The Key Elements to Mathematics Success Description of Teacher’s Guide

Essential Questions are provided at the beginning of each lesson to provide the framework for the lesson and guide the learning process. The essential questions are used not only at the beginning of the lesson, but are also an important part of the lesson closure. Each essential question ties into a SOLVE problem which is used as an introduction and closure tool in each lesson.

Each lesson concept is bracketed with the SOLVE problem solving method. Along with the essential question, the “S” step of SOLVE is introduced at the beginning of the lesson. This helps to guide the learning of the student as they progress through the lesson. At the end of the lesson, the SOLVE problem introduced at the beginning of the lesson is revisited. The student completes the additional steps of SOLVE, applying the lesson concept in a problem solving situation.

Mathematics Success – Level C

LESSON 17: Fractions on a Number Line

[OBJECTIVE]
The student will plot fractions on a number line.

[PREREQUISITE SKILLS]
plotting whole numbers on a number line, basic understanding of fractions

[MATERIALS]
Student pages S159 – S165
Transparencies T488, T490, T492 and T494
Fraction strips – Kit 1 and Kit 2
Overhead fraction kit
Colored pencils

[ESSENTIAL QUESTIONS]
1. What is a fraction?
2. What are the parts of a fraction called, and what do they represent?
3. How can you create and plot a fraction on a number line?

[WORDS FOR WORD WALL]
fraction, numerator, denominator, number line, whole unit, interval

[GROUPING]
Whole Group (WG), Cooperative Pairs (CP), Individual (I)
*For Cooperative Pairs (CP) activities, assign the roles of Partner A and Partner B to students. This allows each student to be responsible for designated tasks within the lesson.

[LEVELS OF TEACHER SUPPORT]
Modeling (M), Guided Practice (GP), Independent Practice (IP)

[MULTIPLE REPRESENTATIONS]
SOLVE, Graphic Organizer, Verbal Description, Pictorial Representation, Concrete Representation

[WARM-UP] (7 minutes – IP, I, WG) S159 (Answers are on T487.)
- Have students turn to S159 in their books to begin the Warm-Up. Students will plot whole numbers on a number line. Monitor students to see if any of them need help during the Warm-Up. Give students 3 minutes to complete the problems and then spend 2 minutes reviewing the answers as a class. (Pictorial Representation)

[HOMWORK] (5 minutes)
Take time to go over the homework from the previous night.

[LESSON] (60 minutes – M, WG, GP, CP, IP, I)

Fractions on a Number Line - Concrete to Pictorial

Step 1: Explain to students that they are going to learn how to represent fractions such as \(\frac{1}{4}\), \(\frac{1}{2}\), \(\frac{1}{3}\), and \(\frac{1}{6}\) on a number line.
- Partner A, place the \(\frac{1}{1}\) unit strip on the desk.
- Partner B, place the \(\frac{1}{4}\) strips underneath the \(\frac{1}{1}\) unit.
- Partner A, identify how many of the \(\frac{1}{4}\) strips are equivalent to 1 \(\frac{1}{1}\) unit. (2)

Step 2: Have students look at the graphic organizer on S160.
- Partner A, identify the color of the \(\frac{1}{1}\) unit fraction strip. (blue)
- Partner B, identify the color of the \(\frac{1}{4}\) unit fraction strips. (brown)
- Have students shade the \(\frac{1}{1}\) unit in Column 2.
- Partner A, identify how many of the \(\frac{1}{4}\) strips are equivalent to 1 \(\frac{1}{1}\) whole unit. (2)
- Partner B, identify the number of halves it takes to equal the \(\frac{1}{1}\) whole unit. (2)

Record in Column 3.

Multiple representations of the concept are incorporated in each lesson. These representations include concrete, pictorial, algebraic formula, verbal descriptions, graphs, tables, graphic organizers and a problem solving paradigm. The multiple representations provide students with different learning styles and abilities the opportunity to acquire and apply knowledge of the lesson concept.

Each lesson contains “modeling boxes” which contain step by step instructions on how to model each concept. Modeling steps are provided for concrete, pictorial and procedural steps of the lesson.
LESSON 17: Fractions on a Number Line

[OBJECTIVE]
The student will plot fractions on a number line.

