Module 1: Use of Manipulatives and Strategies Part 3

Focus on Rational and Irrational Numbers
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Focus on Rational and Irrational Numbers
Integers

Addition/ Subtraction

*Think about: Explain
3 + 5
3 + (-5)
-5 + 2
using both quantity and a linear context.

Multiplication

Division
*Think about: Explain

3 + 5
3 + -5
-6 + 2

using both quantity and a linear context.
Multiplication

\[ (+3) \times (+3) \times (+3) \times (+3) \]
$3 \times -3$
$3 \times -3$
-3 \times -3
\(-3 \times -3\)
-3 \times -3
Division

Example:

How many sets of +5 will make -10?

Begin with zero.

Change the representation. Add 10 neutral pairs.

+ + + + + + + + + + + +

Take out 1 set of -5.
Example 2: (c)

How many sets of +5 will make -10?

Begin with zero.

Change the representation. Add 10 neutral pairs.

Take out 1 set of +5.

Take out a second set of +5.

2 sets of +5 were removed to make -10 or -2 sets of 5 were used to make -10.
How many sets of -5 will make +10?

Begin with zero.

Change the representation. Add 10 neutral pairs.

Take out 1 set of -5.

Take out a second set of -5.

2 sets of -5 were removed to make +10 or -2 sets of -5 were used to make +10.
*Think about: Check your understanding with the examples provided for multiplication and division. Then try: 9 ÷ -3 and -4 x 2
Rational Numbers

All numbers that can be represented as a fraction or a ratio of an integer to an integer.

Operations
<table>
<thead>
<tr>
<th>UNIT FRACTION</th>
<th>PRIME FACTORIZATION OF DENOMINATOR</th>
<th>DECIMAL FORM</th>
<th>TERMINATES OR REPEATS</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{1}{2}$</td>
<td>PRIME</td>
<td>.5</td>
<td>Terminates</td>
</tr>
<tr>
<td>$\frac{1}{3}$</td>
<td>PRIME</td>
<td>$\overline{.3}$</td>
<td>Repeats</td>
</tr>
<tr>
<td>$\frac{1}{4}$</td>
<td>$2 \cdot 2$</td>
<td>.25</td>
<td>Terminates</td>
</tr>
<tr>
<td>$\frac{1}{5}$</td>
<td>PRIME</td>
<td>.2</td>
<td>Terminates</td>
</tr>
<tr>
<td>$\frac{1}{6}$</td>
<td>$2 \cdot 3$</td>
<td>.16</td>
<td>Repeats</td>
</tr>
<tr>
<td>$\frac{1}{7}$</td>
<td>PRIME</td>
<td>$\overline{.142857}$</td>
<td>Repeats</td>
</tr>
<tr>
<td>$\frac{1}{8}$</td>
<td>$2 \cdot 2 \cdot 2$</td>
<td>.125</td>
<td>Terminates</td>
</tr>
<tr>
<td>$\frac{1}{9}$</td>
<td>$3 \cdot 3$</td>
<td>$\overline{.11}$</td>
<td>Repeats</td>
</tr>
</tbody>
</table>
\[
\begin{array}{cccc}
\frac{1}{2} & & & \frac{1}{2} \\
\frac{1}{3} & & & \frac{1}{3} \\
\frac{1}{4} & & & \frac{1}{4} \\
\frac{1}{5} & & & \frac{1}{5} \\
\frac{1}{6} & & & \frac{1}{6} \\
\frac{1}{8} & & & \frac{1}{8} \\
\end{array}
\]
Square Numbers

Squares:

- 6
- 45
- 49

36 6

7 7
Square Number

Squares:

1. \(6 \times 6 = 36\)
2. \(? \times ? = 45\)
3. \(7 \times 7 = 49\)
Irrational Numbers

Approximation

Number line

Operations
$\sqrt{6}$
Number line

\[ \sqrt{4}, \sqrt{9} \]

2, 3
#1 $\sqrt{21}$

#2 $\sqrt{7}$
\[
\begin{array}{ccc}
\sqrt{2} & < & \sqrt{3} \\
\sqrt{3} & < & \sqrt{4} \\
\sqrt{4} & < & \sqrt{5} \\
\sqrt{5} & < & \sqrt{6} \\
\end{array}
\]
Experiment with sums and products of two numbers from the following list to answer the questions that follow:

\[ 5, \frac{1}{2}, 0, \sqrt{2}, -\sqrt{2}, \frac{1}{\sqrt{2}}, \pi. \]

Based on the above information, conjecture which of the statements is ALWAYS true, which is SOMETIMES true, and which is NEVER true?

a. The sum of a rational number and a rational number is rational.

b. The sum of a rational number and an irrational number is irrational.

c. The sum of an irrational number and an irrational number is irrational.

d. The product of a rational number and a rational number is rational.
Meeting Students' Needs

Differentiation
C-R-A at their own pace
Allow students their own time to build their understanding. They will be in different places of understanding which is normal. It is okay for students to remain in the representational stage for an extended period until they are ready to move to abstract thinking.

Tiered Tasks
Below, At and Above

Small Group Instruction
https://jenisesexton.wordpress.com/?s=small+group
Differentiation

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Tiered Tasks
Below, At and Above

Small Group Instruction
https://jenisesexton.wordpress.com/?s=s+group
Directions: Find the estimate of the square root of a number. Draw a model to illustrate your findings.

#1 \sqrt{21}

#2 \sqrt{7}

#3 \sqrt{2}

#4 \sqrt{10}
Meeting Students' Needs

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Tiered Tasks
Below, At and Above

Small Group Instruction

https://jenisesexton.wordpress.com/?s=small+group
Option 1 - 45 minutes
30 students, 4 groups
- Monday - whole group lesson, mini-lesson, student-centered work session
- Tuesday - small group rotations
- Wednesday - small group rotations
- Thursday - Formative assessment, whole group lesson
- Friday - Common formative assessment

Option 2- 60 minutes
30+ students, 4 groups

- Monday- whole group, mini-lesson, student-centered, independent practice
- Tuesday- small group rotation
- Wednesday- small group rotation
- Thursday- Formative assessment, whole group lesson
- Friday- Common formative assessment

NOT typical class size for FOA. Remember this suggestion comes from the GMD session.

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