Computer Science

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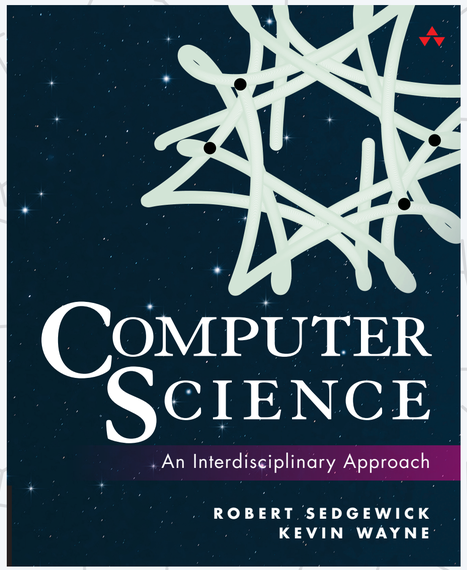

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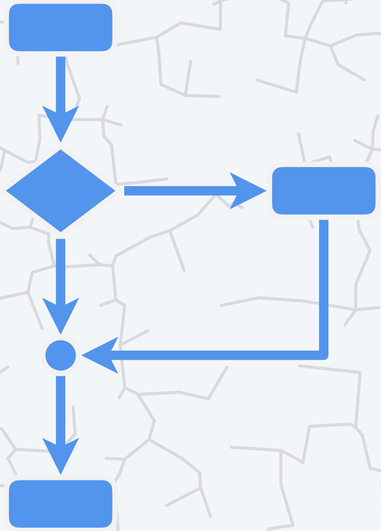
1.3 Conditionals

- *if statements*
- *if–else statements*
- *nested conditionals*
- *year-to-speech*



Basic building blocks for programming

```
System.out.print("Hello, ");
```

```
System.out.println("World");
```

```
System.out.println("Marcel");
```

this lecture: decision making

libraries

graphics, sound, and image I/O

arrays

conditionals | loops

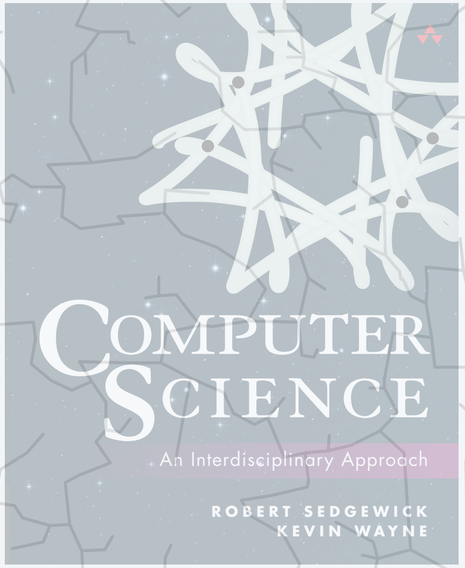
Math | **text I/O**

built-in data types | **assignment statements**

```
System.out.print("Hello, ");
```

```
System.out.println("World");
```

previous lecture: statements were execute one after the other



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1.3 CONDITIONALS

- *if statements*
- *if–else statements*
- *nested conditionals*
- *a note on access and accessibility*

The *if* statement

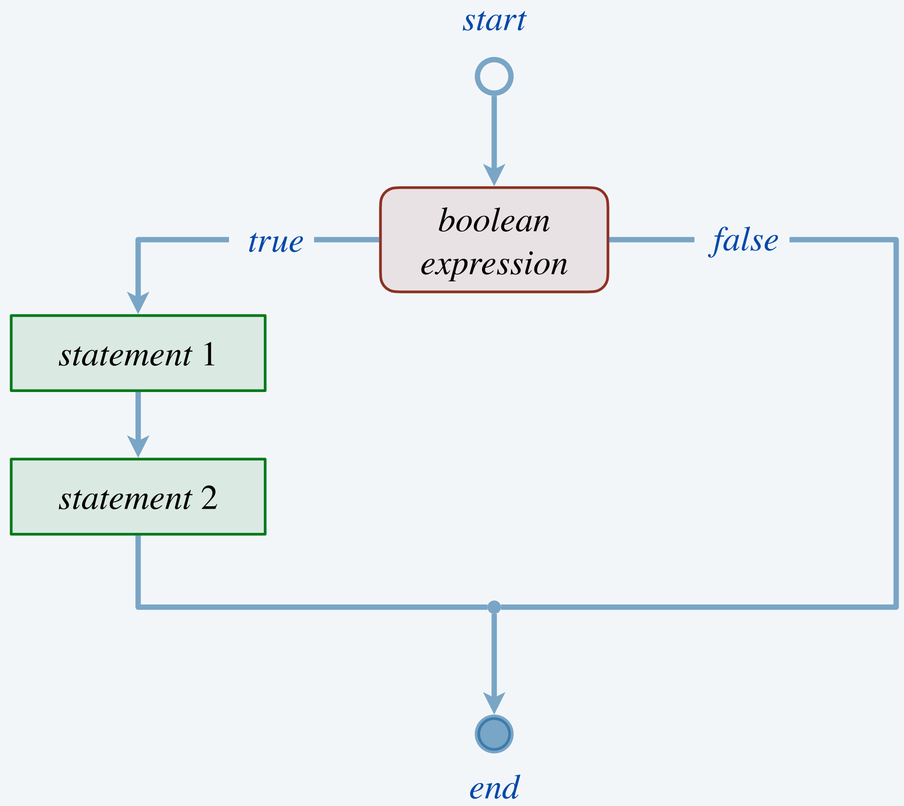
Execute certain statement(s) depending on the value of a boolean expression.