[PREREQUISITE SKILLS]
plotting whole numbers on a number line, basic understanding of fractions

[MATERIALS]
Student pages S159 – S165
Transparencies T488, T490, T492 and T494
Fraction strips – Kit 1 and Kit 2
Overhead fraction kit
Colored pencils

[ESSENTIAL QUESTIONS]
1. What is a fraction?
2. What are the parts of a fraction called, and what do they represent?
3. How can you create and plot a fraction on a number line?

[WORDS FOR WORD WALL]
fraction, numerator, denominator, number line, whole unit, interval

[GROUING]
Whole Group (WG), Cooperative Pairs (CP), Individual (I)
*For Cooperative Pairs (CP) activities, assign the roles of Partner A and Partner B to students. This allows each student to be responsible for designated tasks within the lesson.

[LEVELS OF TEACHER SUPPORT]
Modeling (M), Guided Practice (GP), Independent Practice (IP)

[Multiple Representations]
SOLVE, Graphic Organizer, Verbal Description, Pictorial Representation, Concrete Representation

[WARM-UP] (7 minutes – IP, I, WG) S159 (Answers are on T487.)
- Have students turn to S159 in their books to begin the Warm-Up. Students will plot whole numbers on a number line. Monitor students to see if any of them need help during the Warm-Up. Give students 3 minutes to complete the problems and then spend 2 minutes reviewing the answers as a class. {Pictorial Representation}
LESSON 17: Fractions on a Number Line

[HOMWORK] (5 minutes)
Take time to go over the homework from the previous night.

[LESSON] (60 minutes –M, WG, GP, CP, IP, I)

SOLVE Problem (3 minutes – WG, GP) T488, S160 (Answers on T489.)

Have students turn to S160 in their books, and place T488 on the overhead. The first problem is a SOLVE problem. You are only going to complete the S step with students at this point. Tell students that during the lesson they will learn how to draw number lines and plot fractions on number lines. They will use this knowledge to complete this SOLVE problem at the end of the lesson. {SOLVE, Graphic Organizer}

Fractions on a Number Line - Concrete to Pictorial
(20 minutes – M, WG, GP, CP, IP) T488, S160 (Answers on T489.)

14 minutes – M, WG, CP, GP: Have students turn to S160, and place T488 on the overhead. Use the following modeling activity to introduce the concept of plotting fractions less than 1 on a number line. Designate the roles of Partner A and Partner B. {Verbal Description, Concrete Representation, Pictorial Representation, Graphic Organizer}
Step 1: Explain to students that they are going to learn how to represent fractions such as $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{6}$, and $\frac{1}{8}$ on a number line.

- Partner A, place the 1 unit strip on the desk.
- Partner B, place the $\frac{1}{2}$ strips underneath the 1 unit.
- Partner A, identify how many of the $\frac{1}{2}$ strips are equivalent to 1 whole unit. (2)

Step 2: Have students look at the graphic organizer on S160.

- Partner A, identify the color of the 1 unit fraction strip. (blue)
  Have students shade the 1 unit in Column 2.
- Partner B, identify the color of the $\frac{1}{2}$ unit fraction strips. (brown)
  Have students draw the two $\frac{1}{2}$ units underneath the 1 whole unit and shade.
- Partner A, identify the number of halves it takes to equal the whole unit. (2) Record in Column 3.

Step 3: Model how to draw a line underneath the $\frac{1}{2}$ units. Have students draw the line on S160.

Place a tick mark at the beginning and end of the strips.

- Partner A, determine the label for the beginning mark. (0)
- Partner B, determine the label for the end mark. (1)
- Partner A, identify how many halves are in the whole unit. (2)
Step 4: Tell students that the interval from 0 to 1 is the whole. It is divided into halves because there are 2 parts of the whole. Show the students how to plot the point $\frac{1}{2}$ on the number line.

