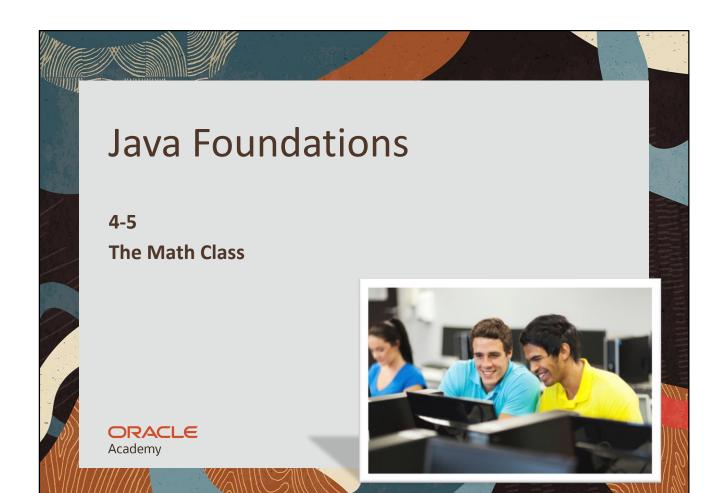
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Objectives

- This lesson covers the following objective:
 - -Understand the methods of the Math class
 - Use methods of the Math class to perform mathematical calculations
 - -Use fields of the Math Class





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Performing Mathematical Calculations

- While developing programs, you may need more advanced mathematical calculations than what the basic Java math operators provide
- For example:
 - Finding the maximum or minimum of two values
 - Rounding values
 - Logarithmic functions
 - Square root
 - Trigonometric functions
- The Java Math class contains methods for performing mathematical calculations



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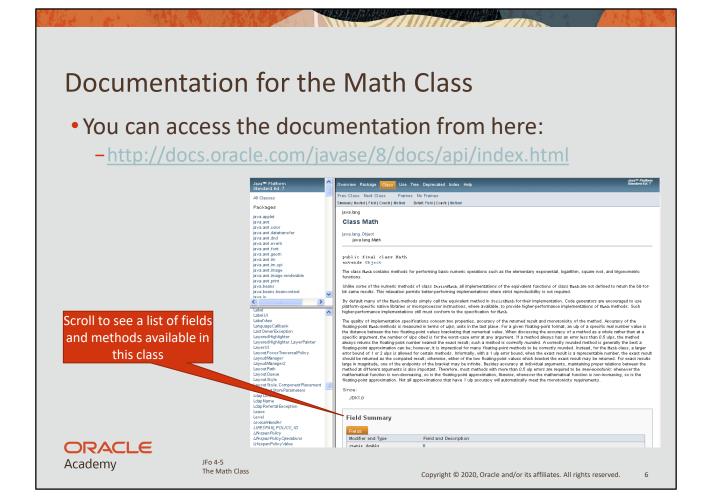
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The Math Class

- Is one of the many classes included in the Java class libraries
- Contains methods that perform various mathematical functions
- Is part of the java.lang package



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Scroll down the lower-left panel and click the Math link to display the documentation in the main panel on the right.



- Examine the Math class documentation:
 - -Standard Edition for Java SE 8: http://docs.oracle.com/javase/8/docs/api/
- See if you can find a value for PI and a method for computing the square root of a number



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Some of the Methods Available in Math Class

Method Name	Description
abs(value)	absolute value
ceil(value)	rounds up
cos(value)	cosine, in radians
floor(value)	rounds down
log(value)	logarithm base e
log10(value)	logarithm base 10
max(value1, value2)	larger of two values
min(value1, value2)	smaller of two values
pow(base, exponent)	base to the exponent power
random()	random double between 0 and 1
round(value)	nearest whole number
sin(value)	sine, in radians
sqrt(value)	square root

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The Math Class

What's Different About the Math Class?

