



# Decision Statements

aka If Statements

# Decision Statements

- Are a form of **control** statements
- They control which code is run at which times
- In java, the most common form is an **if** structure.

## An If Statement

```
int lvl = IO.readInt ("Level? ");
```

```
if (lvl >= 2)
```

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

## An If Statement

```
int lvl = IO.inputInt ("Level? ");
```

```
if (lvl >= 2)
```

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

Keyword for an if...



## An If Statement

```
int lvl = IO.inputInt ("Level? ");
```

```
if (lvl >= 2)
```

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

Boolean  
Expression  
If true, the  
statement runs.

Keyword for an if...

## An If Statement

```
int lvl = IO.inputInt ("Level? ");
```

```
if (lvl >= 2)
```

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

Boolean  
Expression  
If true, the  
statement runs.

Code to run if true

Keyword for an if...

# An If Statement

```
int lvl = IO.readInt("Level? ");
```

No semi-  
colon!

```
if (lvl >= 2)
```

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

Boolean  
Expression  
If true, the  
statement runs.

Code to run if true

Keyword for an if...

## An If/Else Statement

```
int lvl = IO.readInt ("Level? ");
```

```
if (lvl >= 2)
```

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

```
else
```

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

Default = else.

If not the first one, then run this one.

## An If/Else Statement

```
int lvl = IO.readInt ("Level? ");  
  
if (lvl >= 2)  
    System.out.println ("Pass");  
else  
    System.out.println ("Fail");
```

lvl	Printed?
7	

## An If/Else Statement

```
int lvl = IO.readInt ("Level? ");  
  
if (lvl >= 2)  
    System.out.println ("Pass");  
else  
    System.out.println ("Fail");
```

lvl	Printed?
7	Pass
1	

## An If/Else Statement

```
int lvl = IO.readInt ("Level? ");  
  
if (lvl >= 2)  
    System.out.println ("Pass");  
else  
    System.out.println ("Fail");
```

lvl	Printed?
7	Pass
1	Fail
2	

## An If/Else Statement

```
int lvl = IO.readInt ("Level? ");  
  
if (lvl >= 2)  
    System.out.println ("Pass");  
else  
    System.out.println ("Fail");
```

lvl	Printed?
7	Pass
1	Fail
2	Pass
-3	

## An If/Else Statement

```
int lvl = IO.readInt ("Level? ");  
  
if (lvl >= 2)  
    System.out.println ("Pass");  
else  
    System.out.println ("Fail");
```

lvl	Printed?
7	Pass
1	Fail
2	Pass
-3	Fail
81	

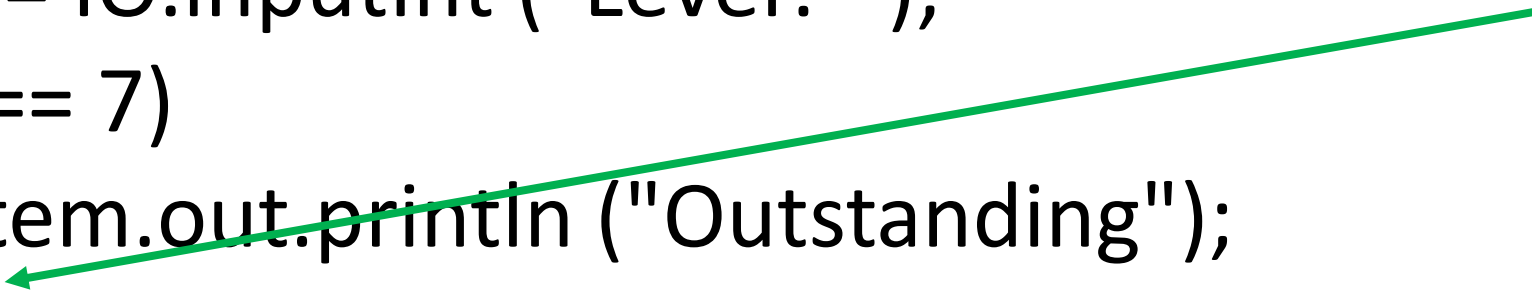
## An If/Else Statement

```
int lvl = IO.readInt ("Level? ");  
  
if (lvl >= 2)  
    System.out.println ("Pass");  
else  
    System.out.println ("Fail");
```

