

## The Big and the Small

**Grade:** 4-5

**Competency Goals:** Multiplication fluency, number sense to from 0.01 to 100,000, decimal notation, problem-solving strategies.

**Items Needed:** Clipboards, Big & Small Worksheets, Factor markers, WhichWatch, LifeSaver™ candies or similar, 100 pennies, small round stickers (blank price tags).

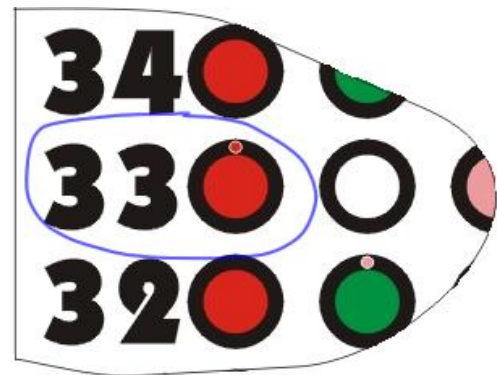
This exercise helps students learn to work with large numbers and decimal numbers, showing them that the same methods used for smaller, whole numbers work at any scale.

### Procedure

Have all students put on factor markers and find their positions on the Z-Row. Starting with the smallest factor, have each student perform a couple of warm-up multiplication exercises using random numbers from the WhichWatch. Have them write these equations in the first block of their worksheets. Example: have Factor 4 perform the equation " $4 \times 9 = 36$ ". He/she will take 9 steps, land on 36, and record this on his sheet.

**TIP:** If you are aware of the students' abilities, choose the factor markers accordingly. More advanced students will perform better with the more difficult factors, while those who are struggling with multiplication facts can assume the easier roles (such as Factor 1, 2, 5, or 10).

After all of the factors have done this simple exercise, tell the students that you have some magic candy. Show them the LifeSaver™ candy (or any treat that resembles a zero), and tell them that once they eat this "magic zero", they will increase in size by a **factor of ten**. So the former Factor 4 will become Factor 40, and Factor 10 will become Factor 100. Also, the Runway will grow by a factor of 10 also, spanning from zero to 1000. Show them how they can imagine the first circle past the number as a zero to help them visualize the bigger number as shown in the diagram at right.



Visualizing 33 as 330 on the Runway

Starting over with the smallest of the factors, have them perform more equations, again using the WhichWatch to generate the random multipliers. A typical equation might now be " $40 \times 8 = 320$ ". The students will quickly see that these larger number work exactly the way the smaller ones did. Have them record their equations in the proper space on their worksheet.

Now give each factor another candy, and have them tell you what their new factor numbers are. Factor 4 becomes Factor 400, and Factor 10 becomes 1000. Have the students figure out the range of the even-bigger Runway (it now runs from zero to 10,000). The Runway number 33 now represents 3300. Repeat the same equation-stepping exercises as before.

Once the students show understanding of the magnification concept, tell them that the magic candy has now worn off, and they are returned to their regular factor values. Have each student work one equation to make sure they all recognize their value.

Then offer each of them a small round sticker, calling it a decimal point. If they stick that decimal point on them, they are magically shrunk down to  $\frac{1}{10}$  their normal size. The Runway is likewise smaller, now running from zero to 10.0. Distribute 100 pennies among the students and have them place them on the numbers as seen in the diagram at right.

**TIP:** Make a game of the penny distribution, having the group place the pennies as quickly and efficiently as possible.

Now have the students perform equations with their new, smaller values. Factor .4 might act out the equation  $.4 \times 5 = 2.0$ . As before, have them record their equations on the worksheet.

**ENHANCEMENT:** If desired, of course, the students can be made to shrink yet again to perform equations like  $.04 \times 4 = .16$ . Or they can be “blown up” again to even greater values.



Using penny decimal points to visualize 33 as 3.3 on the Runway