Name _____

Date _____

Number Sense: Integers   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 the set of integers. 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.
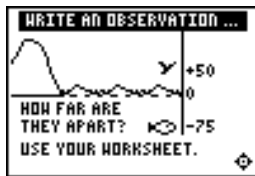
Observation 1

How far apart are the bird and the fish? Should your answer be positive or negative? Write an explanation for your answers here.

_____

_____

_____

_____
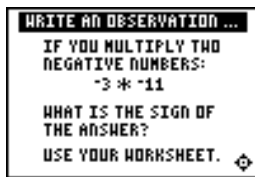
Observation 2

What is the sign of the answer to the problem $^-3 \times {}^-11$?

_____

In your own words, state the rules for multiplying and dividing signed numbers (shown in the grids on the next screens).

_____

_____

_____

_____

Name _____

Date _____

Activities

The **Activities** help you practice integer concepts. You can select from two different activities—
What Is My Sign? and **Integer 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 press ENTER.

SELECT AN ACTIVITY

```
1. WHAT IS MY SIGN ?
USE THE ARROW KEYS
TO SLIDE THE
EXPRESSION TO THE
CORRECT SIGN.
```

SELECT & PRESS [ENTER]

Scoring: Every correct
response earns 2 points.

The game automatically
ends if you have
answered incorrectly four
times (shown in the top
right corner), or you press
⟨**QUIT**⟩ to stop.

What Is My Sign?

1. In your head, quickly solve the sliding expression to
    determine if the result is positive, negative, or zero.

2. As soon as you know the sign of the result, press ▼ and ▲ to
    move the expression into the proper category on the left
    (**+**, **0**, or **-**). Once the expression is in the correct row, you can
    press ◄ to slide it quickly to the left. If the answer is
    incorrect, the correct answer is displayed; press any key to
    resume play.

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

4. What was your score? _____

5. How many incorrect answers did you have? _____

    (Shown in top right corner of the screen.)

Activities (continued)

Integer Smash

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

2. For bronze or silver levels only, press ⟨+⟩, ⟨–⟩, ⟨∗⟩, or ⟨÷⟩ to select the operation you want to practice.

3. Enter the missing number (press [-] for negative numbers) and press ENTER. If the answer is incorrect on the second attempt, the correct answer is displayed; press any key to resume play. As you play the activity, write each number sentence and solution. Show your work here.

_____

_____

_____

_____

_____

4. What level and operation (bronze and silver only) did you play? _____

5. What was your score? _____

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.

Name _____

Date _____

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

Learn to use the subtraction key (⊟), the negation key (⊡), and the absolute value function (**abs(**).

Use the negation and the subtraction keys to calculate ⁻5 – ⁻4.
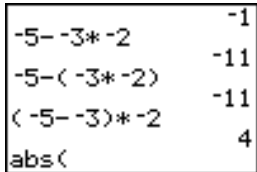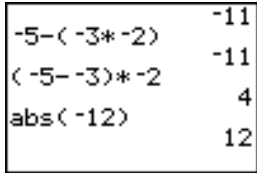
To Do This	Press	Display (TI‑83 Plus shown)
1. Exit the Topics in Algebra 1 application and clear the Home screen.	[2nd] [QUIT] ⟨**EXIT**⟩ [CLEAR]	
| 2. Calculate ⁻5 – ⁻4.<br><br>**Note**: The negation key (⊡) and the subtraction key (⊟) are different. | ⊡ **5** ⊟ ⊡ **4** [ENTER] | ```
-5- -4
         -1
``` |

Enter ⁻5 – ⁻3 × ⁻2, first without using parentheses and then using parentheses.

To Do This	Press	Display (TI‑83 Plus shown)
| 1. Calculate ⁻5 – ⁻3 × ⁻2.<br><br>**Note**: On the TI‑73, notice the difference between the $x$ variable key (⊠) and the multiplication key (⊠). | ⊡ **5** ⊟ ⊡ **3** ⊠ ⊡**2** [ENTER] | ```
-5- -4
         -1
-5- -3* -2
         -11
``` |
| 2. Calculate ⁻5 – (⁻3 × ⁻2). | ⊡ **5** ⊟<br>( ⊡ **3** ⊠ ⊡ **2** )<br>[ENTER] | ```
-5- -4
         -1
-5- -3* -2
         -11
-5-( -3* -2)
         -11
``` |
| 3. Calculate (⁻5 – ⁻3) × ⁻2. | ( ⊡ **5** ⊟ ⊡ **3** )<br>⊠ ⊡ **2**<br>[ENTER] | ```
         -1
-5- -3* -2
         -11
-5-( -3* -2)
         -11
( -5- -3)* -2
          4
``` |

The graphing calculator uses the Order of Operations rules, which say that multiplication and division are performed from left to right, and then addition and subtraction are performed from left to right. Notice that multiplication was calculated before subtraction in the expression ⁻5 – ⁻3 × ⁻2. Notice that the expression ⁻5 – (⁻3 × ⁻2) has the same answer.

