Lesson Title: Beaded Factoring

Pre-Planning

Learning Goals

- Students will use factors and multiples (including GCF) predict patterns.
- (Advanced) Students will discover the relationship between the greatest common factor and least common multiple of two numbers

Standards

(CCSS.MATH.CONTENT.6.NS.B.4) Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12.

Curriculum Alignment

For CMP 3 Curriculum, this lesson aligns with the Prime Time unit for 6th grade. It can also be used in earlier grades.

Prior Knowledge

Students should already have been introduced to greatest common factor and least common multiple before this lesson. Through the lesson they will discover how GCF and LCM appear in the patterns of beads.

Materials

Chromebooks or other devices for students to access the proportion playground sim
(https://phet.colorado.edu/sims/html/proportion-playground/latest/proportion-playground_en.html)
Copies of the activity sheet
(https://drive.google.com/file/d/1IgHksD4y-wfg_0R5I3J2sdxTgW6VLlSR/view?usp=sharing)

Lesson Flow (guided by the slides)

<table>
<tr>
<td>Warm-Up (5 minutes)</td>
<td>Have students complete the warm up in their notes. Ask student volunteers to:

Fill in row 1 of the table
Fill in row 2 of the table
Explain how to compute the GCF of 12 and 8.
Explain how to compute the LCM of 9 and 6

Allow students to shout out all the answers they found for #2.
Warm-Up
1) Find the greatest common factor (GCF) and least common multiple (LCM) of each number pair.
<table>
<tr><td></td><td>GCF</td><td>LCM</td></tr>
<tr><td>9 and 6</td><td></td><td></td></tr>
<tr><td>12 and 8</td><td></td><td></td></tr>
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2) Create a pair of numbers that have 5 as their greatest common factor. Can you create more than one pair?</td>
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<td>Explore the sim (5 minutes)
Share out (2 minutes)</td>
<td>Possible questions:

How is the computer deciding how to arrange the beads?
How can you make a pattern that repeats several times?
How can you make a pattern that does not repeat?
Why do you think the designers made an option to have two strings of beads side by side?
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<td>Activity Sheet (20 to 25 minutes)</td>
<td>For students who are more tactile, you may consider allowing them to use red and blue blocks along with the sim.

Possible questions as students are working:

In the pattern part of the sim, can you ever make the pattern show 4 red, 6 blue? Why not?
Suppose the total number of red beads is prime. What can you say about the number of red beads in the pattern?
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<td>Discussion/Summary (5 to 10 minutes)</td>
<td>Discussion Questions</td>
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How did you predict the patterns and the number of repeats? For example, how would you predict the pattern and number of repeats for 18 red and 24 blue beads?
If you want a pattern that does not repeat, what must be true about the number of red and blue beads?
What did you discover in #7 (the challenge)? [Students should see the given product is the least common multiple of the total # red and total # blue. Students may have difficulty seeing why this works. You can point out that the LCM must have the GCF multiplied by whatever “extra” factors each number has that are not part of the GCF.]

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<td>Exit Ticket (5 minutes)</td>
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<h2>Exit Ticket</h2>
A teacher has a class of 12 native Spanish speakers and 16 non-Spanish speakers. She would like to break up the class into groups such that each group has an equal number of Spanish speakers, and each group has the same total size.
1) List at least two different ways the teacher can make groups.
___ groups with ___ Spanish speakers and ____ non-Spanish speakers in each group
___ groups with ___Spanish speakers and ____ non-Spanish speakers in each group
2) The maximum number of groups the teacher can create is ______ groups because
____
____
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