

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:
 - π
 - 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 ($0 \leq \text{Math.random()} < 1.0$)
- Have we use it before?

More Examples of the Random Method

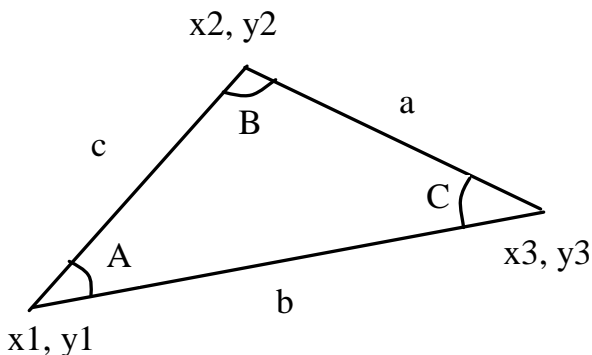
`(int)(Math.random() * 10)` → Returns a random integer between 0 and 9.

`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.



$$A = \arccos\left(\frac{a^2 - b^2 - c^2}{-2bc}\right)$$
$$B = \arccos\left(\frac{b^2 - a^2 - c^2}{-2ac}\right)$$
$$C = \arccos\left(\frac{c^2 - b^2 - a^2}{-2ab}\right)$$

Questions?