- Partner A, identify which value tells us how the line is divided. (2; the denominator)
- Partner B, identify which value tells us which interval we are identifying. (1; the numerator)

$$0 \quad \frac{1}{2} \quad 1$$

- Partner A, how could the 1 be written as a fraction? ($\frac{2}{2}$)
- Partner B, explain why $1 = \frac{2}{2}$. (It is the second interval of the group which also equals 1.)

Step 5: Direct students to get out their fraction strips for $\frac{1}{4}$.

- Partner A, place the 1 unit strip on the desk.
- Partner B, place the $\frac{1}{4}$ strips underneath the 1 unit.
- Partner A, identify how many of the $\frac{1}{4}$ strips are equivalent to 1 unit. (4)

Step 6: Have students look at the graphic organizer on S160.

- Partner A, identify the color of the 1 unit fraction strip. (blue)
  Have students shade the 1 unit in Column 2.
- Partner B, identify the color of the $\frac{1}{4}$ unit fraction strips. (yellow)
  Have students draw the four $\frac{1}{4}$ units underneath the 1 whole unit and shade.
- Partner A, identify the number of fourths it takes to equal the whole unit. (4) Record in Column 3.

Step 7: Draw a line underneath the $\frac{1}{4}$ units. Place a tick mark at the beginning and end of the strips.

- Partner A, determine the label for the beginning mark. (0) Record.
- Partner B, determine the label for the end mark. (1) Record.
- Partner A, identify how many fourths are in the whole unit. (4)
**Step 8:** Tell students that the interval from 0 to 1 is the whole. It is divided into fourths because there are 4 parts in the whole. Show the students how to plot the point on the number line.

- Partner A, identify which value tells us how the line is divided. (4; the denominator)
- Partner B, identify which value tells us which interval we are identifying. (1; the numerator)

- Partner A, describe how the 1 could be written as a fraction. \( \frac{4}{4} \)

4 minutes – IP, CP: Have partners use their fraction strips to draw the number lines and complete the graphic organizer on S160. \{Verbal Description, Concrete Representation, Pictorial Representation, Graphic Organizer\}

2 minutes – WG: Have students come back together as a class and share their results from the graphic organizer and the fraction strips on S160. \{Verbal Description, Concrete Representation, Pictorial Representation, Graphic Organizer\}

**Fractions on a Number Line - Pictorial**  
(15 minutes – M, WG, GP, CP, IP) T490, S161 (Answers on T491.)

10 minutes – M, WG, CP, GP: Have students turn to S161, and place T490 on the overhead. Use the following activity to model for students how to create a number line and plot the values of fractions between 0 and 1 with numerators of 1. \{Verbal Description, Pictorial Representation\}
### LESSON 17: Fractions on a Number Line

#### MODELING

**Fractions on a Number Line - Pictorial**

**Step 1:** Have students look at Problem 1 on S161. (Students may refer back to the number lines they drew using their fraction strips on S160.)

Model the placement of the 0 and the 1 on the number line.
- Partner A, identify how many parts the section between the 0 and 1 will be divided into. (2)
- Partner B, explain why. (The denominator is 2.)

Model how to divide the number line into 2 equal parts.

**Step 2:** Model how to label the intervals on the number line.

- Partner A, identify the placement of the dot to identify the fraction. \(\frac{1}{2}\)

Have the students mark the dot on the number line.

**Step 3:** Have students look at Problem 2 on S161.

Model the placement of the 0 and the 1 on the number line.
- Partner B, identify how many parts the section between the 0 and 1 will be divided into. (4)

Model how to divide the number line into 4 equal parts.
- Partner A, explain why. (The denominator is 4.)

**Step 4:** Model how to label the intervals on the number line.

- Partner B, identify the placement of the dot to identify the fraction. \(\frac{1}{4}\)
- Have the students mark the dot on the number line.
- Have students label all the fourths.

#### 3 minutes – IP, CP:

Have partners use their fraction strips to draw the number lines and plot the fractions for Problems 3 and 4 on S161. \{Verbal Description, Pictorial Representation\}

#### 2 minutes – WG:

Have students come back together as a class and share their results from the number lines on S161. \{Verbal Description, Pictorial Representation\}
**Plotting Fractions on a Number Line**

(15 minutes – M, WG, GP, CP, IP) T492, S162 (Answers on T493.)

