

Fork in the Code

if statements: one-way and two-way selection



Every line, every time?

PAUSE AND TRY

Shipping should be free on orders of \$50 or more. What is wrong here?

```
double total = 62.5;  
double shipping = 7.99;  
System.out.println("Shipping: " + shipping);
```

Talk with a partner. Which line needs to happen only sometimes? How could Java know when?

Every statement runs once, top to bottom. No matter the total.

By the end of class you can...

- 1 Explain how an if statement changes the top-to-bottom order statements run in.
- 2 Trace a one-way if and say whether its body runs for a given value.
- 3 Write a condition and a body correctly, with braces around a body of several statements.
- 4 Trace an if-else and explain why exactly one of its two bodies runs.
- 5 Choose between one-way and two-way selection, and trace separate if statements.

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PART 1

Skipping code: the one-way if

Run the body only when the condition is true

FREE SHIPPING

```
double total = 62.5;
double shipping = 7.99;
if (total >= 50) {
    shipping = 0.0;
}
System.out.println("Shipping: " + shipping);
```

OUTPUT

Shipping: 0.0

if (total >= 50)

The condition: a Boolean expression in parentheses.

{ shipping = 0.0; }

The body: runs only when the condition is true.

after the }

The rest of the program: runs either way.

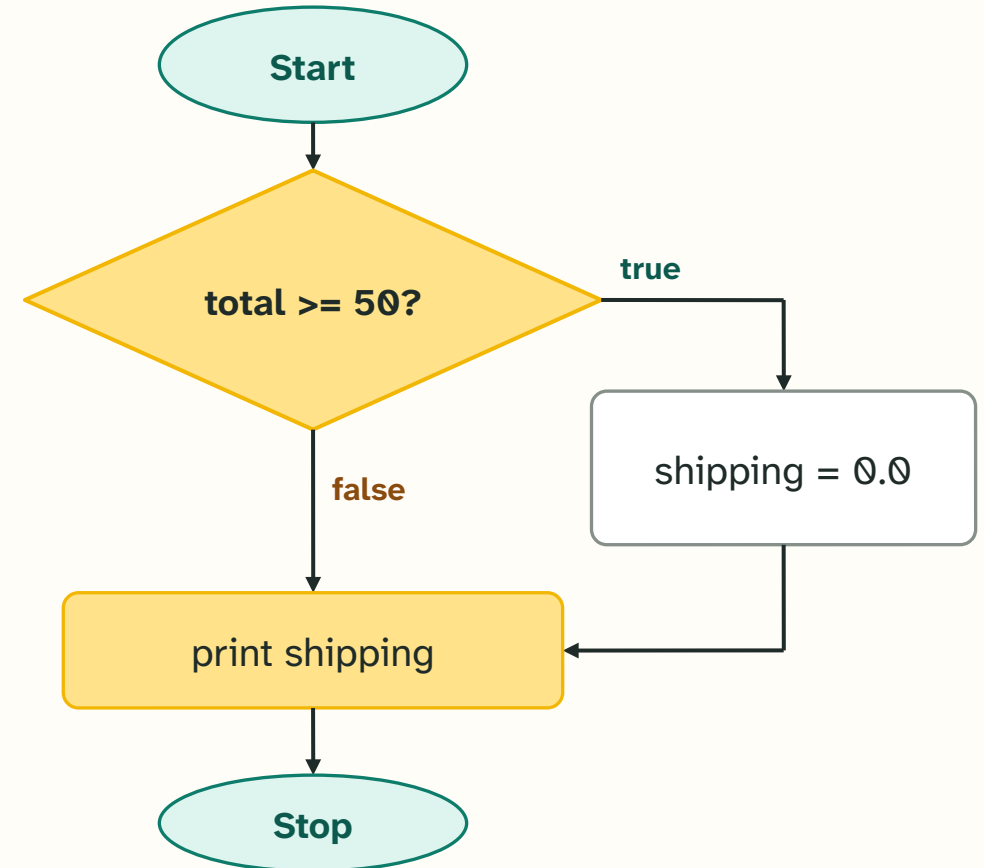
Flow of control: the order statements actually run in.

