**Standards addressed by this mini-lesson:**

5.NF.5 Interpret multiplication as scaling (resizing), by:

* Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.
* b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence

a/b =(n×a)/(n×b) to the effect of multiplying a/b by 1.

*NOTE: This standard is really embedded in all the problem-solving that addresses 5.NF.4 & 5.NF.6. While this lesson is an explicit conversation around this idea, you will want to come back to this as you discuss the problems students are solving. This is an opportunity for students to reason abstractly (Mathematical Practice 2) about an idea and create generalizations about how mathematical ideas work.*

**For more information about this standard, click the link to watch a 4 minute video about this standard** [**http://secc.sedl.org/common\_core\_videos/index.php?action=view&id=656**](http://secc.sedl.org/common_core_videos/index.php?action=view&id=656)

**Materials Needed:**

Math Notebooks

**Lesson:**

* Write 5 x 21 on the board or chart paper. Ask students, “Without finding the exact answer, what do you know about the product of 5 x 21?” Students might say, it is 5 groups of 21, or it is 21 + 21 + 21 + 21 + 21… etc. Record responses on the board or chart paper. To meet this standard, you really want students to say, it is 5 times as big as 21. If no one says it, ask how many times bigger would the product be than the original number 21? Ask, how do you know?
* Ask, “What if the problem is 7 x 21? Without finding the exact answer, what do you know about the product?” (It is 7 times as big as 21) Without finding the exact answers, how much bigger would the product of 7 x 21 be than the product of 5 x 21? ( 2 groups of 21- not two times bigger)
* Create the following chart on the board or chart paper with students, have students record the chart in their math notebooks. The goal is for students to see that one factor is scaled by the other factor in order to come up with the product. That 4 is scaled 3 times in order to get the product of 12. When you get to the last column, students may say that 2 is 2 times bigger than 4. Have them work through that idea- is 2 x 4 = 2? No, so ask students, “What is the relationship between 2 and 4? How can we compare these two numbers in order to get 2 as the product? (They need to come the realization that 2 is half of 4, so the scaling factor is ½ in this case.)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Example 1 | Example 2 | Example 3 |
| Product is | 12 | 30 | 2 |
| One factor is | 4 | 5 | 4 |
| Comparison is | 12 is \_\_ times bigger 4 | 30 is \_\_ times bigger than 5 | 2 is \_\_\_ as big as 4 |

* Ask students, “What do you notice about the products in the first two examples? How do the products compare to the factors?” (They are bigger than both the factors)
* Ask students, “What about example 3? Does this follow that same idea? Is the product bigger than the factor in the chart? (No) Why do you think that is? What does that say about the products when one or more of the factors is a fraction?”
* Lead a discussion with students about this big idea- that when the factors are whole numbers, the products will always be one of the factors times as big, thus bigger than both factors in the problem. Contrast this with the idea that when one or more of the factors is a fraction the product is scaled down (fractions are divisions in themselves), thus smaller than one of the factors.
* Have students generalize this idea in their math notebooks and have them generate other examples that prove these ideas. To engage students in some independent work around this standard, you could post this idea in your class and have students work in pairs or individually to create examples of each idea and display them with the idea in your classroom. When solving problems involving multiplication of fractions (5.NF.4 & 5.NF.6), bring students back to this idea and add more examples to the display.
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