

Boolean and if

Boolean , if, and
Comparison Operators

Lecture Contents

- The `boolean` type
- Comparison Operators
- Operator Precedence
- The `if` statement
- The `if...else` statement

The boolean Type

- The boolean type can take only two values, namely:
 - true
 - false
- Declaration of a boolean variable follows the same format as `int` and `double`:

```
boolean myBool = true;
```

Operator Types

✓ <i>Arithmetic</i>		+	-	*	/	%
✓ <i>Assignment</i>	=	+=	-=	*=	/=	%=
✓ <i>Increment</i>		++	--			
→ <i>Comparison</i>	!=	==	>	>=	<	<=
<i>Logical</i>	!			&&		
<i>Bitwise</i>	~			&		^
	~=	=		&=		^=

Comparison operators return either true or false.

As a general rule, only use ***comparison operators*** with ***primitive types*** (int, double, boolean)

Comparison Operators

Symbol	Name
==	equal to
!=	not equal to
>	greater than
>=	greater than or equal to
<	less than
<=	less than or equal to

Operator Precedence

Level	Description	Operators	Associativity
16	parentheses	()	Left-to-right
15	post inc/dec	++, --	Left-to-right
13	cast	()	Right-to-Left
12	multiplicative	*, /, %	Left-to-right
11	additive	+, -	Left-to-right
9	relational	>, >=, <, <=	Left-to-right
8	equality	==, !=	Left-to-right
1	assignment	=, +=, -= *=, /=, %=	Right-to-Left

Comparison Operators

```
int myInt = 6;  
boolean myBool = myInt >= 5;  
System.out.println("myBool = " + myBool);
```

Comparison Operators

```
int myInt = 6;  
boolean myBool = myInt >= 5;  
System.out.println("myBool = " + myBool);
```

```
myBool = true
```

Comparison Operators

```
int myInt = 6;  
boolean myBool = myInt <= 5;  
System.out.println("myBool = " + myBool);
```

Comparison Operators

```
int myInt = 6;  
boolean myBool = myInt <= 5;  
System.out.println("myBool = " + myBool);
```

```
myBool = false
```

Comparison Operators

```
int myInt = 6;  
boolean myBool = myInt == 6.0;  
System.out.println("myBool = " + myBool);
```

Comparison Operators

```
int myInt = 6;  
boolean myBool = myInt == 6.0;  
System.out.println("myBool = " + myBool);
```

```
myBool = true
```

The `if` Statement

```
public static void main(String args[]) {  
    int x = 5  
    System.out.println("Starting Program...");  
    if(x == 5) {  
        System.out.println("Hello World!");  
    }  
    System.out.println("Finished Program!");  
}
```

The `if` Statement

```
public static void main(String args[]) {  
    int x = 5  
    System.out.println("Starting Program...");  
    if(x == 5) { if(true) {  
        System.out.println("Hello World!");  
    }  
    System.out.println("Finished Program!");  
}
```

The `if` Statement

```
public static void main(String args[]) {  
    int x = 5  
    System.out.println("Starting Program...");  
    if(x == 5) { if(true) {  
        System.out.println("Hello World!");  
    }  
    System.out.println("Finished Program!");  
}
```

```
Starting Program...  
Hello World!  
Finished Program!
```

The `if` Statement

```
public static void main(String args[]) {  
    int x = 5  
    System.out.println("Starting Program...");  
    if(x > 5) {  
        System.out.println("Hello World!");  
    }  
    System.out.println("Finished Program!");  
}
```

The `if` Statement

```
public static void main(String args[]) {  
    int x = 5  
    System.out.println("Starting Program...");  
    if(x > 5) { if(false) {  
        System.out.println("Hello World!");  
    }  
    System.out.println("Finished Program!");  
}
```

