

# Lesson 8: Casting and Rounding

45 minutes

## Overview

**How can I use casting to temporarily convert a value to a different type or round to the nearest integer?**

Students learn how casting operators can be used to temporarily convert a value to a different type. Students explore the effect of using the `(int)` and `(double)` casting operators on a value and expression. Students also use casting operators to round a `double` value to the nearest integer.

## Standards

Full Course Alignment

### CSA Conceptual Framework

- **CON-1** - The way variables and operators are sequenced and combined in an expression determines the computed result.

## Agenda

### Warm Up (10 minutes)

Project Mercury Pastries Food Truck

### Activity (30 minutes)

Casting

Division

Rounding

### Wrap Up (5 minutes)

Three W's

Assessment: Check for Understanding

AP Classroom Topic Questions

## Objectives

Students will be able to:

- Cast between `int` and `double` values
- Round `double` values to the nearest `int`

## Preparation

- Print copies of the Investigating Casting handout (one for each pair of students)
- Check the **Teacher's Lounge** for verified teachers on the CSA Forum to find additional strategies or resources shared by fellow teachers

## Links

**Heads Up!** Please make a copy of any documents you plan to share with students.

For the students

- **Casting** - Video
- **Investigating Casting** - Handout
- **U4L8 Extra Practice** - Handout

## Vocabulary

- **cast** - to assign a value of one type to another
- **widen** - automatically cast from a smaller type to a larger type

## Teaching Guide


## Warm Up (10 minutes)

### Project Mercury Pastries Food Truck

#### Remarks

Project Mercury Pastries Food Truck has run out of coins! Since the owner can't give change using coins, they can only charge whole dollar amounts and no cents.

**Group:** Place students in groups of three or four.

 **Discuss:** *How could the owner change the prices of all the desserts they sell so that the prices are all whole numbers?*

**Discussion Goal:** Students share that the owner could round the price to the nearest dollar. They could always round down or always round up.

#### Teaching Tip

To help students consider always rounding down, ask guiding questions such as:


- *What if the owner doesn't want to overcharge customers?*

## Activity (30 minutes)

### Casting (10 minutes)


#### Remarks

There is a way we can easily solve this problem using some different types of operators that Java provides. Let's explore what these are and how they work.

 **Do This:** Review the lesson objectives.

**Group:** Place students in pairs.

 **Distribute:** Give each pair a copy of the Investigating Casting handout.

 **Do This:** Direct students to Level 1 on Code Studio. Students work with their partners to explore the program on Level 1 and complete the first page of the Investigating Casting handout.

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**Investigate: Casting**


#### Remarks

You just saw that we could treat an `int` as a `double` and a `double` as an `int` using casting. We could help the food truck owner get whole dollar amounts by rounding down with casting and truncation.

 **Discuss:** Click through the animated slide to display the prompts.

- *What does casting mean?*
- *Look at the Food Truck question in your activity guide. How did you round down?*

**Discussion Goal:** Students share their definitions for casting and explain how they used casting to answer the Food Truck question on the Investigating Casting handout.

 **Display:** Show the video – *Casting*.


 **Do This:** Define *cast* and *widen*.

## Division (10 minutes)

### *Remarks*

We used casting to truncate the `double` price to an `int` to round down. Sometimes we may want to cast an `int` to a `double` to ensure we get a `double` result when working with expressions.

We previously learned how to evaluate expressions with `int`s and `double`s in Java. When we divide two `int`s, Java truncates the result of the expression. However, if one of the values is a `double`, then the result of the expression is a `double`.


 **Do This:** Direct students to Level 2 on Code Studio. Have students try different ways to get an expression dividing two `int` values to evaluate to a `double`.

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### Investigate: Division and Printing

#### Teaching Tip

If students struggle with using casting to get a `double` result, have them revisit the first question of the activity guide. Ask students to explain why the `int` value is printed as a `double` and guide them towards making the connection of using the `(double)` operator in an expression to divide two `int`s to get the desired result.

 **Discuss:** *What is one way that you wrote your expression to evaluate to a `double` value?*


**Discussion Goal:** Students share ways to use the `(double)` operator to cast the numerator or denominator as a `double`.

 **Do This:** Return students to Level 2 on Code Studio. Students work with their partners to complete the Division and Printing sections of the Investigating Casting handout.

## Rounding (10 minutes)

### *Remarks*

We have seen how casting operators can be used to convert an `int` value to a `double`, which truncates the decimal portion of the value. This rounds the number down, but we can also use casting operators to round a number to the nearest integer.

 **Do This:** Direct students to Level 3 on Code Studio. Students work with their partners to complete the Rounding section of the Investigating Casting handout.

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### Investigate: Rounding

 **Discuss:** Click through the animated slide to display the prompts.

- *How were you able to round a value to the nearest integer?*

**Discussion Goal:** Students share that they could add 0.5 to the value and cast the result as an `int` to round the number to the nearest integer. If the number is negative, they could subtract 0.5 from the value to achieve the result.

## Wrap Up (5 minutes)

### Three W's

 **Discuss:** Click through the animated slide to display the prompts.

- *What did we learn today?*
- *So what?*
- *Now what?*

**Discussion Goal:** Students share the concepts they learned from the lesson, including using casting operators to temporarily convert a value to a different type and round a value to the nearest integer. Students suggest problems where they might use these operators and strategies and make predictions about upcoming lessons or problems.

 **Do This:** Review the concepts covered in this lesson.

 **Display:** Key Vocabulary

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## Assessment: Check for Understanding

*Check For Understanding Question(s) and solutions can be found in each lesson on Code Studio. These questions can be used for an exit ticket.*



## AP Classroom Topic Questions

To assign questions from the AP Classroom Question Bank that align with this lesson, create a custom quiz in AP Classroom by searching the Question Bank for the Essential Knowledge statements listed at the top of this lesson plan. You can find instructions and video demonstrations to do this on **AP Central**.



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