid is divided by 2, then the resulting volume will be divided by 2. Dividing two dimensions by 2 will result in volume that is 4 times smaller. Dividing all three dimensions by 2 will produce a solid with a volume 8 times smaller than the original.

Changing Dimensions

What happens to the volume of a box when you increase its height by a specific factor?

It will become larger. By how much? Will the volume increase by the same factor? Will the same thing happen if instead you increase the length by the same factor? What will happen if instead you increase the width by the same factor? Find out.

For this activity you will need the blank grid, vertical ruler and interlocking cubes. Build a 2 x 3 x 1 rectangular solid as shown here.



Change the dimensions of the solid and keep track of how many cubes are needed when you build the new solid.

1. First double each of the dimensions one at a time.
How does the number of cubes needed for the new solid change? ____________________

2. Suppose you double two dimensions at once.
How does that change the number of cubes needed for the new solid ? ____________________

3. Finally, how many cubes will you need for the new solid if you double all three dimensions at the same time? ____________________

Challenge:

Start with a solid with dimensions 2 x 4 x 6. What happens if you divide dimensions instead of multiplying them? Try dividing each of the dimensions of this solid by 2. Explore how many cubes are needed to build the new, smaller solid. What happens to the volume if you divide two of the dimensions by 2? What if you divide all three dimensions by 2?

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