

Arithmetic in Java & the Math class

Assignment, Increment, and Decrement

- Assignment is not the same as mathematical equality:
`items = items + 1;`
- `items++`; **is the same as**
`items = items + 1;`
- `items--`; subtracts 1 from `items`

Arithmetic Operations

- `/` is the division operator
- If both arguments are integers, the result is an integer. The remainder is discarded
- `7.0 / 4` yields `1.75`
`7 / 4` yields `1`
- Get the remainder with `%` (pronounced "modulo")
`7 % 4` is `3`

The Math class

- Math class: contains methods like `sqrt` and `pow`
- To compute x^n , you write `Math.pow(x, n)`
- However, to compute x^2 it is significantly more efficient simply to compute `x * x`
- To take the square root of a number, use the `Math.sqrt`; for example, `Math.sqrt(x)`

The Math class

- In Java,

$$\frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

can be represented as

```
(-b + Math.sqrt(b * b - 4 * a * c)) / (2 * a)
```

Mathematical Methods in Java

<code>Math.sqrt(x)</code>	square root
<code>Math.pow(x, y)</code>	power x^y
<code>Math.exp(x)</code>	e^x
<code>Math.log(x)</code>	natural log
<code>Math.sin(x)</code> , <code>Math.cos(x)</code> , <code>Math.tan(x)</code>	sine, cosine, tangent (x in radian)
<code>Math.round(x)</code>	closest integer to x
<code>Math.min(x, y)</code> , <code>Math.max(x, y)</code>	minimum, maximum

Calling Static Methods

- A static method does not operate on an object

```
double x = 4;  
double root = x.sqrt(); // Error
```

- Static methods are defined inside classes
- Naming convention: Classes start with an uppercase letter; objects start with a lowercase letter

```
Math  
System.out
```

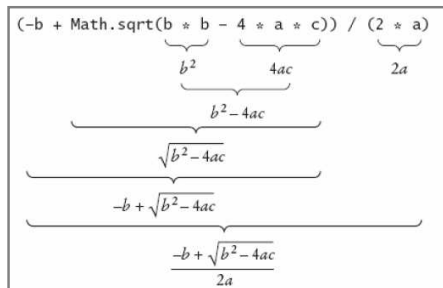
Syntax 4.3: Static Method Call

```
ClassName. methodName(parameters)
```

Example:
Math.sqrt(4)

Purpose:
To invoke a static method (a method that does not operate on an object) and supply its parameters

Analyzing an Expression

$$\frac{(-b + \text{Math.sqrt}(b * b - 4 * a * c))}{(2 * a)}$$


The diagram illustrates the step-by-step simplification of the quadratic formula expression. It starts with the full expression: $\frac{(-b + \text{Math.sqrt}(b * b - 4 * a * c))}{(2 * a)}$. Brackets are used to group parts of the expression: b^2 , $4ac$, and $2a$. Then, $b^2 - 4ac$ is grouped, followed by $\sqrt{b^2 - 4ac}$, and then $-b + \sqrt{b^2 - 4ac}$. Finally, the full fraction $\frac{-b + \sqrt{b^2 - 4ac}}{2a}$ is shown.

Figure 3:
Analyzing an Expression