- Evaluate a boolean expression.
- If true, execute statements in code block delimited by curly braces.

age < 16
x == 0

```
if (<boolean expression>) {
   <statement 1>
   <statement 2>
}
```

if statement template



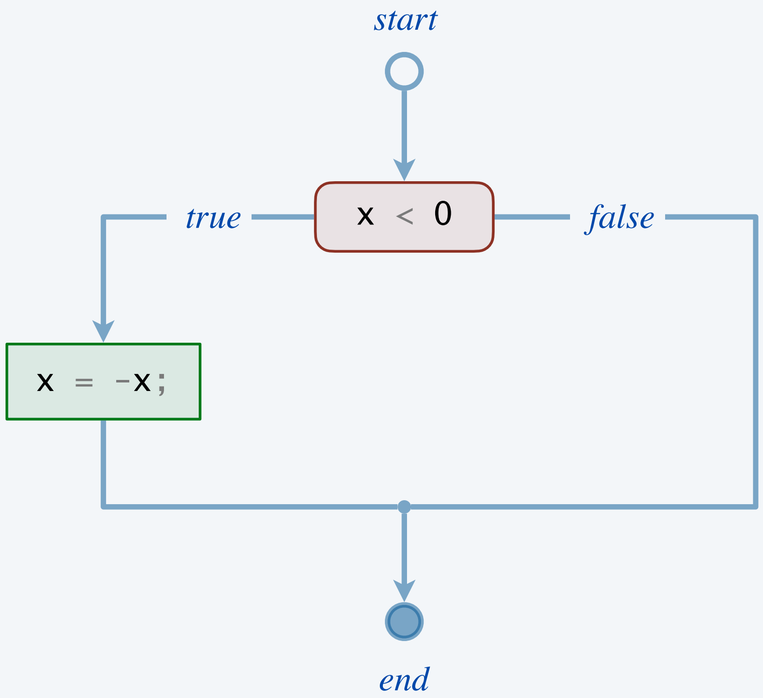
The *if* statement

Execute certain statement(s) depending on the value of a boolean expression.

- Evaluate a boolean expression.
- If true, execute statements in code block delimited by curly braces.

```
if (x < 0) {
   x = -x;
}
```

replaces x with the absolute value of x



More examples of *if* statements

Conditionals: quiz 1

What is the result of compiling and executing the following program?

A. 6

B. 12

C. *Program does not compile.*

D. *Run-time error.*

E. *None of the above.*

```
public class Mystery1 {
   public static void main(String[] args) {
      int a = 12;
      int b = 6;
      if (b < a) {
         int temp = a;
         a = b;
         b = temp;
      }
      System.out.println(temp);
   }
}
```

Conditionals: quiz 2

What does the following code fragment print?