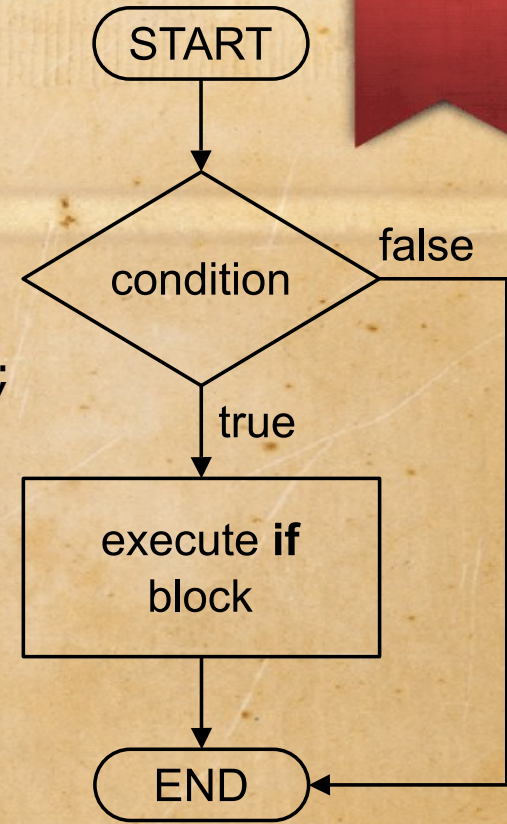
The `if` Statement

```
public static void main(String args[]) {  
    int x = 5  
    System.out.println("Starting Program...");  
    if(x > 5) { if(false) {  
        System.out.println("Hello World!");  
    }  
    System.out.println("Finished Program!");  
}
```

```
Starting Program...  
Finished Program!
```

The `if` Statement

```
public static void main(String args[]) {  
    int x = 5  
    System.out.println("Starting Program...");  
    if(x > 5) { if(false) {  
        System.out.println("Hello World!");  
    }  
    System.out.println("Finished Program!");  
}
```

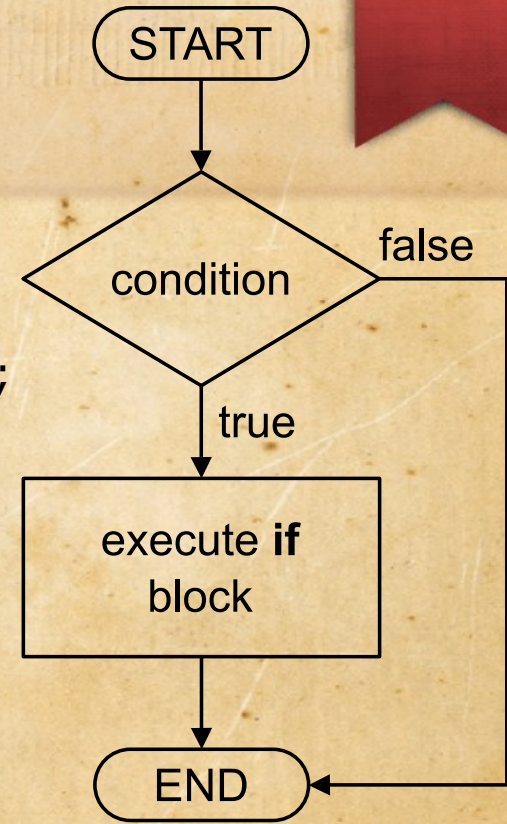


Starting Program...
Finished Program!

The `if` Statement

```
public static void main(String args[]) {  
    int x = 5  
    System.out.println("Starting Program...");  
    if(x > 5) { if(false) {  
        System.out.println("Hello World!");  
    }  
    System.out.println("Finished Program!");  
}
```

Note: a ***condition*** is an expression that evaluates to either **true** or **false**.



Starting Program...
Finished Program!