The graphing calculator performs operations inside the parentheses before operations outside the parentheses. Notice that the expression (⁻5 – ⁻3) × ⁻2 has a different answer than the expressions ⁻5 – ⁻3 × ⁻2 and ⁻5 – (⁻3 × ⁻2).

▦ Try-It!™ on Your TI–83 Plus or TI–73 (continued)

Use the absolute value (**abs()**) function on the graphing calculator to find the absolute value of $^-12$.

| To Do This	Press	Display (TI-83 Plus shown)
1. Find the absolute value of $^-12$, which is written as $\lvert ^-12 \rvert$. **Note**: The MATH **NUM** menu varies slightly from the TI–73 to the TI–83 Plus.	MATH ▶	MATH **NUM** CPX PRB **1**▮abs(2:round(3:iPart(4:fPart(5:int(6:min(7↓max(

2. Select the absolute value (**abs()**) function. It is copied to the Home screen.	**1:abs(**	-1
		-5--3*-2
		           -11
		-5-(-3*-2)
		           -11
		(-5--3)*-2
		             4
		abs(

3. Calculate the result.	(–) **12**)
	ENTER
		-5-(-3*-2)
		           -11
		(-5--3)*-2
		             4
		abs(-12)
		            12

Additional problems—Calculate the following problems by hand, then check your answers using the graphing calculator. Remember to use the Order of Operations rules.

1. $^-4 + {^-12} \times {^-10} =$ 2. $4 \times {^-8} - {^-10} \times 2 =$

3. $^-30 \div {^-5} - 6 =$ 4. $\lvert ^-12 + {^-28} \rvert =$

5. $\lvert ^-4 \times {^-8} - {^-10} \times 2 \rvert =$ 6. $^-\lvert ^-3 - 14 - {^-10} \rvert =$

Number Sense: Integers   Teacher Notes

Objectives

- To illustrate the set of integers in a Venn diagram.
- To give an overview of the following definitions: the sign of a number, numbers of opposite sign, and absolute value.
- To give illustrations of the sets of positive and negative integers, and zero.
- To review ordering and the additive inverse property.
- To show examples of addition, subtraction, multiplication, and division of integers.

Math Highlights

This section begins with a Venn diagram and follows with an illustration of the use of integers on the Fahrenheit and Celsius scales. The temperature equivalencies shown are integer values. Students are reminded that the absolute value operation is defined as the distance of the number from zero. Examples of addition, subtraction, multiplication, and division operations are given. A number line model is used for addition and subtraction. Subtraction uses the *add-the-opposite* rule.

Common Student Errors

Students may have trouble identifying rules, such as the *add-the-opposite* rule for subtraction.

Note: The number line model for addition and subtraction is shown on the graphing calculator when the Topics in Algebra 1 application is installed.

Following are some activities to help students construct the rules for multiplication and division. These activities are not part of the Topics in Algebra 1 application.

Pattern Development for Multiplication and Division	
Investigation 1: What is the product of a positive and negative number? Begin by writing the product of two positive numbers, for example, $3 \times 3 = 9$. Keep decreasing the second term by 1 to create the sequence of multiplication values shown to the right. Notice the values on the right side of the number sentences decrease by 3. **Observation:** The product of a positive and negative number is negative.	$3 \times 3 = 9$ $3 \times 2 = 6$ $3 \times 1 = 3$ $3 \times 0 = 0$ $3 \times {}^-1 = {}^-3$ $3 \times {}^-2 = {}^-6$ $3 \times {}^-3 = {}^-9$ . . .