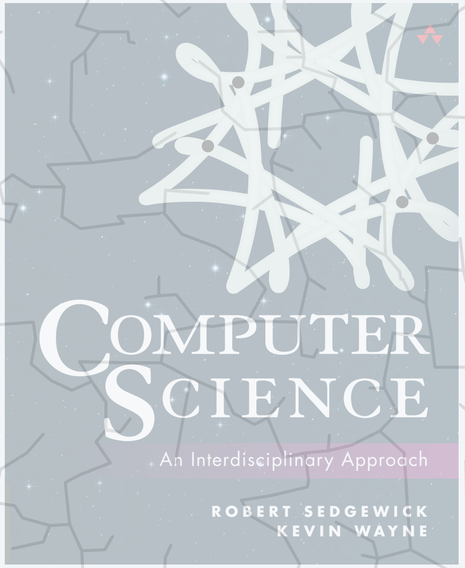
```
int x = -125;
if (x > 0); {
    System.out.println("positive");
};
```

A. `"positive"`

B. *nothing*

C. *compile-time error*

D. *run-time exception*



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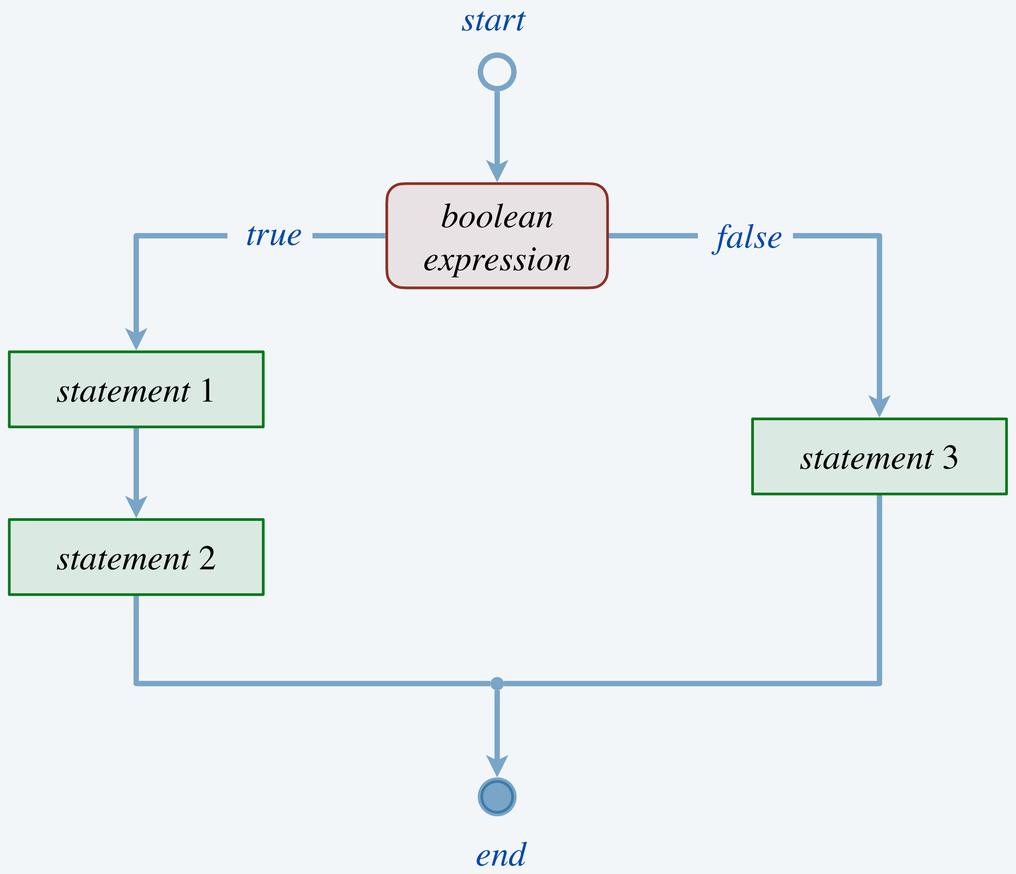
The *if-else* statement

Execute certain statements depending on the value of a boolean expression.

- Evaluate a boolean expression.
- If true, execute some statements.
- Otherwise, execute different statements. ← *the* `else` *clause*

```
if (<boolean expression>) {
   <statement 1>
   <statement 2>
}
else {
   <statement 3>
}
```

