

# Lesson 7: The Math Class

45 minutes

## Overview

### What can I do with the Math class?

Students explore the `Math` class to learn about its structure and available methods. As students review the documentation for the `Math` class, they revisit the `final` keyword and learn how it can be used to prevent inheritance. Students practice using methods in the `Math` class to solve problems.

## 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)

#### Finding Patterns

### Activity (30 minutes)

#### Exploring the Math Class

#### Using Math Class Methods

### Wrap Up (5 minutes)

#### Glow, Grow, Want-to-Knows

#### Assessment: Check for Understanding

#### AP Classroom Topic Questions

## Objectives

Students will be able to:

- Call `Math` class methods
- Explain the purpose and functionality of a `final` class

## Preparation

- Print copies of The Math Class handout (one for each student)
- 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

- **The Math Class** - Handout
- **U4L7 Extra Practice** - Handout

## Vocabulary

- `Math` **class** - a class that contains methods for performing basic numeric operations
- `final` **class** - a class that cannot be extended


## Teaching Guide

### Warm Up (10 minutes)

# Finding Patterns

## Remarks

Patterns in the data can help us decide how we want to communicate its story visually.

 **Discuss:** Click through the animated slide to display the prompts. Use the Retrieve-Pair-Share strategy to discuss the prompts.

- *What patterns or relationships do you see in this dataset?*
- *What type of visualization might you create to represent these patterns and relationships?*


**Discussion Goal:** Students share patterns and relationships they notice in the dataset and suggest ways to visualize the data, such as charts or graphs or more abstract visualizations or animations that represent the patterns.

## Activity (30 minutes)


### Exploring the Math Class (15 minutes)

## Remarks

We have explored several classes in the Java API, such as the `Scanner` class and the `Object` class. Let's take a look at another class that is available in the Java API.

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

**Group:** Place students in pairs.

 **Distribute:** Give each pair a copy of The Math Class handout.

 **Do This:** Direct students to Level 1 on Code Studio to access the `Math` class documentation and complete The Math Class handout.

### 1

### Investigate: The Math Class

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

- *What did you find most interesting about the `Math` class?*
- *What questions do you have?*

**Discussion Goal:** Students share what they found in the documentation and in the example program, as well as any questions they may have.

## Remarks

Notice that we don't have to make a `Math` object to use the methods in the `Math` class. `Math` is a special type of class because it is `final`.

 **Do This:** Define `final` class.

 **Discuss:** Use the Retrieve-Pair-Share strategy to discuss the prompts.

- *Why do you think the `Math` class is `final` with all static methods?*

**Discussion Goal:** Students identify that mathematical operations or constant values should function the same way, regardless of the input. Students note that a `Math` object does not need to be created to use its methods.

#### 💡 Teaching Tip

Students may struggle to identify why the `Math` class is `final` and has only static methods. A few guiding questions might include:

- *What might happen if we could change different mathematical formulas or calculations depending on the input?*
- *If we were to create `Math` objects, what would you want to change about them? In other words, what instance variables would you declare?*

## Using Math Class Methods (15 minutes)

### 🎤 Remarks

Now that we have a better understanding of `final` classes and static methods, we will focus on three methods from the `Math` class. While you may have noticed that the `Math` class has many different methods, we will practice using methods to calculate absolute values, square roots, and exponents.

**Do This:** Click through the animated slides to demonstrate the `Math` class methods:

- `Math.abs(double a)`
- `Math.sqrt(double a)`
- `Math.pow(double a, double b)`

#### 💡 Teaching Tip

When calculating the square root of a negative number, Java returns `NaN`, which stands for "Not a Number." Negative numbers do not have square roots (since they must be positive or zero), so Java will always return `NaN`.

### 🎤 Remarks

Now that we're familiar with how each of these methods works, let's practice using them!

**Do This:** Direct students to Level 2 on Code Studio to complete Levels 2 through 5. Students use the `Math` class methods on Levels 2, 3, and 4, then complete a choice level on Level 5.



2-5

Using Math Class Methods

2

3

4

5

## Wrap Up (5 minutes)

Glows, Grows, Want-to-Knows

### 🎤 Remarks

We have learned a lot in this unit about conditionals, logical operators, static methods, and the Math class.

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

- *What was awesome about writing your code?*
- *What is one action you can take to improve your code?*
- *What questions do you have about today?*

**Discussion Goal:** Students share aspects of their program they enjoyed or strengths of writing algorithms and identify areas of improvement to strengthen their programming skills. Students also share any questions or misconceptions they may have.

 **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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