A+ Computer Science

PARAMETERS

What is a reference?

References

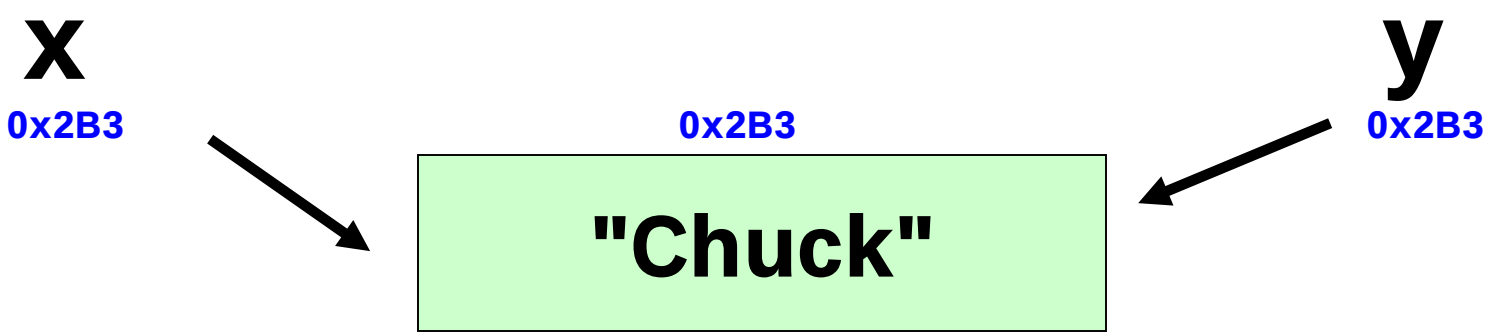
In Java, any variable that refers to an Object is a reference variable.

The variable stores the memory address of the actual Object.

References

```
String x = new String("Chuck");
String y = x;
```

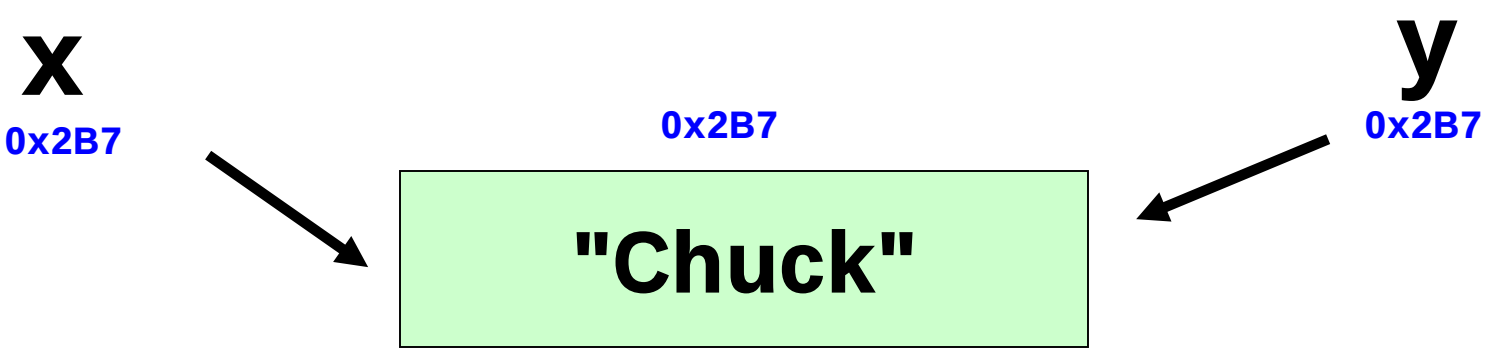
x and y store the same memory address.



References

```
String x = "Chuck";
String y = "Chuck";
```

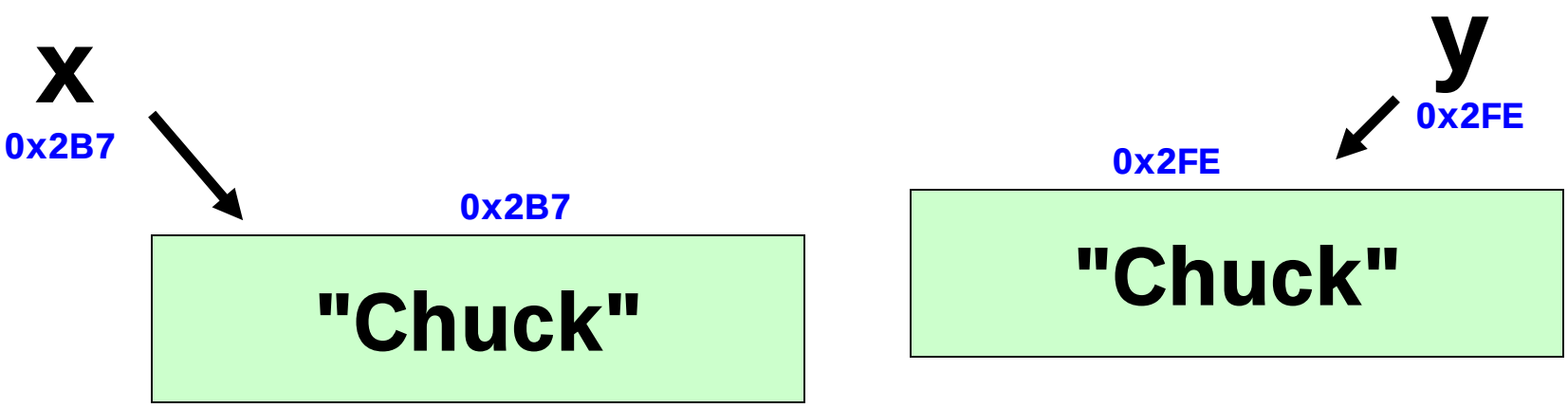
x and y store the same memory address.