lvl	Printed?
7	Pass
1	Fail
2	Pass
-3	Fail
81	Pass

## If/Else if/Else

```
int lvl = IO.inputInt ("Level? ");  
if (lvl == 7)  
    System.out.println ("Outstanding");  
else if (lvl >= 5)  
    System.out.println ("Great work!");  
else if (lvl >= 3)  
    System.out.println ("Satisfactory");  
else  
    System.out.println ("Come for extra help");
```



In an if/else if structure, the **FIRST** true statement is run and then it skips to the end.

Nothing else is run once one is true.









## If/Else if/Else

```
int lvl = IO.readInt ("Level? ");  
if (lvl == 7)  
    System.out.println ("Outstanding");  
else if (lvl >= 5)  
    System.out.println ("Great work!");  
else if (lvl >= 3)  
    System.out.println ("Satisfactory");  
else  
    System.out.println ("Come for extra help");
```

lvl	Printed?
7	Outstanding
6	Great Work!
5	Great Work!
4	Satisfactory
3	

## If/Else if/Else

```
int lvl = IO.readInt ("Level? ");  
if (lvl == 7)  
    System.out.println ("Outstanding");  
else if (lvl >= 5)  
    System.out.println ("Great work!");  
else if (lvl >= 3)  
    System.out.println ("Satisfactory");  
else  
    System.out.println ("Come for extra help");
```

lvl	Printed?
7	Outstanding
6	Great Work!
5	Great Work!
4	Satisfactory
3	Satisfactory
2	

## If/Else if/Else

```
int lvl = IO.readInt ("Level? ");  
if (lvl == 7)  
    System.out.println ("Outstanding");  
else if (lvl >= 5)  
    System.out.println ("Great work!");  
else if (lvl >= 3)  
    System.out.println ("Satisfactory");  
else  
    System.out.println ("Come for extra help");
```

lvl	Printed?
7	Outstanding
6	Great Work!
5	Great Work!
4	Satisfactory
3	Satisfactory
2	Come for extra help
-45	

## If/Else if/Else

```
int lvl = IO.readInt ("Level? ");  
if (lvl == 7)  
    System.out.println ("Outstanding");  
else if (lvl >= 5)  
    System.out.println ("Great work!");  
else if (lvl >= 3)  
    System.out.println ("Satisfactory");  
else  
    System.out.println ("Come for extra help");
```

lvl	Printed?
7	Outstanding
6	Great Work!
5	Great Work!
4	Satisfactory
3	Satisfactory
2	Come for extra help
-45	Come for extra help
90	

## If/Else if/Else

```
int lvl = IO.readInt ("Level? ");
```

```
if (lvl == 7) ❌
```

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

```
else if (lvl >= 5)
```

```
    System.out.println ("Great work!");
```

```
else if (lvl >= 3)
```

