

Variables 2
With slides from Chris Piech

Comparison Operators

Operator	Meaning	Example	Value
==	equals	$1 + 1 == 2$	true
!=	does not equal	$3.2 != 2.5$	true
<	less than	$10 < 5$	false
>	greater than	$10 > 5$	true
<=	less than or equal to	$126 <= 100$	false
>=	greater than or equal to	$5.0 >= 5.0$	true

* All have equal precedence



Comparison Operators

Sign of a number is particularly important for many mathematical operations.

Let's write a program that checks sign of a user specified value.

```
int num = readInt("Enter a number: ");  
if (num == 0) {  
    println("That number is 0");  
} else {  
    println("That number is not 0.");  
}
```

....could be positive or negative



If Else Revisited

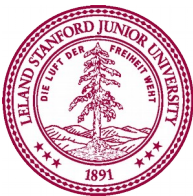
```
int num = readInt("Enter a number: ");
if (num == 0) {
    println("Your number is 0 ");
} else {
    if (num > 0) {
        println("Your number is positive");
    } else {
        println("Your number is negative");
    }
}
```

...becoming hard to read there is an alternative



Else If

```
int num = readInt("Enter a number: ");  
if (num == 0) {  
    println("Your number is 0 ");  
} else if (num > 0) {  
    println("Your number is positive");  
} else {  
    println("Your number is negative");  
}
```



Else If

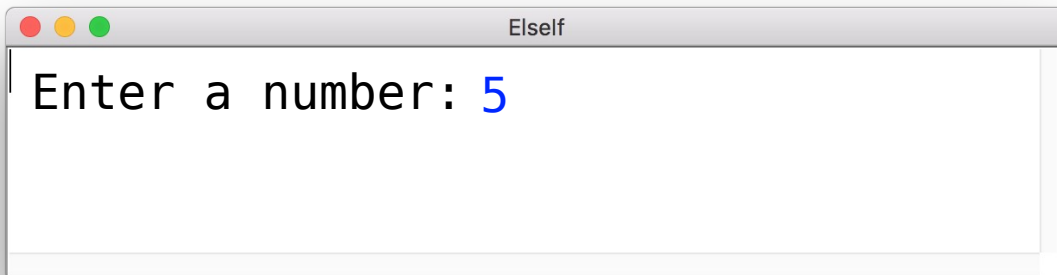
```
int num = readInt("Enter a number: ");  
if (num == 0) {  
    println("Your number is 0 ");  
} else if (num > 0) {  
    println("Your number is positive");  
} else {  
    println("Your number is negative");  
}
```



Else If

5

```
int num = readInt("Enter a number: ");  
if (num == 0) {  
    println("Your number is 0 ");  
} else if (num > 0) {  
    println("Your number is positive");  
} else {  
    println("Your number is negative");  
}
```



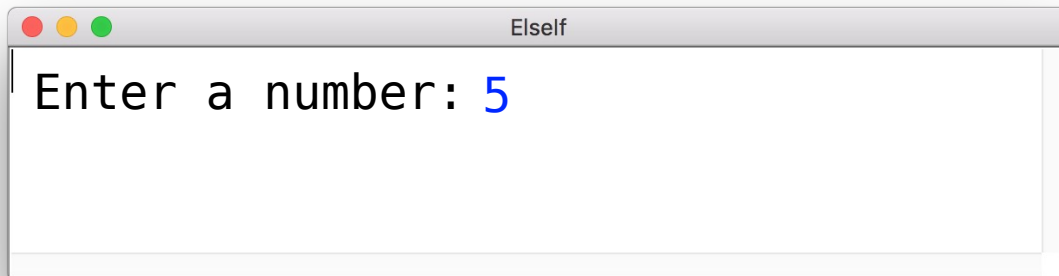
```
Elself  
Enter a number: 5
```



Else If

5

```
int num = readInt("Enter a number: ");  
if (num == 0) {  
    println("Your number is 0 ");  
} else if (num > 0) {  
    println("Your number is positive");  
} else {  
    println("Your number is negative");  
}
```



A terminal window titled "Elsif" with a white background and a grey border. It shows the prompt "Enter a number: 5" where the number 5 is highlighted in blue. The window has three colored dots (red, yellow, green) in the top-left corner.