Common Student Errors (continued)

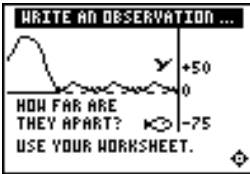| Pattern Development for Multiplication and Division (continued)	
Investigation 2: What is the product of two negative numbers? Start with the last number sentence from Investigation 1 ($3 \times {}^-3 = {}^-9$). Keep decreasing the first term by 1 to create the sequence of multiplication values shown to the right. Notice that the values on the right side of the number sentences increase by 3. **Observation:** The product of two negative numbers is positive.	$3 \times {}^-3 = {}^-9$ $2 \times {}^-3 = {}^-6$ $1 \times {}^-3 = {}^-3$ $0 \times {}^-3 = 0$ ${}^-1 \times {}^-3 = 3$ ${}^-2 \times {}^-3 = 6$ ${}^-3 \times {}^-3 = 9$ …
Investigation 3: What are the division rules for multiplying signed numbers? **Observation:** Division rules are developed using multiplication as the inverse operation. The rules are similar.	${}^-6 \div 3 = {}^-2$ since $3 \times {}^-2 = {}^-6$ ${}^-6 \div {}^-2 = 3$ since ${}^-2 \times 3 = {}^-6$

Student Worksheet Notes with Answers

Overview

Tell students:

1. How to find the **Overview**, if necessary.

2. How to navigate the application, if necessary.

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 operations with signed integers. If necessary, tell students how to find the **Observations**.
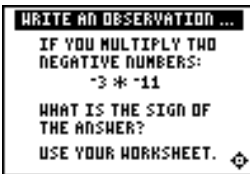

Observation 1

How far apart are the bird and the fish? Should the answer be positive or negative? Students write an explanation of their answers.

The bird and the fish are +125 ft. apart. The distance is positive. (Students will see the answers on the next three screens. Signed numbers give a perspective as shown on the screens.) Explanations will vary.

Students see the answers on the following three screens.

Observation 2

What is the sign of the answer to the problem $^-3 \times {}^-11$?

The answer is positive. $^-3 \times {}^-11 = 33$.

Students see grids explaining the rules.

What are the rules for multiplying and dividing signed numbers?

The product of a positive and negative number is negative.

The product of two numbers with the same sign is positive.

Rules for division are similar to the rules for multiplication.

Activities

SELECT AN ACTIVITY
1. WHAT IS MY SIGN ?
USE THE ARROW KEYS
TO SLIDE THE
EXPRESSION TO THE
CORRECT SIGN.
SELECT & PRESS [ENTER]

Scoring: Students earn 2 points for each correct response.

Unless you specify point or time limits for this activity, students can play the activity until they have answered incorrectly four times or they press ⟨**QUIT**⟩ to stop. There is no time limit.

What Is My Sign?

Tell students to:

1. Quickly solve the expression in their heads before it slides all the way to the left.

2. Move the expression into the correct category (**+**, **0**, or **-**) using ▲ and ▼. Once the expression is in the correct row, they can press ◄ to slide it quickly to the left. If the answer is incorrect, the correct answer is displayed; press any key to resume play.

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

   • Until they have answered incorrectly four times (no time limit).

   • Until a certain amount of time has expired (highest score with the fewest misses wins).

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

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

4. Record their score.

5. Record how many incorrect answers they had.

   (Shown in top right corner of the screen.)

SELECT AN ACTIVITY
2. INTEGER 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.

Students can earn up to 10 points.

Tip: You may want to remind students playing at the gold level about the Order of Operations rules.

Integer Smash

Tell students to:

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

2. Bronze or silver levels only: 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, write each number sentence and solution, showing all of their work on the worksheet.

4. Record the level and operation (bronze and silver only) they played.

5. Record their score.

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

These keystroke exercises let students practice using the basic operation keys (⊞, ⊟, ⊠, ⊡), the negation key (⊟), the parentheses keys (⦅ ⦆), and the absolute value function (MATH **NUM 1:abs(**).

Tell students to follow the steps exactly on the graphing calculators. Example screens are displayed on the worksheets for students to compare with the graphing calculator screens.

Additional problems—These problems give students additional practice using the subtraction key (⊟), the negation key (⊟), and the absolute value function (MATH **NUM 1:abs(**). Remind them to follow the Order of Operations rules.

Tell students to do the following calculations by hand, and then check the answers using the graphing calculator.

1. $^-4 + {}^-12 \times {}^-10 = 116$ 2. $4 \times {}^-8 - {}^-10 \times 2 = {}^-12$

3. $^-30 \div {}^-5 - 6 = 0$ 4. $|{}^-12 + {}^-28| = 40$

5. $|{}^-4 \times {}^-8 - {}^-10 \times 2| = 52$ 6. $^-|{}^-3 - 14 - {}^-10| = {}^-7$