Name _____

Date _____

Number Sense: Rational Numbers   Student Worksheet

Overview

The **Overview** introduces the topics covered in **Observations** and **Activities**. Scroll through the **Overview** using ▶ (◀ to review, if necessary). Read each screen carefully. Look for new terms, definitions, and concepts.

Observations

The **Observations** illustrate number sense concepts relating to rational numbers. Scroll through the **Observations** using ▶ (◀ to review, if necessary). Read each screen carefully. When you come to a **Write an Observation** screen, stop and write the answers to the questions on your worksheet.

Observation 1

Write $4\frac{2}{3}$ as an improper fraction.

Write your answer here. Show all of your work.

Observation 2

Write $\frac{5}{8}$ and $\frac{2}{11}$ as decimals.

Write your answer here. Show all of your work.

Observation 3

Write .1875 and $\frac{1}{4}$ as percentages.

Write your answer here. Show all of your work.

Name

Date

Activities

The **Activities** help you practice rational number concepts. You can select from two activities—**Slide** and **Number Smash**. Follow these steps to play the activity and complete your worksheet.

1. Make sure you are in the **Activities** for this section.

2. Highlight an activity using ⬆ or ⬇, and then press ENTER.

SELECT AN ACTIVITY
```
1. SLIDE
USE THE ARROW KEYS
TO LINE UP THE
FRACTIONS SO THEY
ADD TO 1.
SELECT & PRESS [ENTER]
```

Scoring: When a row or column adds up to 1, it disappears, and you score 2 points.

The game automatically ends if the screen is full or if you press ⟨**QUIT**⟩ to stop.

Slide

1. Highlight a level (bronze = least difficult; gold = most difficult), and press ENTER to select it.

2. Line up the fractions so they add to 1 (horizontally or vertically). As a fraction slides across the screen, press ⬇ and ⬆ to move it up or down. Once a fraction is in the correct row, you can press ◀ to slide it quickly to the left.

3. Follow your teacher's instructions for how long to play the activity.

4. What level did you play? _____

5. What was your score? _____

6. Write a paragraph describing the **Slide** activity. What was your strategy for playing the game?

_____

_____

_____

_____

_____

_____

Activities (continued)

SELECT AN ACTIVITY

2. NUMBER SMASH
FIND THE
MISSING NUMBER.

SELECT & PRESS [ENTER]

Scoring: You get two attempts to solve each problem. You earn 2 points for a correct answer on the first try, 1 point for a correct answer on the second try.

You can earn up to 10 points.

Tip: To change an answer before you press ENTER, press CLEAR and re-enter the answer.

Tip: Press ⟨**n/d**⟩ to move between the numerator and denominator.

Number Smash

1. Highlight a level (bronze = least difficult; gold = most difficult), and press ENTER to select it.

2. Press ⟨**+**⟩, ⟨**−**⟩, ⟨∗⟩, or ⟨**÷**⟩ to select the operation you want to practice.

3. Enter the missing number (press ⊡ for negative numbers), and press ENTER. As you play the activity, write each number sentence and solution. Show your work below.

    •   To enter a mixed number, enter the whole number and press ⟨**UNIT**⟩. Then enter the fraction.

    •   To enter a fraction, press ⟨**n/d**⟩ and enter the numerator. Press ⟨**n/d**⟩ again and enter the denominator.

    If the answer is incorrect, the correct answer is displayed; press any key to resume play.

_____

_____

_____

_____

_____

4. What level and operation did you play? _____

5. What was your score? _____

▣ Try-It!™ on Your TI‑83 Plus

Investigate how the graphing calculator computes addition expressions. Solve $\frac{2}{3}+\frac{5}{6}$.