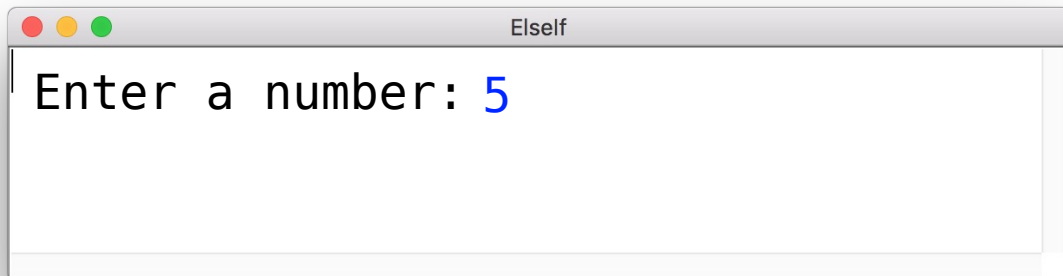
5

num



Else If

```
int num = readInt("Enter a number: ");  
if (num == 0) {  
    println("Your number is 0 ");  
} else if (num > 0) {  
    println("Your number is positive");  
} else {  
    println("Your number is negative");  
}
```



A terminal window titled "Elsif" with a white background and a grey border. The prompt "Enter a number: " is followed by the number "5" in blue text. The window has three colored dots (red, yellow, green) in the top-left corner.

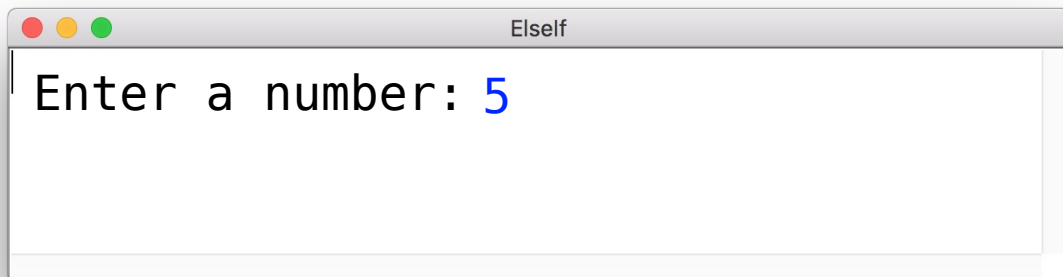
5

num



Else If

```
int num = readInt("Enter a number: ");
if (num == 0) {
    println("Your number is 0 ");
} else if (num > 0) {
    println("Your number is positive");
} else {
    println("Your number is negative");
}
```



A terminal window titled "Elsif" with a white background and a grey border. It shows the prompt "Enter a number: 5" where the number 5 is entered in blue text.

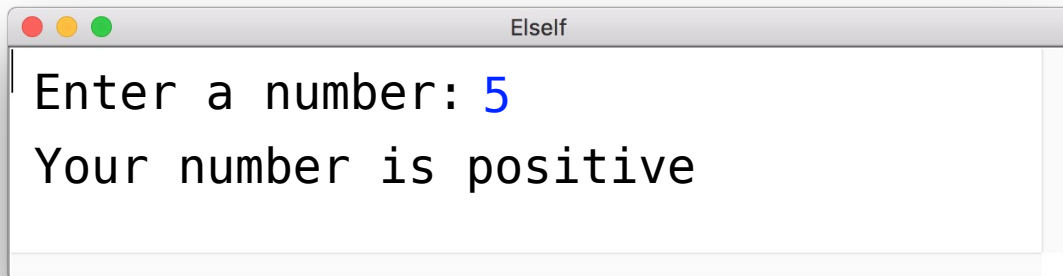
5

num



Else If

```
int num = readInt("Enter a number: ");
if (num == 0) {
    println("Your number is 0 ");
} else if (num > 0) {
    println("Your number is positive");
} else {
    println("Your number is negative");
}
```



