

Check Out the Library

Application Program Interface (API) and libraries



Who wrote this code?

PAUSE AND TRY

Which capitalized names did the programmer write? Who wrote the rest?

BAKERY.JAVA

```
public class Bakery {  
    public static void main(String[] args) {  
        String treat = "bagel";  
        double side = Math.sqrt(225.0);  
        System.out.println(treat);  
        System.out.println(side);  
    }  
}
```

OUTPUT

```
bagel  
15.0
```

Math.sqrt gives back a square root. Did anyone here write that code?

By the end of class you can...

- 1 Explain what a library is and pick out the library classes in a program.
- 2 Name the package a class is in and decide when a program needs an import line.
- 3 Use API documentation to find a method, what it needs, and what it gives back.
- 4 Sort what a class offers into attributes (data) and behaviors (methods).
- 5 Explain that a class is a reference type and a blueprint for objects.

A large white square with rounded corners, tilted slightly to the right, containing a large teal number '1' in the center.

1

PART 1

Libraries are collections of classes

A library is code someone else already wrote



A **library** is a collection of **classes** written for other programs to use. Your program uses them by name.

Class you have typed	What it does for you	First used
System	Gives the program access to the screen	Topic 1.3
String	Holds text	Topic 1.3
Scanner	Reads input	Topic 1.4
Integer	Facts about int values, like the largest one	Topic 1.5
Math	Calculations such as square roots	Today

Spot the library classes

BAKERY.JAVA

```
1 public class Bakery {  
2     public static void main(String[] args) {  
3         String treat = "bagel";  
4         double side = Math.sqrt(225.0);  
5         System.out.println(treat);  
6         System.out.println(side);  
7     }  
8 }
```

Line	Class	Who wrote it?
1	Bakery	The programmer
3	String	Library
4	Math	Library
5, 6	System	Library



One class is yours. Every other capitalized class name came from the library, and Java is **case-sensitive**: math is not Math.

A large, bold, teal number '2' is centered within a white rounded square that has a slight 3D effect and a shadow.

2

PART 2

Packages and import

Packages are labeled shelves

Package	Some classes	Import line?
java.lang	String, Math, System, Integer	No: available by default
java.util	Scanner	Yes

WITH AN IMPORT LINE

```
import java.util.Scanner;  
...  
Scanner console =  
    new Scanner(System.in);
```

WITH THE FULL NAME

```
(no import line)  
...  
java.util.Scanner console =  
    new java.util.Scanner(System.in);
```

Full name = package + dot + class: `java.util.Scanner`. Both versions read 4 and 9 and print 36.

Forgetting the import line



Only **java.lang** classes are available by default. A class from any other package needs its import line.

NOIMPORT.JAVA

```
public class NoImport {  
    public static void main(String[] args) {  
        Scanner console = new Scanner(System.in);  
        int rows = console.nextInt();  
        System.out.println(rows);  
    }  
}
```

COMPILER SAYS

```
NoImport.java:3: error:  
    cannot find symbol  
    symbol:   class Scanner  
    location: class NoImport  
(reported twice, once for  
each Scanner on line 3)
```

How many import lines?

PAUSE AND TRY

Answer both. Be ready to say why.

QUESTION 1

A program uses String, Math, Scanner, and Integer. How many import lines does it need? Write them.

QUESTION 2

The documentation says the LocalDate class is in the package java.time. Write the import line a program needs to use it.

A large, white, rounded square containing the number '3' in a bold, teal, sans-serif font.

3

PART 3

Reading the documentation

The API tells you how to use a class

MATH DOCUMENTATION (SIMPLIFIED)

Package java.lang

Class Math

Method Summary

```
static int    abs(int a)
    the absolute value of a
static double pow(double a, double b)
    a raised to the power b
static double sqrt(double a)
    the nonnegative square root of a
```

Package

Where the class lives. java.lang: no import.

Type before the name

What kind of value it gives back: int or double.