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

```
else
```

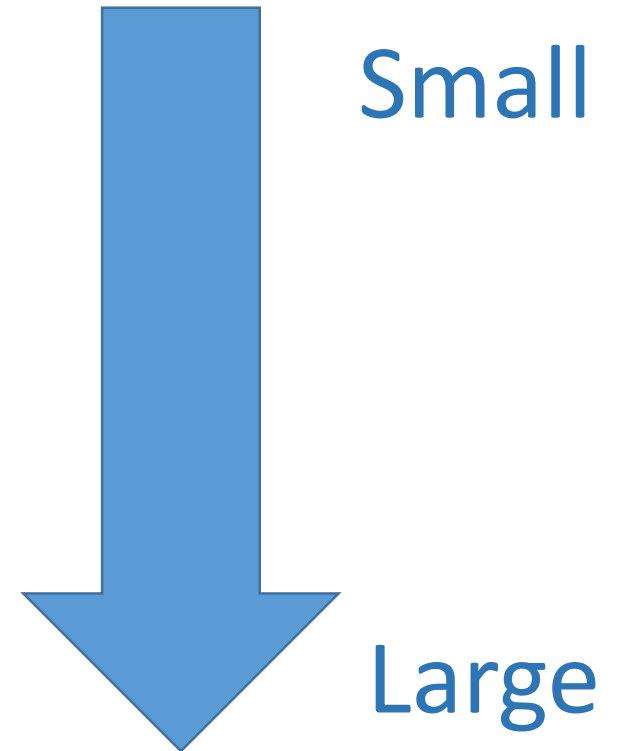
```
    System.out.println ("Come for extra help");
```

lvl	Printed?
7	Outstanding
6	Great Work!
5	Great Work!
4	Satisfactory
3	Satisfactory
2	Come for extra help
-45	Come for extra help
90	Great Work!

```
public class levels {
    public static void main(String args[]) {
        new levels();
    }
    public levels() {
        int n = IO.readInt("Number? ");
        if(n<2)
            System.out.println("Tiny");
        else if(n<6)
            System.out.println("Medium");
        else if(n<8)
            System.out.println("Large");
        else if(n<4)
            System.out.println("Small");
        else
            System.out.println("Giant");
    }
}
```

Order the if clauses.  
Either smallest to largest or vice versa.

```
public class levels {
    public static void main(String args[]) {
        new levels();
    }
    public levels() {
        int n = IO.inputInt("Number? ");
        if(n<2)
            System.out.println("Tiny");
        else if(n<4)
            System.out.println("Small");
        else if(n<6)
            System.out.println("Medium");
        else if(n<8)
            System.out.println("Large");
        else
            System.out.println("Giant");
    }
}
```



```
int lvl = IO.readInt ("Level? ");
if (lvl == 7)
{
    System.out.println ("Outstanding");
    System.out.println ("Top level in class");
}
else if (lvl >= 5)
    System.out.println ("Great work!");
else if (lvl >= 3)
    System.out.println ("Satisfactory");
else
{
    System.out.println ("Come for extra help");
    System.out.println ("Review study techniques.");
}
```

## Multi-line Ifs

Multi-line ifs require  
{ } to set up a region  
of code.

```
public class Magic8 {
    public static void main (String args[]) {
        new Magic8();
    }
    public Magic8() {
        String question = IO.inputString("Ask the Magic 8 Ball: ");
        int n = (int)(Math.random()*8)+1;
        if(n==1)
            System.out.println("All signs point to yes");
        else if(n==2)
            System.out.println("Sadly, no");
        else if(n==3)
            System.out.println("Without a doubt");
        else
            System.out.println("It is certain");
    }
}
```







## Tracing

```
int x = IO.readInt ("X? ");  
if (x == 6)  
    System.out.println ("turtle");  
else if (x > 4)  
    System.out.println ("fish");  
else if (x > 2)  
    System.out.println ("snail");  
else  
    System.out.println ("pineapple");
```

x	Printed?
6	turtle
5	fish
7	fish
3	

## Tracing

```
int x = IO.readInt ("X? ");  
if (x == 6)  
    System.out.println ("turtle");  
else if (x > 4)  
    System.out.println ("fish");  
else if (x > 2)  
    System.out.println ("snail");  
else  
    System.out.println ("pineapple");
```

x	Printed?
6	turtle
5	fish
7	fish
3	snail
4	

## Tracing

```
int x = IO.readInt ("X? ");
if (x == 6)
    System.out.println ("turtle");
else if (x > 4)
    System.out.println ("fish");
else if (x > 2)
    System.out.println ("snail");
else
    System.out.println ("pineapple");
```