The `if...else...` Statement

```
public static void main(String args[]) {  
    System.out.println("Starting Program...");  
    if(false) {  
        System.out.println("Hello World!");  
    } else {  
        System.out.println("Goodbye cruel world...");  
    }  
    System.out.println("Finished Program!");  
}
```

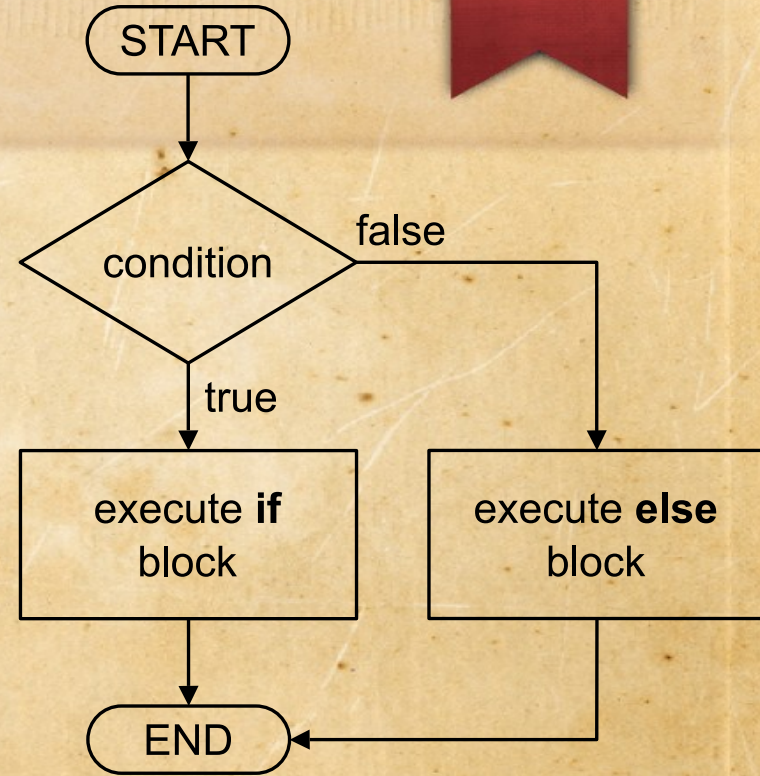
The `if...else...` Statement

```
public static void main(String args[]) {  
    System.out.println("Starting Program...");  
    if(false) {  
        System.out.println("Hello World!");  
    } else {  
        System.out.println("Goodbye cruel world...");  
    }  
    System.out.println("Finished Program!");  
}
```

Starting Program...
Goodbye cruel world...
Finished Program!

The `if...else...` Statement

```
public static void main(String args[]) {  
    System.out.println("Starting Program...");  
    if(false) {  
        System.out.println("Hello World!");  
    } else {  
        System.out.println("Goodbye cruel world...");  
    }  
    System.out.println("Finished Program!");  
}
```

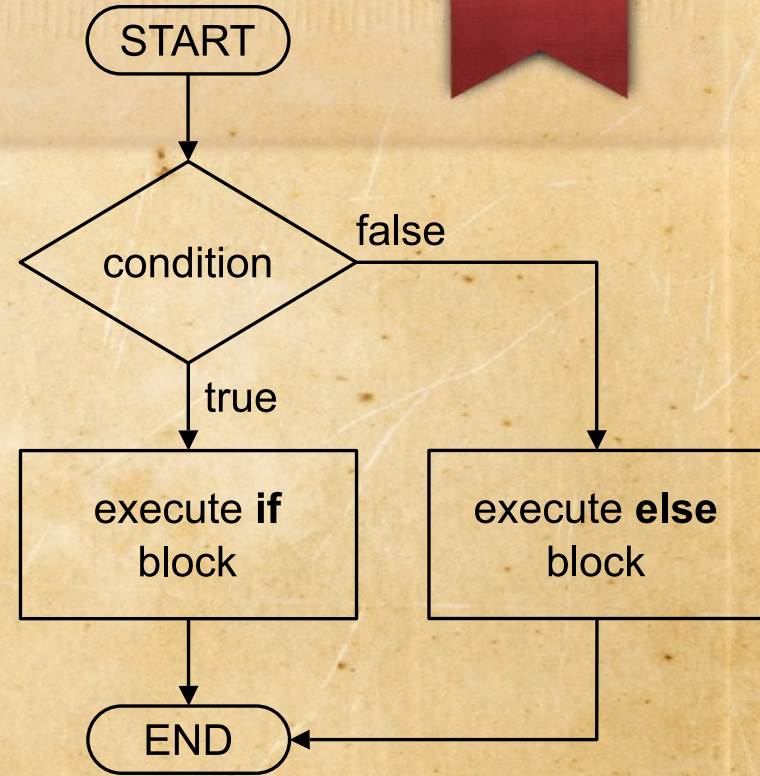


Starting Program...
Goodbye cruel world...
Finished Program!

