Lesson 1-3A

Action Fractions
Math+CT

Introducing Conditionals: A Rounding Shortcut (unplugged)

Math Connections: Students learn and practice a strategy for rounding whole numbers.
CS Connections: Students connect prior knowledge of T/F statements to the formal definition of a condition and its use in a conditional statement.

▶ **Before You Begin**

Option 1: Do this activity during Lesson 1-3: Formal Procedures for Rounding. Complete these activities after finishing the Exploring Rounding Procedures activity in Lesson 1-3. If you choose this option, you can skip the Reviewing Rounding Procedures activity in the Warm Up.
Option 2: Do this as a stand-alone lesson any time after Lesson 1-3.

▶ **Vocabulary**

conditional (or conditional statement) • If-Then statement • condition • True • False

Computational Thinking

- **CONDITIONALS:** A condition is something that can be true or false.
- **CONDITIONALS:** A conditional connects a condition to its outcome.

1 Warm Up 5–10 min

	Materials
Reviewing Rounding Procedures Students practice using a shortcut method to round whole numbers.	*Student Reference Book* p. 87
"I Can ..." Statements Students read the explicit math and CS goals.	

2 Focus 10–20 min

Rounding with Computers Students think about the rounding shortcut in terms of conditionals.	*Student Reference Book* p. 87
Building Conditional Statements Students brainstorm examples of conditionals.	
Student Conditionals Students practice writing their own conditionals.	

"I Can ..." statements

- *I can apply a rounding strategy to round numbers.*
- *I can explain what a conditional statement is.*
- *I can write True/False statements as conditions in the "if" part.*
- *I can write action statements in the "then" part.*
- *I can identify non-examples of conditional statements.*
- *I can decide whether I should round up or down based on the conditional statements.*

Anticipated Barriers

- Some students may struggle with differentiating between an action and a definition, classification, or statement when coming up with valid and invalid examples of conditionals.
- If/then logic, beyond very simple concrete examples, may be challenging.
- Students may have difficulty in choosing action verbs.
- Students may have difficulty in differentiating linking/helping verbs from action verbs.

Student Options

Consider these options for adapting the lesson to your students' preferences:

- Students may prefer to use a graphic organizer along with the verbal prompting for if/then.

Student Reference Book, p. 87

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1 Warm Up   5–10 min

▶ Reviewing Rounding Procedures

Student Reference Book, p. 87

As needed, remind students about rounding — a technique often used to approximate known numbers. Numbers are rounded to make them easier to work with or understand. In today's lesson we will focus on Method 3 from Lesson 1-3: Formal Procedures for Rounding. To introduce this method, display *Student Reference Book*, page 87. "A Rounding Shortcut" method of rounding to the hundreds place is given in four steps:

1. Find the digit in the hundreds place.

2. Look at the digit to the right of the hundreds place.

3. If the digit is less than 5, round down.

4. If the digit is 5 or greater, round up.

After reading step 4, explain that sometimes a number is halfway between the lower number and the higher number. When this happens, students should round up to the higher number. Have students help you work through the *Student Reference Book* example (rounding to hundreds) or the Millenium Force roller coaster example (rounding to thousands) using this shortcut method.

▶ I Can ...

Display the "I Can ..." statements and explain that these statements express the goals for today's lesson. During the warm up for each class, carefully read these statements and ask them to use their thumbs to show how true they feel each statement is for them (thumbs up for yes, thumbs down for no, thumbs sideways for maybe). Note that the statements can also give students clues about what to expect in each lesson.