if-else statement template



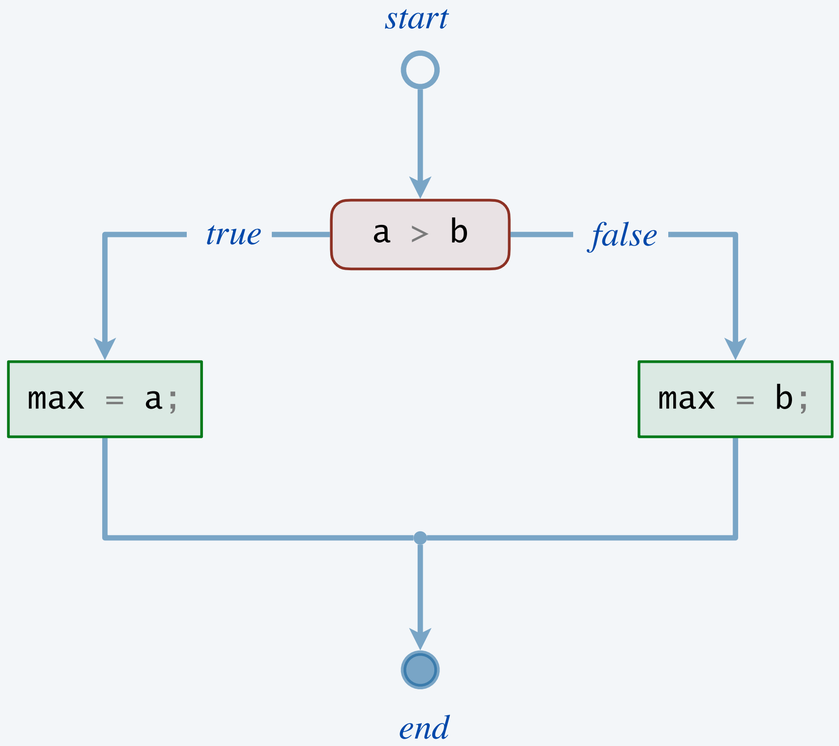
The *if-else* statement

Execute certain statements depending on the value of a boolean expression.

- Evaluate a boolean expression.
- If true, execute some statements.
- Otherwise, execute different statements. ← *the* `else` *clause*

```
int max;
if (a > b) {
   max = a;
}
else {
   max = b;
}
```

sets max to the maximum of a and b



More examples of *if-else* statements

Conditionals: quiz 2

What does the following code fragment print?

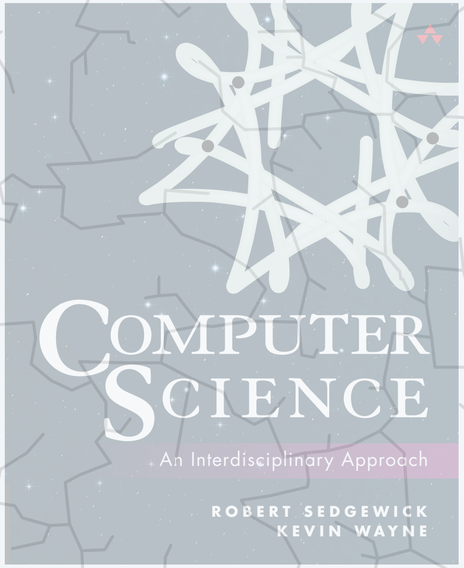
```
boolean a = false;
if (a = true) System.out.println("yes");
else          System.out.println("no");
```

A. "yes"

B. "no"

C. *compile-time error*

D. *run-time exception*



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1.3 CONDITIONALS

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Nesting conditionals: sign function

Sign function.

```
public class Sign {
   public static void main(String[] args) {
      double x = Double.parseDouble(args[0]);

      if (x == 0.0) {
         System.out.println(0.0);
      }
      else {
         if (x > 0.0) {
            System.out.println(1.0);
         }
         else {
            System.out.println(-1.0);
         }
      }
   }
}
```

$$sign(x) = \begin{cases} -1 & \text{if } x < 0 \\ 0 & \text{if } x = 0 \\ +1 & \text{if } x > 0 \end{cases}$$

`if-else` statement nested within the `else` clause of an `if` statement

```
~/cos126/conditionals> java Sign 0
0.0

~/cos126/conditionals> java Sign -89
-1.0
```

Multiway selection shorthand

Note. Curly braces not needed here since each body consists of a single statement.

```
public class Sign {
   public static void main(String[] args) {
      double x = Double.parseDouble(args[0]);
      double sign;

      if      (x == 0.0)  sign = 0.0;
      else if (x > 0.0)   sign = 1.0;
      else                sign = -1.0;

      System.out.println(sign);
   }
}
```

3 *mutually exclusive alternatives*

$$sign(x) = \begin{cases} -1 & \text{if } x < 0 \\ 0 & \text{if } x = 0 \\ +1 & \text{if } x > 0 \end{cases}$$