The `if...else...` Statement

```
public static void main(String args[]) {  
    System.out.println("Starting Program...");  
    if(false) {  
        System.out.println("Hello World!");  
    } else {  
        System.out.println("Goodbye cruel world...");  
    }  
    System.out.println("Finished Program!");  
}
```

Note: a ***condition*** is an expression that evaluates to either **true** or **false**.



Starting Program...
Goodbye cruel world...
Finished Program!

Operator Types

✓ <i>Arithmetic</i>		+	-	*	/	%
✓ <i>Assignment</i>	=	+=	-=	*=	/=	%=
✓ <i>Increment</i>		++	--			
→ <i>Comparison</i>	!=	==	>	>=	<	<=
<i>Logical</i>	!			&&		
<i>Bitwise</i>	~			&		^
	~=	=		&=		^=

Comparison operators return either true or false.

Comparison Operators

Symbol	Name
==	equal to
!=	not equal to
>	greater than
>=	greater than or equal to
<	less than
<=	less than or equal to

Comparison Operators

```
public static void main(String args[]) {  
    System.out.println("Starting Program...");  
    if (5 == 5.0) {  
        System.out.println("Hello World!");  
    }else {  
        System.out.println("Goodbye cruel world...");  
    }  
    System.out.println("Finished Program!");  
}
```

Comparison Operators

```
public static void main(String args[]) {  
    System.out.println("Starting Program...");  
    if (5 == 5.0) {  
        System.out.println("Hello World!");  
    }else {  
        System.out.println("Goodbye cruel world...");  
    }  
    System.out.println("Finished Program!");  
}
```

```
Starting Program...  
Hello World!  
Finished Program!
```

Comparison Operators

```
public static void main(String args[]) {  
    System.out.println("Starting Program...");  
    if (5 == "5") {  
        System.out.println("Hello World!");  
    }else {  
        System.out.println("Goodbye cruel world...");  
    }  
    System.out.println("Finished Program!");  
}
```

Comparison Operators

```
public static void main(String args[]) {  
    System.out.println("Starting Program...");  
    if (5 == "5") {  
        System.out.println("Hello World!");  
    }else {  
        System.out.println("Goodbye cruel world...");  
    }  
    System.out.println("Finished Program!");  
}
```

ERROR:

Incompatible operand types int and String

Comparison Operators

```
public static void main(String args[]) {  
    System.out.println("Starting Program...");  
    if (65 == 'A') {  
        System.out.println("Hello World!");  
    }else {  
        System.out.println("Goodbye cruel world...");  
    }  
    System.out.println("Finished Program!");  
}
```

Comparison Operators

```
public static void main(String args[]) {  
    System.out.println("Starting Program...");  
    if (65 == 'A') {  
        System.out.println("Hello World!");  
    }else {  
        System.out.println("Goodbye cruel world...");  
    }  
    System.out.println("Finished Program!");  
}
```

```
Starting Program...  
Hello World!  
Finished Program!
```

Comparison Operators – Strings

```
public static void main(String args[]) {  
    if ("Hello" == "Hello") {  
        System.out.println("Hello == Hello");  
    }  
}
```

Comparison Operators – Strings

```
public static void main(String args[]) {  
    if ("Hello" == "Hello") {  
        System.out.println("Hello == Hello");  
    }  
}
```

Hello == Hello

Comparison Operators – Strings

```
public static void main(String args[]) {  
    String s = "Hell";  
    s += "o";  
    System.out.println("s == " + s);  
    if (s == "Hello") {  
        System.out.println("Confirmed. s == Hello");  
    } else {  
        System.out.println("What?! s != Hello");  
    }  
}
```

