

# Improving Understanding of Multiplication Using “Arithmetic PhET Simulation”

Designed for a 6th-8th Grade Math Academic Support Class  
(Could be used for 3rd, 4th, or 5th Grade)

## Pre-Planning:

Students will come into this lesson with prior knowledge and exposure to multiplication strategies and representations (Grades 2-5). Most, and probably all, students will have seen these representations and concepts in a previous math class but have not fully consolidated understanding of multiplication and number charts to represent multiplication into their math abilities.

## Materials:

- Each student will need a Chromebook to access [https://phet.colorado.edu/sims/html/arithmetic/latest/arithmetic\\_en.html](https://phet.colorado.edu/sims/html/arithmetic/latest/arithmetic_en.html)
- [Student Handout](#) for each student
- Optional - colored pencils

## Learning Goals:

Students should be able to...

- Represent multiplication of whole numbers on a number chart.
- Describe various strategies to multiply whole numbers.

**Standards** (from <http://www.corestandards.org/Math/> )

**Represent and solve problems involving multiplication and division.**

[CCSS.MATH.CONTENT.2.OA.C.4](#)

Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

[CCSS.MATH.CONTENT.3.OA.A.1](#)

Interpret products of whole numbers, e.g., interpret  $5 \times 7$  as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as  $5 \times 7$ .*

## Curriculum Alignment

- Aimed at gap filling for middle school students in a math support class.
- Supports 6th Grade CMP3 books “Decimal Ops”, “Prime Time” and “Comparing Bits and Pieces”
- Supports 7th Grade CMP3 books “Accentuate the Negative”, “Stretching and Shrinking” and “Comparing and Scaling”

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## Lesson Flow

**Estimated Time: 50 minutes (1 class period)**

	Teacher will...	Student will...
<b>Warm-Up (Q1):</b>  <b>(10 min)</b>	<ul style="list-style-type: none"> <li>● Direct students to Arithmetic PhET Simulation.</li> <li>● Distribute Student Handout</li> <li>● As students are completing “Multiplication Level 1”, ask them:               <ul style="list-style-type: none"> <li>○ <i>What is your strategy to find the total number of shaded boxes?</i></li> <li>○ <i>Can you find a quicker way to count the boxes?</i></li> <li>○ <i>Can you use the answer from a previous problem to help you answer this problem?</i></li> </ul> </li> <li>● Optional: Record student times on a spreadsheet for your individual records to see if they can beat their time as a warm-up on another day.</li> </ul>	<ul style="list-style-type: none"> <li>● Explore “Arithmetic” PhEt simulation using only “Multiplication Level 1”</li> <li>● Record score and time for “Multiplication Level 1”</li> </ul>
<b>Activity (Q2 parts A, B, C):</b>  <b>(10 min)</b>	<ul style="list-style-type: none"> <li>● Support students in using number chart to model multiplication problems.               <ul style="list-style-type: none"> <li>○ <i>Can you draw what would be on the simulation for this problem?</i></li> <li>○ <i>What are different ways you can find the number of shaded boxes?</i></li> </ul> </li> <li>● Lead debrief of different representations and strategies to find total number of shaded boxes.               <ul style="list-style-type: none"> <li>○ <i>Can you find a quicker way to count the boxes?</i></li> <li>○ <i>Can you use the answer from a previous problem to help you answer this problem?</i></li> </ul> </li> <li>● <i>Answers may include:</i> <ul style="list-style-type: none"> <li>■ <i>Counting each shaded box individually.</i></li> <li>■ <i>Adding 5+5+5</i></li> <li>■ <i>Adding 3+3+3+3+3</i></li> <li>■ <i>Finding parts of the total box to add together (10+5 or 9+6)</i></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● Use completed multiplication table to Complete Q2 parts A, B, and C on the Student Handout</li> <li>● Discuss various strategies and representations with other students.</li> </ul>
<b>Activity (Q2 part D):</b>  <b>(10 min)</b>	<ul style="list-style-type: none"> <li>● Support students in using number chart to model multiplication problems.               <ul style="list-style-type: none"> <li>○ <i>Can you draw what would be on the simulation for this problem?</i></li> <li>○ <i>What are different ways you can find the number of shaded boxes?</i></li> </ul> </li> <li>● Lead debrief of different representations and strategies to find total number of shaded boxes.               <ul style="list-style-type: none"> <li>○ <i>Can you find a quicker way to count the boxes?</i></li> <li>○ <i>Can you use the answer from a previous problem to help you answer this problem?</i></li> </ul> </li> <li>● <i>Answers may include:</i> <ul style="list-style-type: none"> <li>■ <i>Counting each shaded box individually.</i></li> <li>■ <i>Adding 6+6+6</i></li> <li>■ <i>Adding 3+3+3+3+3+3</i></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● Complete Q2 parts A, B, and C on the Student Handout</li> <li>● Discuss various strategies and representations with other students.</li> </ul>

	<ul style="list-style-type: none"> <li>■ <i>Using <math>5 \times 3 = 15</math> to show that the answer is <math>15+3</math></i></li> <li>■ <i>Finding parts of the total box to add together (<math>12+6</math> or <math>15+3</math>)</i></li> </ul>	
<b>Activity (Q3):</b> <b>(20 min)</b>	<ul style="list-style-type: none"> <li>● Support students in completing Multiplication Level 2 and 3.</li> <li>● Optional: Record student times on a spreadsheet for your individual records to see if they can beat their time as a warm-up on another day.</li> </ul>	<ul style="list-style-type: none"> <li>● Complete “Multiplication Level 2” and “Multiplication Level 3”</li> <li>● Record score and time for “Multiplication Level 2” and “Multiplication Level 3”</li> </ul>
<b>Extension Activity:</b>	<ul style="list-style-type: none"> <li>● Have students work through “Factors” or “Division” tabs in the simulation</li> </ul>	<ul style="list-style-type: none"> <li>● Work individually on simulation.</li> </ul>