2 Focus   25–35 min

▶ Rounding with Computers

Student Reference Book, p. 87

WHOLE CLASS	SMALL GROUP	PARTNER	INDEPENDENT

Point out that the shortcut method is useful for thinking about how to program a computer to round numbers. Tell students that to do this, programmers would use an important type of statement called a **conditional** or **If-Then statement**. A conditional statement tells you what to do If a certain condition is met. So in step 3 of this method, we could say *"**If** the digit is less than 5, **Then** round down."*

Display the following statement structure:

If _____ , Then _____ .
　　　　　　condition　　　　　　　　　　　　　　action

Explain that a **condition** is in the first half of the statement, and it must always be something that can be determined **True** or **False**. The second half of the statement must always contain an action—the thing you should DO if the condition is TRUE. Ask: *What would you write to fill in the blanks for step 3 of the shortcut method?* the digit is less than 5; round down

▶ Building Conditional Statements

| WHOLE CLASS | SMALL GROUP | PARTNER | INDEPENDENT |

To help students understand conditional statements, have them brainstorm examples of conditionals that they use in everyday life. To come up with examples, it might be helpful to pose a scenario, such as those given in the examples below, and then ask students what conditions might be in place that prompt particular actions. Read through a few of the examples to help students get started if needed.

Examples of Valid Conditional Statements:

When I am about to leave the house:

- If it is raining, Then I pick up my umbrella.
- If it is cold, Then I put on a jacket.

When I am asked to identify a shape:

- If the shape has three sides, Then I say out loud, "It is a triangle!"

When I am checking my work:

- If my estimate is very different from my answer, Then I go back and check my work.

When I am doing my Math Boxes:

- If I am not sure how to do a problem, Then I look at the SRB page.

Expect that some students will brainstorm conditionals that are similar to the invalid examples given below. Explain that these kinds of statements are not conditionals that can be used by a computer because they do not identify an action to be completed if the condition is true. These kinds of statements, which are common in mathematics, give more information about the condition, but a conditional must have an action in the then part.

Examples of Invalid Conditional Statements:

When I am about to leave the house:

- If it is raining, Then I need my umbrella.

When I go to school:

- If I am in fourth grade, Then I have Ms. Smith as a teacher.

When I am asked to identify a shape:

- If the shape has three sides, Then it is a triangle.

Academic Language Development

To clarify the non-examples, remind students that the action has to be something you can do at the moment.

When I am checking my work:

- If my estimate is very different from my answer, Then it is incorrect.
- If the number is divisible by 2, Then then it is even.

Record students' conditional statements, in If-Then form. Students should identify the condition and the action. Remind them that the condition part of the statement must be either True or False. The action part of the statement must include an action verb, not a linking or helping verb, such as *have* or *is*, which are states of being. It must be something that they can do. Make sure to also record and discuss the invalid examples.

After writing several statements, ask for volunteers to read them out loud and verify that they are valid examples of conditionals. You could test these by changing the condition into a question and checking that it can be answered by True/False or Yes/No. For example: Is it raining? Is it cold? Does the shape have three sides? The second part must be an action, not a definition, classification, or statement, as in the invalid examples. If there are invalid examples, have students suggest changes to make them to fit the criteria, or replace them with a correct conditional statement.

▶ Student Conditionals

| WHOLE CLASS | SMALL GROUP | PARTNER | INDEPENDENT |

In small groups, have students think of three conditional statements. Give students index cards to record their statements. Ask each group to choose one conditional statement to share with the class. Students may enjoy performing the specified action. Remind them that the first part is the condition and the second part is the connected action. Have the rest of the class assess if each example is a valid or invalid conditional. If invalid, ask students to suggest a change to make it a valid conditional statement.

▶ Wrap Up

| WHOLE CLASS | SMALL GROUP | PARTNER | INDEPENDENT |

DIsplay the conditional structure shown on page 2. Ask students what to write to fill in the blanks for step 4 of the rounding method. the digit is 5 or greater; round up

Tell students that in Computer Science, the purpose of a conditional statement is to tell the computer what action to take next, so the second half must say what to do, not just provide information.

You may wish to mention that this rounding method is particularly useful for computers to be able to solve problems. As humans, we can use real world information or inferences to help us solve a problem, but a computer cannot, so we have to explicitly tell it what to do to avoid getting an unexpected (and possibly incorrect) answer.

Now "I Can ..."   Review today's "I Can ..." statements and ask students to use their thumbs to show how true they now feel each statement is for them. Note that some students may have started with thumbs down, but are now all the way or halfway up. Assure students that they will see some of the same "I Can ..." statements in future lessons, to build more confidence about them.

"I Can ..." statements

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