x	Printed?
6	turtle
5	fish
7	fish
3	snail
4	snail
2	

## Tracing

```
int x = IO.readInt ("X? ");
if (x == 6)
    System.out.println ("turtle");
else if (x > 4)
    System.out.println ("fish");
else if (x > 2)
    System.out.println ("snail");
else
    System.out.println ("pineapple");
```

x	Printed?
6	turtle
5	fish
7	fish
3	snail
4	snail
2	pineapple
-1	

## Tracing

```
int x = IO.readInt ("X? ");  
if (x == 6)  
    System.out.println ("turtle");  
else if (x > 4)  
    System.out.println ("fish");  
else if (x > 2)  
    System.out.println ("snail");  
else  
    System.out.println ("pineapple");
```

x	Printed?
6	turtle
5	fish
7	fish
3	snail
4	snail
2	pineapple
-1	pineapple
90	

## Tracing

```
int x = IO.readInt ("X? ");  
if (x == 6)  
    System.out.println ("turtle");  
else if (x > 4)  
    System.out.println ("fish");  
else if (x > 2)  
    System.out.println ("snail");  
else  
    System.out.println ("pineapple");
```

x	Printed?
6	turtle
5	fish
7	fish
3	snail
4	snail
2	pineapple
-1	pineapple
90	fish













## Tracing

```
int y = IO.readInt ("Y? ");  
if (y >= 8)  
    System.out.print ("A");  
else if (y <= 15)  
    System.out.print ("B");  
if (y >= 10)  
    System.out.print ("C");  
else if (y >= 5)  
    System.out.print ("D");  
else  
    System.out.print ("E");
```

y	Printed?
9	AD
8	AD
16	AC
15	AC
10	AC
5	

## Tracing

```
int y = IO.readInt ("Y? ");
if (y >= 8)
    System.out.print ("A");
else if (y <= 15)
    System.out.print ("B");
if (y >= 10)
    System.out.print ("C");
else if (y >= 5)
    System.out.print ("D");
else
    System.out.print ("E");
```

y	Printed?
9	AD
8	AD
16	AC
15	AC
10	AC
5	BD
2	

## Tracing

```
int y = IO.readInt ("Y? ");
if (y >= 8)
    System.out.print ("A");
else if (y <= 15)
    System.out.print ("B");
if (y >= 10)
    System.out.print ("C");
else if (y >= 5)
    System.out.print ("D");
else
    System.out.print ("E");
```

y	Printed?
9	AD
8	AD
16	AC
15	AC
10	AC
5	BD
2	BE
90	

## Tracing

```
int y = IO.readInt ("Y? ");
if (y >= 8)
    System.out.print ("A");
else if (y <= 15)
    System.out.print ("B");
if (y >= 10)
    System.out.print ("C");
else if (y >= 5)
    System.out.print ("D");
else
    System.out.print ("E");
```

y	Printed?
9	AD
8	AD
16	AC
15	AC
10	AC
5	BD
2	BE
90	AC
-3	

## Tracing

```
int y = IO.readInt ("Y? ");
if (y >= 8)
    System.out.print ("A");
else if (y <= 15)
    System.out.print ("B");
if (y >= 10)
    System.out.print ("C");
else if (y >= 5)
    System.out.print ("D");
else
    System.out.print ("E");
```

y	Printed?
9	AD
8	AD
16	AC
15	AC
10	AC
5	BD
2	BE
90	AC
-3	BE

# If Statements

- Decision statements
- Useful to do something like determine a winner: if one score is larger than the other, the first player wins.
- Controlled by Boolean Expressions.
- The first Boolean Expression that is true is the clause that runs.
- Once one clause is run, it skips to the end of the if. The others aren't even tested.

## If Statements Syntax

- First clause must be an if
- The last clause can be an else. This means it is a the default. It does not need a Boolean expression.
- The middle clauses are else ifs
- There is no semi-colon after the Boolean expression
- When the clause has more than one line of code inside it, then it needs to have { } around it.