A terminal window titled "Elsif" showing the execution of the code. The prompt "Enter a number:" is followed by the input "5". The output is "Your number is positive".

```
Elsif
Enter a number: 5
Your number is positive
```

5

num



Else If

```
int num = readInt("Enter a number: ");  
if (num == 0) {  
    println("Your number is 0 ");  
} else if (num > 0) {  
    println("Your number is positive");  
} else {  
    println("Your number is negative");  
}
```



```
Elsif  
Enter a number: 5  
Your number is positive
```

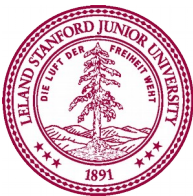
5

num



How about checking ranges?

```
int cost = readInt("How much does this book cost?");
if(cost < 0) {
    println("Are you joking?");
}else if(cost == 0){
    println("Hey, thanks for the gift!");
}else {
    ...
    ...      0 < cost <= 20 : very cheap
    ...      20 < cost <=50: cheap
    ...      50 < cost <= 75: fair
    ...      75 < cost <= 100: expensive
    ...
    ...
}
```



Logical Operators

Cannot "chain" tests ; use logical operators

```
// assume cost = 60
```

```
// wrong
```

```
20 < cost <= 50  
true <= 10
```

```
// correct version
```

```
20 < cost && cost <= 50  
true && false
```

Operator	Description	Example	Result
!	not	!(2 == 3)	true
&&	and	(2 == 3) && (-1 < 5)	false
	or	(2 == 3) (-1 < 5)	true



CSBridge Game Show



CSBridge Game Show

```
GameShow
Welcome to the CSBridge Game Show!
Chose door 1, 2 or 3 and win a prize.
Be careful. If the program crashes, no
prize for you.
-----
choose a door: 2
You win: [REDACTED] TL
|
```


CSBridge Game Show

```
int door = readInt("Door: ");

// while the input is invalid
while(door < 1 || door > 3) {
    // tell the user the input was invalid
    println("Invalid door!");
    // ask for a new input
    door = readInt("Door: ");
}
println("You chose door " + door);
...
```

CSBridge Game Show

```
// door logic
int prize = 3;
if(door == 1) {
    prize = 2 + 9 / 10 * 100;
} else if(door == 2) {
    boolean locked = prize % 2 != 1;

    if(!locked) {
        prize += 7;
    }

} else {
    prize++;
}

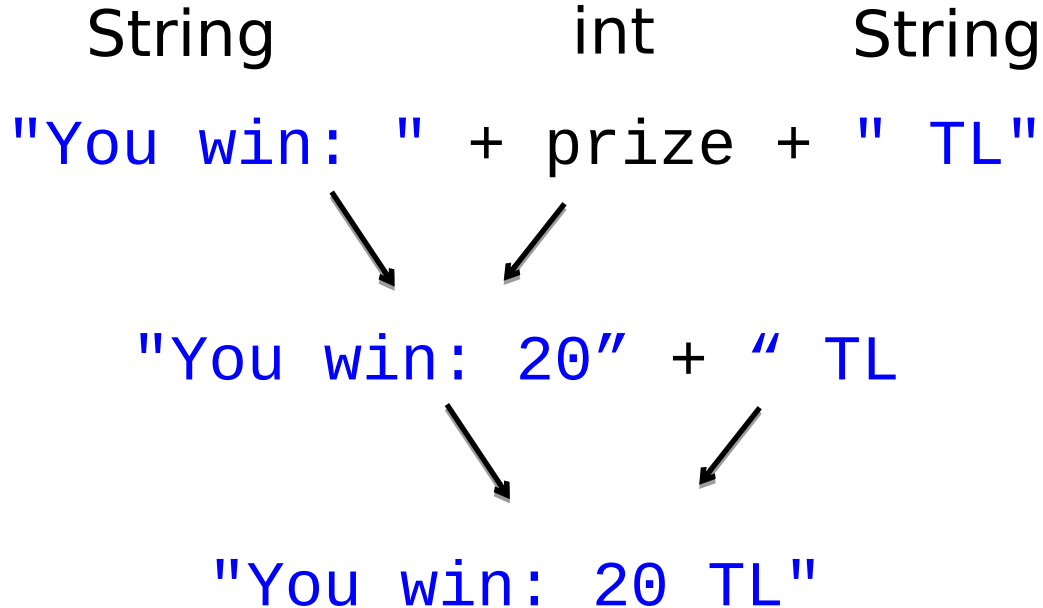
println("You win $" + prize);
```