When the condition is false

```
double total = 30.0;
double shipping = 7.99;
if (total >= 50) {
    shipping = 0.0;
}
System.out.println("Shipping: " + shipping);
```

OUTPUT

Shipping: 7.99



A semicolon after the condition



`if (...);` ends the if statement right there. The braces after it **always run**, and Java won't warn you.

COMPILES, BUT WRONG

```
int battery = 80;  
if (battery < 20); {  
    System.out.println("Plug in now!");  
}  
System.out.println("Battery: " + battery);
```

OUTPUT

```
Plug in now!  
Battery: 80
```

Fix: delete the `;` so the braces are the body again.

A large, white, rounded square containing the number '2' in a bold, teal, sans-serif font.

2

PART 2

The condition and the body

The condition must be a boolean

THREE KINDS OF CONDITION

```
boolean raining = true;  
String day = "Sat";  
int score = 100;  
if (raining) {  
    System.out.println("Umbrella");  
}  
if (day.equals("Sat")) {  
    System.out.println("No school");  
}  
if (score == 100) {  
    System.out.println("Perfect");  
}
```

OUTPUT

```
Umbrella  
No school  
Perfect
```

```
if (score = 100) {
```

Does not compile

COMPILER SAYS

```
incompatible types: int  
cannot be converted to boolean
```

Indenting a line doesn't put it in the body



No braces? The body is **only the next statement**. Java ignores indentation.

NO BRACES

```
int lives = 3;  
if (lives == 0)  
    System.out.println("Game over");  
    System.out.println("Try again?");
```

OUTPUT

Try again?

BRACES

```
int lives = 3;  
if (lives == 0) {  
    System.out.println("Game over");  
    System.out.println("Try again?");  
}  
System.out.println("Lives: " + lives);
```

OUTPUT

Lives: 3

Step challenge

PAUSE AND TRY

What prints for each number of steps?

```
int points = 0;  
if (steps >= 10000) {  
    points += 50;  
}  
points += 5;  
System.out.println(points);
```

steps	Prints
12000	
10000	
9999	

A large, white, rounded square with a teal number '3' centered inside it.

