The Math Class and Mathematical Functions

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Objectives

- To solve mathematics problems by using the methods in the **Math** class (§4.2).

Outline

- Constants and methods in the Math class
  - Constants
  - Trigonometric Methods
  - Exponent Methods
  - Rounding Methods
  - min, max, abs, and random Methods
- Example programming problem

Mathematical Functions

- **Math** class defines
  - methods for performing common mathematical functions.
  - mathematical constants

The Math Class

- Constants:
  - `PI`
  - `E`
- Methods (static/class methods):
  - Trigonometric Methods
  - Exponent Methods
  - Rounding Methods
  - min, max, abs, and random Methods

Trigonometric Methods

- toDegrees(double radian)
- toRadians(double degrees)
- sin(double a)
- cos(double a)
- tan(double a)
- acos(double a)
- asin(double a)
- atan(double a)

Exponent Methods

- exp(double a)
  - Returns e raised to the power of a.
- log(double a)
  - Returns the natural logarithm of a.
- log10(double a)
  - Returns the 10-based logarithm of a.
- pow(double a, double b)
  - Returns a raised to the power of b.
- sqrt(double a)
  - Returns the square root of a.

Rounding Methods

- double ceil(double x)
  - x rounded up to its nearest integer. This integer is returned as a double value.
- double floor(double x)
  - x is rounded down to its nearest integer. This integer is returned as a double value.
- double rint(double x)
  - x is rounded to its nearest integer. If x is equally close to two integers, the even one is returned as a double.
- int round(float x)
  - Return (int)Math.floor(x+0.5).
- long round(double x)
  - Return (long)Math.floor(x+0.5).

min, max, abs

- max(a, b)and min(a, b)
  - Returns the maximum or minimum of two parameters.
- abs(a)
  - Returns the absolute value of the parameter.
- random()
  - Returns a random double value in the range [0.0, 1.0).

The random Method

- Generates a random double value greater than or equal to 0.0 and less than 1.0 (0 <= Math.random() < 1.0)
- Have we use it before?

More Examples of the Random Method

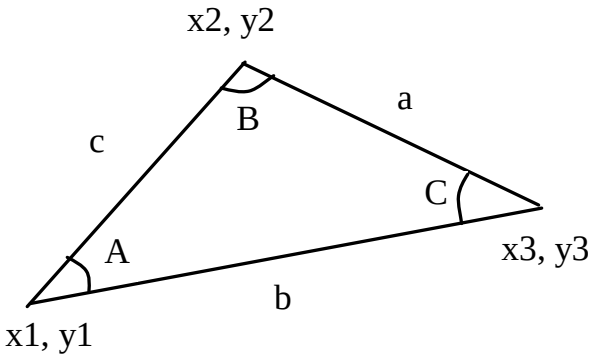
```
(int)(Math.random() * 10)
```
→ Returns a random integer between 0 and 9.

```
50 + (int)(Math.random() * 50)
```
→ Returns a random integer between 50 and 99.

```
a + Math.random() * b
```
→ Returns a random number between a and a + b, excluding a + b.

Problem. Computing Angles of a Triangle

- Write a program that prompts the user to enter the x- and y-coordinates of the three corner points in a triangle and then displays the triangle's angles.




```
A = acos((a * a - b * b - c * c) / (-2 * b * c))
B = acos((b * b - a * a - c * c) / (-2 * a * c))
C = acos((c * c - b * b - a * a) / (-2 * a * b))
```

Questions?