To Do This	Press	Display (TI-83 Plus shown)
1. Exit the Topics in Algebra 1 application and clear the Home screen.	[2nd] [QUIT] ⟨**EXIT**⟩ [CLEAR]	
2. Enter the expression on the Home screen.	**2** [÷] **3** [+] **5** [÷] **6**	2/3+5/6
3. To specify that you would like the result to be shown in fraction form, select ▸**Frac**. It is copied to the Home screen.	[MATH] **1:▸Frac**	MATH NUM CPX PRB 1:▸Frac 2:▸Dec 3:³ 4:³√(5:ˣ√ 6:fMin(7↓fMax(
4. Evaluate the answer.	[ENTER]	2/3+5/6▸Frac 3/2

Notice that the answer is in simplified form. The graphing calculator follows the Order of Operations rules. Division is performed before addition. Solve this problem by hand. Show all of your work.
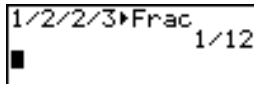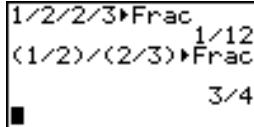
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_____

▥ Try-It!™ on Your TI‑83 Plus (continued)

Investigate how the graphing calculator computes division expressions. Solve $\dfrac{1}{2} \div \dfrac{2}{3}$.

To Do This	Press	Display (TI-83 Plus shown)
1. Solve without parentheses and specify that you want the result in fraction form.	1 ÷ 2 ÷ 2 ÷ 3 MATH 1:▸Frac ENTER	1/2/2/3▸Frac 1/12 ■

2. Solve using parentheses and specify that you want the result in fraction form.	(1 ÷ 2) ÷
	 (2 ÷ 3)
	 MATH 1:▸Frac
	 ENTER
		1/2/2/3▸Frac
		        1/12
		 (1/2)/(2/3)▸Frac
		        3/4
		 ■

The graphing calculator gives two different answers, depending on how you entered the expression.

Which one is the answer for the problem $\dfrac{1}{2} \div \dfrac{2}{3}$?

Solve this problem by hand. Show all of your work here. Explain which answer from the graphing calculator is the desired answer and why.

Additional problems—Calculate the following problems by hand. Simplify your answers. Then check your answers using the graphing calculator. Remember to use the Order of Operation rules.

1. $-\dfrac{1}{3} + \dfrac{1}{4} =$

2. $-\dfrac{2}{3} \times \dfrac{5}{6} =$

3. $\dfrac{3}{5} \div \dfrac{5}{6} =$

4. $\dfrac{1}{2} - \dfrac{-2}{5} =$

5. $-\dfrac{2}{5} + \dfrac{1}{4} \times \dfrac{2}{3} =$
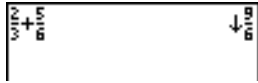
6. $\dfrac{1}{8} \times \dfrac{3}{16} \div \dfrac{1}{2} =$

7. $-\dfrac{1}{6} - \dfrac{1}{12} + \dfrac{3}{4} =$

8. $-\dfrac{1}{2} - \dfrac{3}{4} \div (-3) =$

Name _____

Date _____

▤ Try-It!™ on Your TI-73

Investigate how the graphing calculator computes addition expressions. Solve $\dfrac{2}{3} + \dfrac{5}{6}$.

To Do This	Press	Display (TI-73 shown)
1. Exit the Topics in Algebra 1 application and clear the Home screen.	[2nd] [QUIT] ⟨**EXIT**⟩ [CLEAR]	

2. Select the **b/c** and **Mansimp** mode settings.
 	
 Note: See ▤ TIp™ 2: *Adjusting Your Graphing Calculator Settings* for more information.
	[MODE] [▼] [▼] [▼] [▶] to highlight **b/c** [ENTER] [▼] [▶] to highlight **Mansimp** [ENTER]	`Normal Sci`
		 `Float 0123456789`
		 `Degree Radian`
		 `Aub/c b/c`
		 `Autosimp Mansimp`

3. Calculate the result.	[2nd] [QUIT] **2** [b/c] **3** [▶] [+] **5** [b/c] **6** [ENTER]	`2/3 + 5/6          ↓9/6`

4. Simplify the fraction.	[SIMP] [ENTER]	`2/3 + 5/6          ↓9/6`
		 `9/6 ▸Simp   Fac=3 3/2`
		 ▪
		
		 Simplified by a factor of 3.