- The methods of the Math class are static methods
- Static methods can be invoked through the class name
- That means you don't have to create an object of the Math class to call the methods
- For example, to invoke the methods of the Random class, you have to create an object of the Random class like this:

```
Random rndNum = new Random();
int randomNum = rndNum.nextInt();
```



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How Do You Call the Methods of the Math Class?

- You can call methods of the Math class without creating an instance of the Math class, like this:
- Syntax:
 - -Math.methodName(parameters)
- Example:

```
-Math.sqrt(121.0);
```

Call methods by prefacing them with Math dot operator



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Calling a Method and Observing Its Result

 Let's see an example of calling a method and observing its result:

```
public static void main(String[] args) {
    Math.sqrt(121.0);
}//end method main
```

- Observe the output:
 - No output is displayed
 - -Simply calling these methods produces no visible result



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How Do the Methods of the Math Class Work?

- The Math methods don't print the results to the console
- Each method returns a numerical result
- The returning value is more flexible than printing
- You can store, print, or combine it with a larger expression



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Storing and Printing the Results

- To see the result, you must print it or store it in a variable
- For example:
 - -Print the result:

```
public static void main(String[] args) {
    System.out.println("Square root: " + Math.sqrt(121.0)); //11.0
}//end method main
```

-Store the value:

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Combining the Results

 You can combine the results and use it in a larger expression, like this:

```
public static void main(String[] args) {
    double result = Math.min(3, 7) + Math.abs(-50);
    System.out.println("Result is " + result); //53
}//end method main
```



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- On paper, evaluate the following Java statements and record the results:
 - -Math.abs(-1.23)
 - -Math.pow(3, 2)
 - -Math.sqrt(121.0) Math.sqrt(256.0)
 - -Math.abs (Math.min(-3, -5))



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- Consider an integer variable named age
- Use Math.max and Math.min methods to answer the following questions:
 - -What expression would replace negative ages with 0?
 - -What expression would limit the maximum age to 40?



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Answer:

What expression would replace negative ages with 0?
Math.max(age, 0)
What expression would limit the maximum age to 40?
Math.min(age, 40)

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Fields in the Math Class

- The Math class contains two constant fields:
 - -PI and E

Field	Description
Math.E	2.7182818
Math. PI	3.1415926



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PI Field



- The Math class contains a constant, PI
- It contains a double value:
 - -3.14159265358979323846
- Remember, Math class methods are static methods and are accessed by using the Math class name
- Similarly, PI is a static variable in the Math class, and it is accessed by using the Math class name
- To use PI in a program, specify the class name (Math) and PI, separated by the dot operator:
 - -Math.PI



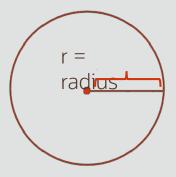
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Calculating the Area of a Circle

- Suppose that you have to write a Java program to compute the area of a circle
- Here's the formula to compute the area of a circle:
 - -Area = PI* radius* radius
 - -Where PI is a constant (approximately 3.1416)



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Computing the Area of a Circle

 Using the Math.PI field for calculating the area yields a more accurate result than using a constant value for pi like 3.14

```
public class AreaOfCircle {
   public static void main(String args[]) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter the radius: ");
        double radius = sc.nextDouble();
        double area = Math.PI * radius * radius;
        System.out.println("The area of circle is: " + area);
    }//end method main
}//end class AreaOfCircle
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```

Output:

Enter the radius: 7.5

The area of circle is: 176.71458676442586



- A person's body mass index (BMI) is computed like this: $BMI = \frac{weight}{height^2} \times 703$
- Import and open the MathEx project
- Examine ComputeBMI.java
- Write a program that computes the BMI and rounds off the BMI



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- Use the methods of the Math class and display the output as:
 - -Enter the weight in pounds: 132.5
 - -Enter the height in inches: 62.5
 - -Your Body Mass Index is 24



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Summary

- In this lesson, you should have learned how to:
 - -Understand the methods of the Math class
 - Use methods of the Math class to perform mathematical calculations
 - -Use fields of the Math Class





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