10 minutes – M, WG, CP, GP: Have students turn to S162, and place T492 on the overhead. Use the following activity to model for students how to create a number line and plot the values between 0 and 1 with numerators greater than 1. {Verbal Description, Pictorial Representation}

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**MODELING**

**Plotting Fractions on a Number Line**

**Step 1:** Have students look at Problem 1 on S162.

Model the placement of the 0 and the 1 on the number line.
- Partner A, identify how this fraction differs from the other fractions that we have plotted. (The numerator is not 1.)
- Partner B, identify how many parts the section between the 0 and 1 will be divided into. (6)
- Partner A, determine the value of each of the 6 intervals. \( \frac{1}{6} \)

Model how to equally divide the number line into 6 parts.

**Step 2:** Model how to label the intervals on the number line.

- Partner A, identify the placement of the dot to identify the fraction. \( \frac{5}{6} \)
- Partner B, explain how we know where to place the dot. (Each interval represents 1 section so we count each mark until we reach 5.)

Have the students mark the dot on the number line.

**Step 3:** Have students look at Problem 2 on S162.

Model the placement of the 0 and the 1 on the number line.
- Partner A, identify how many parts the section between the 0 and 1 will be divided into. (4)

Model how to equally divide the number line into 4 parts.

**Step 4:** Model how to label the intervals on the number line.

- Partner B, identify the placement of the dot to identify the fraction. \( \frac{2}{4} \)

Have the students mark the dot on the number line.
LESSON 17: Fractions on a Number Line

3 minutes – IP, CP: Have partners use their fraction strips to draw the number lines and plot the fractions for Problems 3 - 5 on S162. {Verbal Description, Pictorial Representation}

2 minutes – WG: Have students come back together as a class and share their results from the number lines on S162. {Verbal Description, Pictorial Representation}

SOLVE Problem (5 minutes – GP, WG) T494, S163 (Answers on T495.)

Remind students that the SOLVE problem is the same one from the beginning of the lesson. Complete the SOLVE problem with your students. Ask them for possible connections from the SOLVE problem to the lesson. (plotting a fraction on a number line) {SOLVE, Verbal Description, Pictorial Representation, Graphic Organizer}

If time permits… (10 minutes – IP, I) S164 (Answers on T496.)

Have students complete Problems 1 - 8 on page S164.

[CLOSURE] (2 minutes)
To wrap up the lesson, go back to the essential questions and discuss them with students.

• What is a fraction? (a way to represent part of a whole unit)

• What are the parts of a fraction called, and what do they represent? (numerator and denominator; The denominator represents how many equal parts, and the numerator tells how many parts away from zero the fraction is located on the number line.)

• How can you create and plot a fraction on a number line? (Use the denominator to tell you how many equal parts to have, and use the numerator to tell you how many parts from zero to plot the fraction.)

[HOMWORK] Assign S165 for homework. (Answers on T497.)

[QUIZ ANSWERS] T498–T499

The quiz can be used at anytime as extra homework or to assess how students progress on understanding fractions as a value on a number line.
Warm-Up

Directions: Plot the following numbers on the number line.

1. 3

2. 5

3. 8

4. 6

5. 0

6. 10
TRANSARENCY MASTER for S160

Directions: Complete the following SOLVE problem with your teacher. You will only complete the S step.

Jeff is plotting the progress of the participants in a 1-mile fun run on a number line. Alexis is $\frac{1}{3}$ of a mile from the starting line. Her friend, Julie, is $\frac{1}{2}$ of a mile from the starting line. How will Jeff represent Alexis’ location on a number line?

S Underline the question.
This problem is asking me to find _____________________________
______________________________________________________________.

Directions: Complete this page with your teacher and partner.