Notice that the answer is in simplified form. The graphing calculator follows the Order of Operations rules. Division is performed before addition. Solve this problem by hand. Show all of your work.
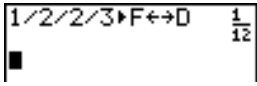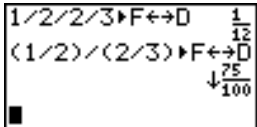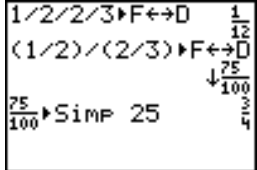
_____

_____

_____

▦ Try-It!™ on Your TI-73 (continued)

Investigate how the graphing calculator computes division expressions. Solve $\frac{1}{2} \div \frac{2}{3}$.

To Do This	Press	Display (TI-73 shown)
1. Solve without parentheses and specify that you want the result in fraction form.	**1** ⊡ **2** ⊡ **2** ⊡ **3** [F↔D] [ENTER]	1/2/2/3▶F↔D $\frac{1}{12}$ ■
2. Solve using parentheses and specify that you want the result in fraction form.	[(] **1** ⊡ **2** [)] ⊡ [(] **2** ⊡ **3** [)] [F↔D] [ENTER]	1/2/2/3▶F↔D $\frac{1}{12}$ (1/2)/(2/3)▶F↔D ↓$\frac{75}{100}$ ■
3. Simplify the result by a factor of 25.	[SIMP] **25**	1/2/2/3▶F↔D $\frac{1}{12}$ (1/2)/(2/3)▶F↔D ↓$\frac{75}{100}$ $\frac{75}{100}$▶Simp 25 $\frac{3}{4}$

The graphing calculator gives two different answers, depending on how you entered the expression. Which one is the answer for the problem:

$$\frac{1}{2} \div \frac{2}{3}$$

Solve this problem by hand. Show all of your work here. Explain which answer from the graphing calculator is the desired answer and why.

_____

Additional problems—Calculate the following problems by hand. Simplify your answers. Then check your answers using the graphing calculator. Remember to use the Order of Operation rules.

1. $-\frac{1}{3} + \frac{1}{4} =$ 2. $-\frac{2}{3} \times \frac{5}{6} =$

3. $\frac{3}{5} \div \frac{5}{6} =$ 4. $\frac{1}{2} - \frac{-2}{5} =$

5. $-\frac{2}{5} + \frac{1}{4} \times \frac{2}{3} =$ 6. $\frac{1}{8} \times \frac{3}{16} \div \frac{1}{2} =$

7. $-\frac{1}{6} - \frac{1}{12} + \frac{3}{4} =$ 8. $-\frac{1}{2} - \frac{3}{4} \div (\text{-}3) =$

Number Sense: Rational Numbers   Teacher Notes

Objectives

- To review the definition of rational numbers as ratios and as terminating and repeating decimals.

- To review ordering and the reciprocal property of rational numbers.

- To review operations with rational numbers.

Math Highlights

Students review rational numbers. This includes rational numbers as ratios, terminating decimals, repeating decimals, and integers, as well as operations with fractions. In the **Observations**, students are reminded of the connection between fractions, decimals, and percents.

Common Student Errors

- Students might confuse the algorithms for addition, subtraction, multiplication, and division of fractions.