Comparison Operators – Strings

```
public static void main(String args[]) {  
    String s = "Hell";  
    s += "o";  
    System.out.println("s == " + s);  
    if (s == "Hello") {  
        System.out.println("Confirmed. s == Hello");  
    } else {  
        System.out.println("What?! s != Hello");  
    }  
}
```

```
s == Hello  
What?! s != Hello
```

Comparison Operators – Strings

```
public static void main(String args[]) {  
    String s = "Hell";  
    s += "o";  
    System.out.println("s == " + s);  
    if (s == "Hello") {  
        System.out.println("Confirmed. s == Hello");  
    } else {  
        System.out.println("What?! s != Hello");  
    }  
}
```

Note: to be safe simply do **NOT**
compare the values stored
in objects using the equality
operator! (==)

```
s == Hello  
What?! s != Hello
```

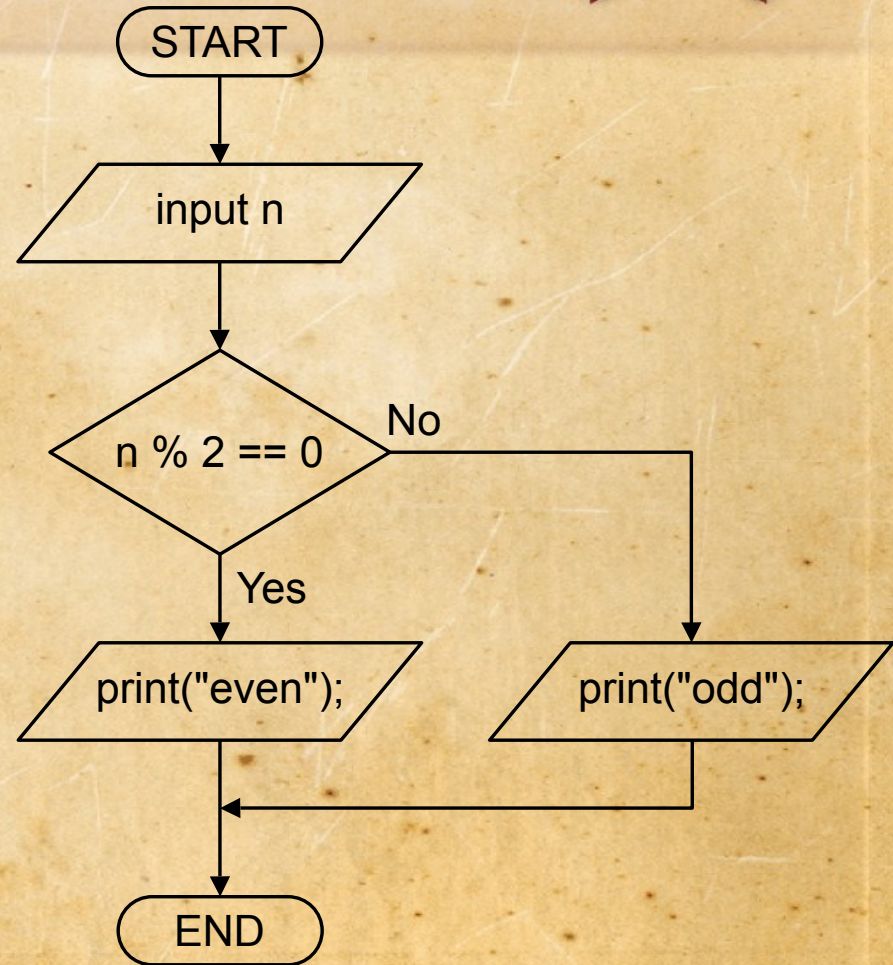
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Exercise

```
public static void main(String[] args) {  
    evenOrOdd(5);  
    evenOrOdd(26);  
}  
  
public static void evenOrOdd(int n) {  
    /* WRITE YOUR CODE HERE */  
}
```

5 is odd.
26 is even.



Boolean and if

Boolean , if, and
Comparison Operators