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Fraction Strips</th>
<th>Number of Parts in the Whole Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{1}{2}$</td>
<td>1 Unit</td>
<td></td>
</tr>
<tr>
<td>$\frac{1}{4}$</td>
<td>1 Unit</td>
<td></td>
</tr>
<tr>
<td>$\frac{1}{3}$</td>
<td>1 Unit</td>
<td></td>
</tr>
<tr>
<td>$\frac{1}{6}$</td>
<td>1 Unit</td>
<td></td>
</tr>
</tbody>
</table>
LESSON 17: Fractions on a Number Line

Here is the key to S160.

**Directions:** Complete the following SOLVE problem with your teacher. You will only complete the S step.

Jeff is plotting the progress of the participants in a 1-mile fun run on a number line. Alexis is $\frac{1}{3}$ of a mile from the starting line. Her friend, Julie, is $\frac{1}{2}$ of a mile from the starting line. How will Jeff represent Alexis’ location on a number line?

S  Underline the question.
   This problem is asking me to find the location of Alexis’ position on a number line.

**Directions:** Complete this page with your teacher and partner.

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Fraction Strips</th>
<th>Number of Parts in the Whole Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{1}{2}$</td>
<td><img src="image1" alt="Fraction strip for $\frac{1}{2}$" /></td>
<td>2</td>
</tr>
<tr>
<td>$\frac{1}{4}$</td>
<td><img src="image2" alt="Fraction strip for $\frac{1}{4}$" /></td>
<td>4</td>
</tr>
<tr>
<td>$\frac{1}{3}$</td>
<td><img src="image3" alt="Fraction strip for $\frac{1}{3}$" /></td>
<td>3</td>
</tr>
<tr>
<td>$\frac{1}{6}$</td>
<td><img src="image4" alt="Fraction strip for $\frac{1}{6}$" /></td>
<td>6</td>
</tr>
</tbody>
</table>
TRANSPARENCY MASTER for S161

Directions: Complete this page with your teacher and partner.

1. \( \frac{1}{2} \)

2. \( \frac{1}{4} \)

3. \( \frac{1}{3} \)

4. \( \frac{1}{6} \)
Here is the key to S161.

**Directions:** Complete this page with your teacher and partner.

1. $\frac{1}{2}$

2. $\frac{1}{4}$

3. $\frac{1}{3}$

4. $\frac{1}{6}$
Directions: Complete this page with your teacher and partner.

1. \( \frac{5}{6} \)

2. \( \frac{2}{4} \)

3. \( \frac{7}{8} \)

4. \( \frac{2}{2} \)

5. \( \frac{2}{3} \)
Here is the key to S162.

Directions: Complete this page with your teacher and partner.

1. \( \frac{5}{6} \)

   ![Diagram for \( \frac{5}{6} \)]

2. \( \frac{2}{4} \)

   ![Diagram for \( \frac{2}{4} \)]

3. \( \frac{7}{8} \)

   ![Diagram for \( \frac{7}{8} \)]

4. \( \frac{2}{2} \)

   ![Diagram for \( \frac{2}{2} \)]

5. \( \frac{2}{3} \)

   ![Diagram for \( \frac{2}{3} \)]
Jeff is plotting the progress of the participants in a 1-mile fun run on a number line. Alexis is $\frac{1}{3}$ of a mile from the starting line. Her friend, Julie, is $\frac{1}{2}$ of a mile from the starting line. How will Jeff represent Alexis’ location on a number line?

**S** Underline the question.
This problem is asking me to find ________________________________
______________________________

**O** Identify the facts.
Eliminate the unnecessary facts.
List the necessary facts.

**L** Choose an operation or operations.
Write in words what your plan of action will be.

**V** Estimate your answer.
Carry out your plan.

**E** Does your answer make sense? (Compare your answer to the question.)
Is your answer reasonable? (Compare your answer to the estimate.)
Is your answer accurate? (Check your work.)
Write your answer in a complete sentence.
Here is the key to S163.

**Directions:** Complete the following SOLVE problem with your teacher.

Jeff is plotting the progress of the participants in a 1-mile fun run on a number line. | Alexis is \( \frac{1}{3} \) of a mile from the starting line. | Her friend, Julie, is \( \frac{1}{2} \) of a mile from the starting line. | How will Jeff represent Alexis’ location on a number line?