- Students may have trouble identifying whether a fraction is positive or negative. For example:

$$\frac{-1}{-3} = \frac{1}{3} \quad \text{or} \quad \frac{1}{-3} = \frac{-1}{3} = -\frac{1}{3}$$

- Students may have problems because they use short cuts to change the decimal representation of a number to a percent representation. Using short cuts does not provide an understanding of why the representations are equal. Students should understand that the quantity stays the same. Using the multiplicative identity, 1=100/100, is the key to the change in the representation. For example, students change .1875 to a percent. A shift of the decimal point gives the correct answer, but without any connection to the math they know. However, multiplying by 1 in the form 100/100 gives the same result and makes the connection to the math as well.

$$.1875 \times \frac{100}{100} = \frac{18.75}{100} = 18.75\%$$

Student Worksheet Notes with Answers

Overview

Tell students:

1. How to find the **Overview**, or tell them to review the instructions on the worksheet.

2. How to navigate the application, if they are not yet familiar with the application.

3. To scroll through the **Overview** on the graphing calculator. Point out new terms, definitions, and concepts, and tell students to look for them as they go through the **Overview**.

Observations

The **Observations** help students understand number sense concepts relating to rational numbers. If necessary, tell students how to find the **Observations**.
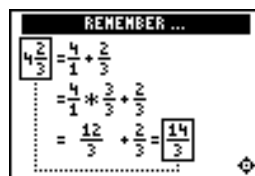
Observation 1

Write $4\frac{2}{3}$ as an improper fraction.

Answer: $\frac{14}{3}$

Remind students to write the answer on the worksheet and to show all of their work.

Students see the answer on the next two screens. Tell students to check the answers on the worksheet.
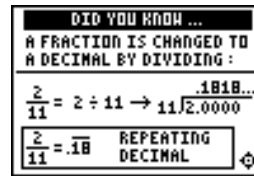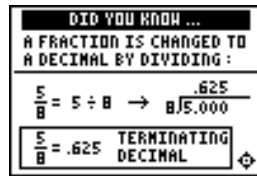
Observations (continued)

Observation 2

Write $\frac{5}{8}$ and $\frac{2}{11}$ as decimals.

Answer: .625 and $.\overline{18}$

Remind students to write the answers on the worksheet and to show all of their work.

Students see the answers on the next two screens. Tell students to check the answers on the worksheet.

Observation 3

Write .1875 and $\frac{1}{4}$ as percentages.

Answer: 18.75% and 25%

Remind students to write the answers on the worksheet and to show all of their work.

Students see the answers on the next two screens. Tell students to check the answers on the worksheet.
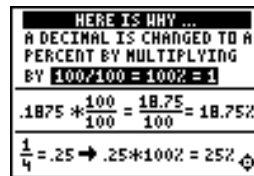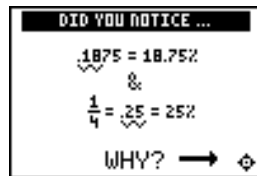
Activities

Slide

Tell students to:

1. Highlight a level (bronze = least difficult; gold = most difficult), and press ENTER to select it.

2. Line up the fractions so they add to 1 (horizontally or vertically). As a fraction slides across the screen, press ▾ and ▴ to move it up or down. Once a fraction is in the correct row, they can press ◂ to slide it quickly to the left.

Scoring: When a row or column adds up to 1, it disappears, and the player scores 2 points.

The game automatically ends if the screen is full, or you press ⟨**QUIT**⟩ to stop.

Activities (continued)

SELECT AN ACTIVITY

```
SELECT AN ACTIVITY
[icon] 1. SLIDE
1↗   USE THE ARROW KEYS
     TO LINE UP THE
     FRACTIONS SO THEY
     ADD TO 1.
SELECT & PRESS [ENTER] ⟡
```

Scoring: When a row or column adds up to 1, it disappears, and the player scores 2 points.

The game automatically ends if the screen is full, or you press ⟨**QUIT**⟩ to stop.

Slide (continued)

3. Follow your instructions. For example, students can play:

    • Until the screen fills up (no time limit).

    • Until a certain amount of time has expired (highest score wins).

    • Until a certain score has been reached (first student to reach the score wins).

    • Repeatedly over a period of time (days, weeks, etc.) for tracking improvement of high scores.