String Concatenation

```
println("You win: " + prize + " TL");
```

prize

20



Variables in loops

“i” in for loop is a real variable, we can print it, we can use it

```
for(int i = 0; i < 10 ; i++) {  
    println(i);  
}  
println("Last value of i = " + i );
```

i cannot be resolved to a variable

0
1
2
3
4
5
6
7
8
9



Variables in loops

```
int i;  
for(i = 0; i < 10 ; i++) {  
    println(i);  
}  
  
println("Last value of i = " + i );
```

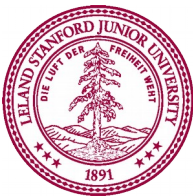
```
0  
1  
2  
3  
4  
5  
6  
7  
8  
9  
Last value of i = 10
```



Variables in loops

```
int i = 0;
while(i < 10) {
    println(i);
    i++;
}
println("Last value of i = " + i );
```

```
0
1
2
3
4
5
6
7
8
9
Last value of i = 10
```



Number Combinations

How to write a code to produce a combination of numbers?

```
for(int i = 0; i < 4; i++){  
    for(int j = 0; j < 4; j++) {  
        println(" (" + i + " , " + j + " ) ");  
    }  
}
```

Good ! Now I know how to produce many numbers in order.

How about creating random numbers, for example dice experiments: (1,4),(6,6), etc.

(0,0)
(0,1)
(0,2)
(0,3)
(1,0)
(1,1)
(1,2)
(1,3)
(2,0)
(2,1)
(2,2)
(2,3)
(3,0)
(3,1)
(3,2)
(3,3)



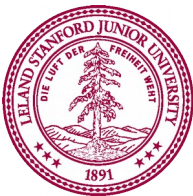
Random numbers

```
public class RandomNumbers extends ConsoleProgram {  
    // A random number generator  
    private RandomGenerator rg = new RandomGenerator();  
  
    public void run() {  
  
        int example = rg.nextInt(0, 10);  
        println(example);  
  
    }  
}
```

Help me print 100 random digits

Help me roll 100 dice

Help me roll 100 dice pairs



Time for a riddle :)

**I have a factory that runs with 100 people.
Some people get paid 500 units/month, some
100 units/month, and some 5 units/month.
I pay 10000 units/month to my workers.**

How many of the 100 receive 5 units/month?

Could you help me with a Java program?



Receipt Program

```
public class Receipt extends ConsoleProgram {
    public void run() {
        double subtotal = readDouble("Meal cost?");
        double tax = subtotal * 0.18;
        double total = subtotal + tax;

        println("Tax : $" + tax);
        println("Total: $" + total);
    }
}
```



A Better Receipt Program

```
public class Receipt extends ConsoleProgram {  
    private static final double TAX_RATE = 0.18;  
  
    public void run() {  
        double subtotal = readDouble("Meal cost? $");  
        double tax = subtotal * TAX_RATE;  
        double total = subtotal + tax;  
  
        println("Tax : $" + tax);  
        println("Total: $" + total);  
    }  
}
```