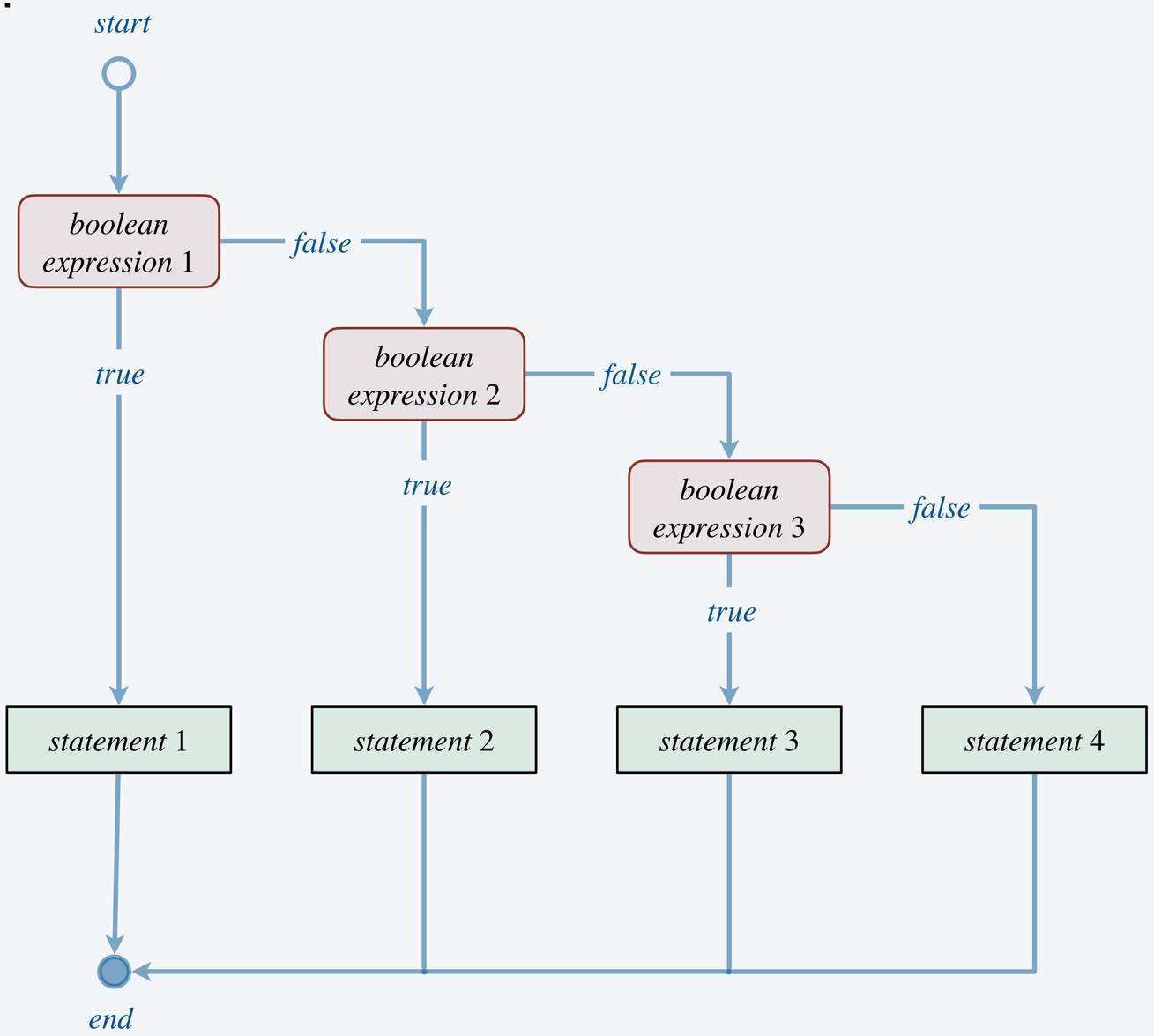
```
~/cos126/conditionals> java Sign 0
0.0

~/cos126/conditionals> java Sign -89
-1.0
```

A ladder of nested *if-else* statements

Multiway selection. Mutually exclusive alternatives.

```
if (<boolean expression 1>) {
   <statement 1>
}
else if (<boolean expression 2>) {
   <statement 2>
}
else if (<boolean expression 3>) {
   <statement 3>
}
else {
   <statement 4>
}
```

if-else ladder template



More examples of nested conditionals

Conditionals: quiz 4

What will the following code fragment print if r is 0.453125?