4. Record the level they played.

5. Record their scores.

6. Write on the worksheet a paragraph in which they describe the **Slide** activity and the strategy for playing.

Number Smash

```
SELECT AN ACTIVITY
[icon]
[icon] 2. NUMBER SMASH
     FIND THE
     MISSING NUMBER.
SELECT & PRESS [ENTER] ⟡
```

Scoring: Students get two attempts to solve each problem. They earn 2 points for a correct answer on the first try, 1 point for a correct answer on the second try.

They can earn up to 10 points.

Tips: Tell students that they can:

• Change the answer before they press [ENTER] by pressing [CLEAR] and re-entering the answer.

• Press ⟨**n/d**⟩ to move between the numerator and denominator.

Note: Unsimplified fractions are counted as correct.

Tell students to:

1. Highlight a level (bronze = least difficult; gold = most difficult), and press [ENTER] to select it.

2. Press ⟨**+**⟩, ⟨**−**⟩, ⟨*∗*⟩, or ⟨**÷**⟩ to select the operation that they want to practice.

3. Enter the missing number (press [(-)] for negative numbers), and press [ENTER]. As they play the activity, they should write each number sentence and its solution on the worksheet, showing all their work. If the missing number is a mixed number or fraction, tell them:

    • To enter a mixed number, enter the whole number, press ⟨**UNIT**⟩, and then enter the fraction.

    • To enter a fraction, press ⟨**n/d**⟩ and enter the numerator. Press ⟨**n/d**⟩ again and enter the denominator.

    If the answer is incorrect, the correct answer is displayed; press any key to resume play.

4. Record the level and operation they played.

5. Record their scores.

▦ Try-It!™ on Your TI‑83 Plus or TI‑73

Review the Order of Operations rules with students, if necessary. Explain to them that the graphing calculator uses the Order of Operations rules to simplify expressions. Discuss with them how parentheses are used.

Note: The ▦ **Try-It!** activities are repeated for each of the two graphing calculators—the TI‑83 Plus and then the TI‑73. The problems are the same, but they vary due to the differences in the two graphing calculators. The **Additional problems**, which are identical, can be performed on either graphing calculator. They are repeated for your convenience when you copy the activities.

Tell students to do the two graphing calculator ▦ **Try-It!** investigations.

- Investigate how the graphing calculator computes addition expressions. Solve $\frac{2}{3} + \frac{5}{6}$.
- Investigate how the graphing calculator computes division expressions. Solve $\frac{1}{2} \div \frac{2}{3}$.

Ask students to explain the difference in the two results in second investigation.

Although each of the two results is correct based on how the problem was entered, to make sure that the division is performed correctly, the problem must be entered as (1 / 2) / (2 / 3). The answer is 3/4, not 1/12. The graphing calculator uses the Order of Operations rules. Operations inside parentheses are performed before operations outside parentheses.

On the TI‑73, students must simplify the fraction 75/100 to get 3/4. They may either specify the factor to use, as shown, or let the graphing calculator simplify the fraction, one factor at a time by repeatedly pressing SIMP.

Additional problems—Make sure that students understand and use the Order of Operation rules so they can determine when to use parentheses.

1. $-\frac{1}{3} + \frac{1}{4} = -\frac{1}{12}$

2. $-\frac{2}{3} \times \frac{5}{6} = -\frac{5}{9}$

3. $\frac{3}{5} \div \frac{5}{6} = \frac{18}{25}$

4. $\frac{1}{2} - \frac{-2}{5} = \frac{9}{10}$

5. $-\frac{2}{5} + \frac{1}{4} \times \frac{2}{3} = -\frac{7}{30}$

6. $\frac{1}{8} \times \frac{3}{16} \div \frac{1}{2} = \frac{3}{64}$

7. $-\frac{1}{6} - \frac{1}{12} + \frac{3}{4} = \frac{1}{2}$

8. $-\frac{1}{2} - \frac{3}{4} \div (-3) = -\frac{1}{4}$