**S** Underline the question.
This problem is asking me to find the location of Alexis’ position on a number line.

**O** Identify the facts.
Eliminate the unnecessary facts.
List the necessary facts. Alexis is \( \frac{1}{3} \) of a mile from the starting line.

**L** Choose an operation or operations. N/A
Write in words what your plan of action will be. Draw a number line. Divide it into the number of parts indicated by the denominator of the fraction. Plot the point.

**V** Estimate your answer. N/A
Carry out your plan.

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0   1   2   1
  3   3
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**E** Does your answer make sense? (Compare your answer to the question.)
Yes, because I am looking for the location of Alexis’ position on a number line.

Is your answer reasonable? (Compare your answer to the estimate.) N/A.
Is your answer accurate? (Check your work.) Yes.
Write your answer in a complete sentence. Alexis’ location on the number line is \( \frac{1}{3} \) or the 1st of 3 parts from zero to one.
Here is the key to S164.

**Directions:** Draw and plot the following fractions on the number lines.

1. \( \frac{3}{3} \)

![Number Line 1](image1)

2. \( \frac{3}{8} \)

![Number Line 2](image2)

3. \( \frac{4}{6} \)

![Number Line 3](image3)

4. \( \frac{1}{8} \)

![Number Line 4](image4)

**Directions:** Answer the following questions about fractional relationships.

5. In the fraction \( \frac{5}{8} \), the 8 is the **denominator** and the 5 is the **numerator**.

6. In the fraction \( \frac{2}{3} \), the 3 represents the number of parts on the number line between 0 and 1.

7. If a number line is divided into 4 sections between 0 and 1, each section has an interval of \( \frac{1}{4} \).

8. If a number line is divided into intervals of \( \frac{1}{6} \), how many sections are between 0 and 1? **6**
Homework

Name ___________________ Date ____________________

Directions: Draw and plot the following fractions on the number lines.

1. \( \frac{3}{6} \)

2. \( \frac{6}{8} \)

3. \( \frac{4}{6} \)

4. \( \frac{5}{8} \)

Directions: Answer the following questions about fractional relationships.

5. In the fraction \( \frac{4}{6} \), the 6 is the denominator and the 4 is the numerator.

6. In the fraction \( \frac{1}{2} \), the 2 represents the number of parts on the number line between 0 and 1.

7. If a number line is divided into 3 sections between 0 and 1, each section has an interval of \( \frac{1}{3} \).

8. If a number line is divided into intervals of \( \frac{1}{8} \), how many sections are between 0 and 1?
Quiz

Directions: Chose the letter that represents the given fraction on the number line.

1. \(\frac{4}{6}\)

   [Number line with points labeled A, B, C, D, and 0 and 1]

2. \(\frac{1}{4}\)

   [Number line with points labeled A, B, C, D, and 0 and 1]

3. \(\frac{5}{6}\)

   [Number line with points labeled A, B, C, D, and 0 and 1]

4. \(\frac{3}{4}\)

   [Number line with points labeled A, B, C, D, and 0 and 1]

5. \(\frac{3}{6}\)

   [Number line with points labeled A, B, C, D, and 0 and 1]

Directions: Answer the following questions about fractional relationships.

6. In the fraction \(\frac{5}{8}\), what term can be used to describe the 5?
   
   A. denominator
   B. numerator
   C. fraction
   D. interval
7. In the fraction \( \frac{4}{8} \), how many parts are on the number line between 0 and 1?
   A. 2
   B. 4
   C. 6
   D. 8

8. If a number line is divided into 6 sections between 0 and 1, what is the interval of each section?
   A. \( \frac{1}{12} \)
   B. \( \frac{1}{6} \)
   C. 2
   D. 6

9. If a number line is divided into intervals of \( \frac{1}{3} \), how many sections are there between 0 and 1?
   A. 1
   B. 2
   C. 3
   D. 6

10. If a number line is divided evenly into 4 sections between 0 and 1, which of the following fractions can be used to identify the point of the first interval?
    A. 0
    B. \( \frac{1}{4} \)
    C. \( \frac{3}{4} \)
    D. 1