Name

Spelled exactly. No guessing.

Inside the parentheses

What it needs, in order.

Find the method, then read its order

HOW BIG WAS THE CHANGE?

```
int morning = 41;  
int afternoon = 63;  
int change =  
    Math.abs(morning - afternoon);  
System.out.println(change);
```

OUTPUT

22

DOES ORDER MATTER?

```
double a = Math.pow(10.0, 2.0);  
double b = Math.pow(2.0, 10.0);  
System.out.println(a);  
System.out.println(b);
```

OUTPUT

100.0
1024.0

The documentation gives the name, what goes in (in order), and the type that comes back.

Guessing a method name



If the documentation does not list a name, the name **does not exist**, however sensible it sounds.

CUBE.JAVA

```
public class Cube {  
    public static void main(String[] args) {  
        double box = Math.cube(3.0);  
        System.out.println(box);  
    }  
}
```

COMPILER SAYS

```
Cube.java:3: error:  
  cannot find symbol  
    symbol:   method cube(double)  
    location: class Math
```

Use the documentation to predict

PAUSE AND TRY

Write the exact output. Watch the type each method gives back.

```
System.out.println(Math.sqrt(36.0));  
System.out.println(Math.pow(3.0, 2.0));  
System.out.println(Math.abs(5 - 9));
```

YOUR OUTPUT

A large, bold, teal-colored number '4' is centered within a white rounded square that has a slight 3D effect and a shadow.

PART 4

Attributes, behaviors, and objects

Attributes are data. Behaviors are actions.

Attribute

DATA IN A VARIABLE

```
Integer.MAX_VALUE
```

Listed in the Field Summary. No parentheses.

Behavior

AN ACTION: A METHOD

```
word.length()
```

Listed in the Method Summary. Always parentheses.

SAME BEHAVIOR, TWO OBJECTS

```
String first = "Ada";  
String full = "Grace Hopper";  
System.out.println(first.length());  
System.out.println(full.length());
```

OUTPUT

```
3  
12
```

Parentheses in the wrong place



Attributes: **no** parentheses. Behaviors: **always** parentheses, even when nothing goes inside.

```
int low = Integer.MIN_VALUE();
```

COMPILER SAYS

```
cannot find symbol  
symbol:   method MIN_VALUE()  
location: class Integer
```

```
String city = "Austin";  
int size = city.length;
```

COMPILER SAYS

```
cannot find symbol  
symbol:   variable length  
location: variable city of type String
```

Fixes: `Integer.MIN_VALUE` and `city.length()`

A class is a type and a blueprint

THREE DECLARATIONS

```
1 int seats = 30;
2 String city = "Austin";
3 Scanner console =
    new Scanner(System.in);
```

Line	Type	Object?
1	int (primitive)	No: a plain number
2	String (a class)	Yes: "Austin"
3	Scanner (a class)	Yes: made with new



Each class defines a **reference type**. A class is the **blueprint**; an **object** (an **instance**) is one particular thing made from it, with its own values for the attributes.

Attribute or behavior?

PAUSE AND TRY

The Scanner documentation describes these. Sort each one.

(a) the text the scanner is reading from

(b) read the next whole number

(c) how far through the text it has read

(d) read the next word

Test:

A fact the object stores?
attribute

An action it does?
behavior

Words to know

Library

A collection of classes written for other programs to use.

Package

A named group of related classes, like `java.util`.

Import statement

A line at the top that lets a file use a class's short name.

API documentation

Tells you how to use a class without showing its code.

Attribute / behavior

Data stored in variables / actions defined by methods.

Object (instance)

One particular thing made from a class, its blueprint.

Look it up, don't guess



Explain to your partner why a programmer reads a class's documentation instead of its code.

SENTENCE STARTER

The documentation tells me the method's _____, what it _____, and what it _____, so I don't have to _____.

Next: the Check Out the Library puzzle worksheet.