A. -1

B. 4

C. 5

D. 6

```
double r = 0.453125;
int roll = -1;
if (r < 0.125) roll = 1;
if (r < 0.250) roll = 2;
if (r < 0.375) roll = 3;
if (r < 0.500) roll = 4;
if (r < 0.625) roll = 5;
if (r < 1.000) roll = 6;
System.out.println(roll);
```

Nested *if* statements

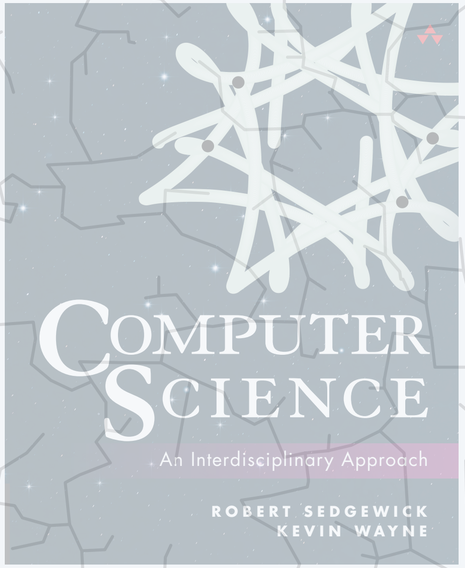
Design principle. Avoid unnecessary/gratuitous nesting of *if* statements.

```
if (r == 0) {
   if (g == 0) {
      if (b == 0) {
         System.out.println("black");
      }
   }
}
```

bad design (gratuitous nesting)

```
if (r == 0 && g == 0 && b == 0) {
   System.out.println("black");
}
```

easier to read and debug



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Barriers to Access and Accessibility

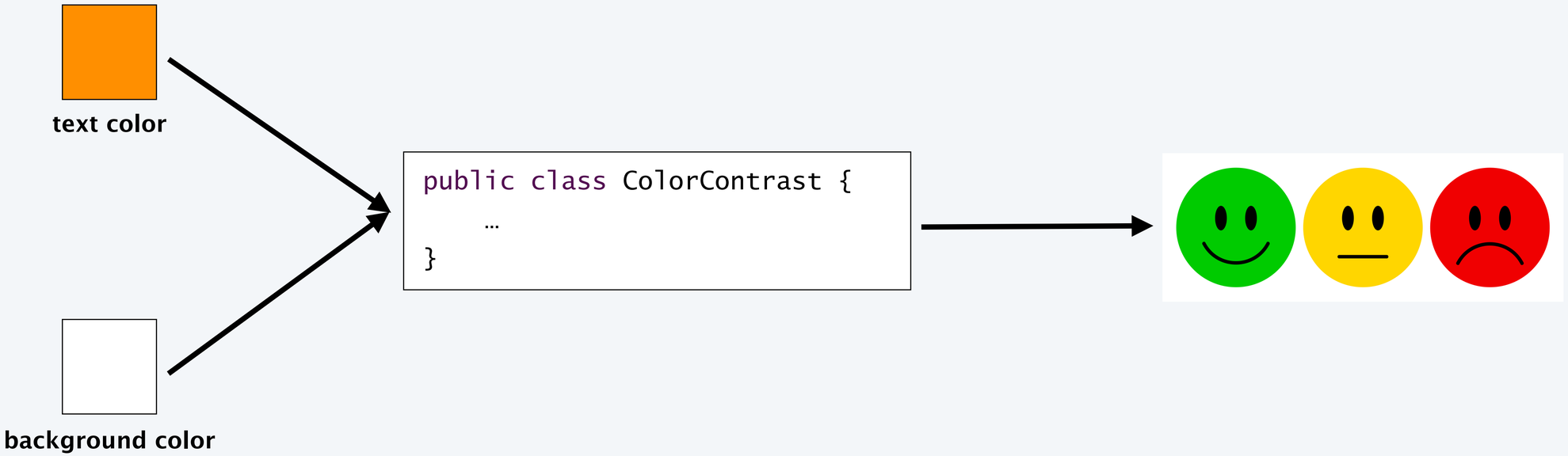
Barriers to Access. 25% of high school and college-aged youth worldwide cannot access the internet.

- Affordability
- Infrastructure
- Interest
- Communication

Barriers to Accessibility. Obstacles for people with a wider range of abilities. We will focus on web access.

- Technology barriers
- Communication
- Site Policy
- Inaccessible Media Formats

A note on your assignment




```
Hello World!
```

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