3

PART 3

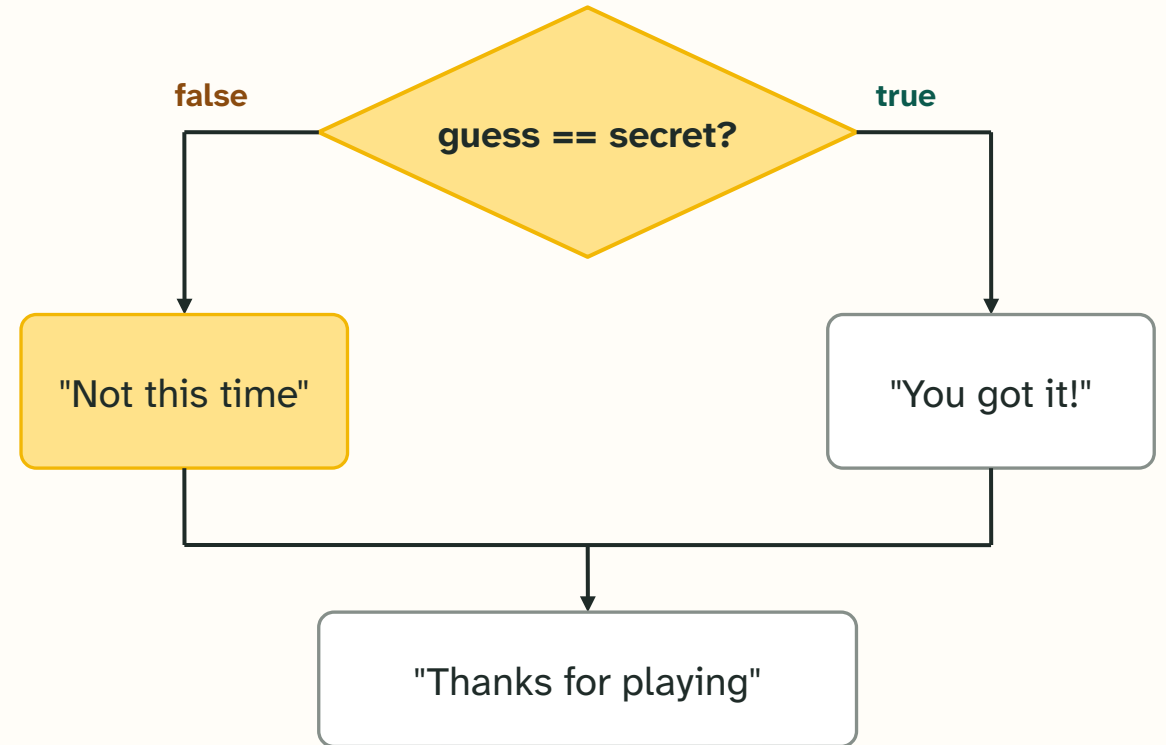
Two ways: if-else

if-else: exactly one body runs

```
int guess = 42;  
int secret = 37;  
if (guess == secret) {  
    System.out.println("You got it!");  
} else {  
    System.out.println("Not this time");  
}  
System.out.println("Thanks for playing");
```

OUTPUT

```
Not this time  
Thanks for playing
```



The paths join. One body ran.

The semicolon strikes again



An `else` must come **right after** the closing brace of an `if` body.

DOES NOT COMPILE

```
int guess = 42;
if (guess > 50); {
    System.out.println("Too high");
} else {
    System.out.println("Not too high");
}
```

COMPILER SAYS

```
error: 'else' without 'if'
```

Fix: delete the `;` after the condition.

Parking garage

PAUSE AND TRY

The first 2 hours are free. What prints for each value of hours?

```
int cost;  
if (hours <= 2) {  
    cost = 0;  
} else {  
    cost = hours * 3;  
}  
System.out.println(cost);
```

hours	Prints
1	
2	
5	

A large, bold, blue number '4' centered within a light blue rounded square.

4

PART 4

One-way or two-way?

Separate ifs are independent

TWO SEPARATE IFs

```
int score = 95;  
if (score >= 90) {  
    System.out.println("Honor roll");  
}  
if (score >= 70) {  
    System.out.println("Passing");  
}
```

OUTPUT

```
Honor roll  
Passing
```

ONE IF-ELSE

```
int score = 95;  
if (score >= 90) {  
    System.out.println("Honor roll");  
} else {  
    System.out.println("Passing");  
}
```

OUTPUT

```
Honor roll
```

A value on only one path



Java checks **every path**, including the one where a one-way if body is skipped.

DOES NOT COMPILE

```
int age = 16;
String ticket;
if (age >= 13) {
    ticket = "teen";
}
System.out.println(ticket);
```

COMPILER SAYS

```
variable ticket might not
have been initialized
```

FIXED: EVERY PATH SETS IT

```
int age = 16;
String ticket;
if (age >= 13) {
    ticket = "teen";
} else {
    ticket = "child";
}
System.out.println(ticket);
```

Does the shop open?

PAUSE AND TRY

Write the output of each version. Why are they different?

VERSION A

```
int coins = 8;
if (coins < 10) {
    coins += 5;
}
if (coins >= 10) {
    System.out.println("Shop open");
}
System.out.println(coins);
```

VERSION B

```
int coins = 8;
if (coins < 10) {
    coins += 5;
} else {
    System.out.println("Shop open");
}
System.out.println(coins);
```

Words to know

Selection statement

Changes the flow of control based on a Boolean expression.

Condition

The Boolean expression in parentheses after if.

Body

The statement or block an if or else controls.

Block

Statements between braces that run, or are skipped, together.

One-way selection

An if: its body runs only when the condition is true.

Two-way selection

An if-else: exactly one of its two bodies runs.

One way or two?



Explain to your partner when you would use an if-else instead of a plain if. Use an example from a game or app.

SENTENCE STARTER

A one-way if can _____ its body, but an if-else always runs exactly _____.

Next: the Fork in the Code puzzle worksheet.