References

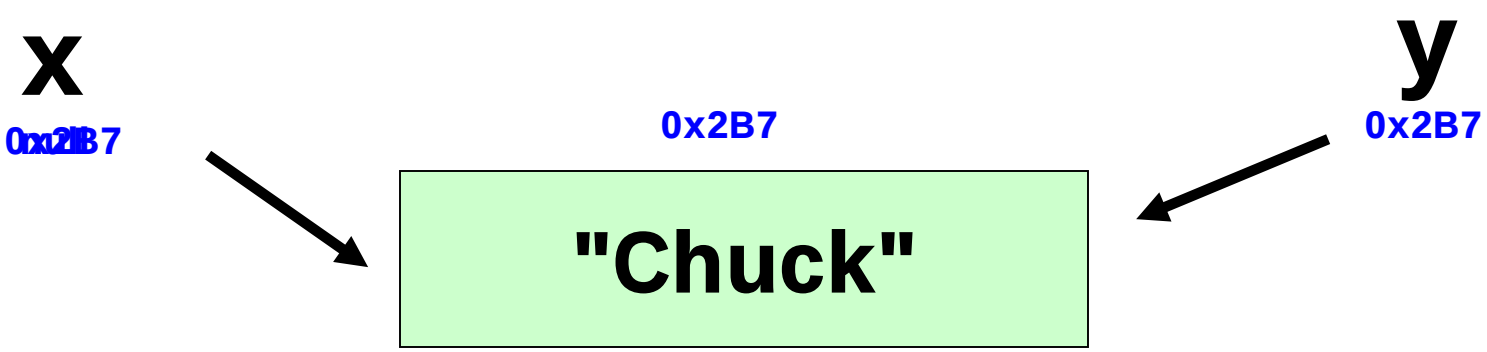
```
String x = new String("Chuck");
String y = new String("Chuck");
```

x and y store different memory addresses.



References

```
String x = "Chuck";
String y = "Chuck";
x = null;
```



references.java

What is a parameter?

Parameters

A parameter/argument is a channel used to pass information to a method. Parameters provide important information for methods.

```
window.setColor( Color.red );
```

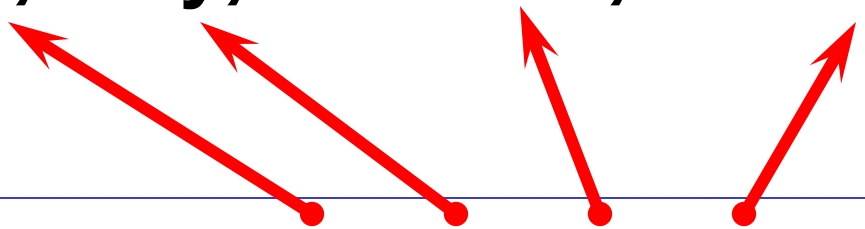
Parameters

A parameter / argument is a channel used to pass information to a method. setColor() is a method of the Graphics class the receives a Color.

void setColor(Color theColor)

Parameters

void fillRect (int x, int y, int width, int height)

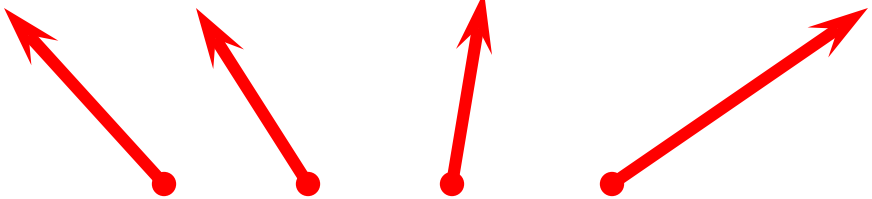


window.fillRect(10, 50, 30, 70);

method call with parameters

Parameters

```
void fillRect(int x, int y, int width, int height)
```



```
window.fillRect( 10, 50, 30, 70 );
```

The call to fillRect would draw a rectangle at position 10,50 with a width of 30 and a height of 70.

Passing by Value

Java passes all parameters by VALUE.

Primitives are passed as values by VALUE.

References are passed as addresses by VALUE.

Passing by Value

Passing by value simply means that a copy of the original is being sent to the method.

Passing by Value

If you are sending in a primitive, then a copy of that primitive is sent.

If you are sending in a reference or memory address, then a copy of that memory address is sent.

Passing by Value

```
public static void swap( int x, int y){
    int t = x;
    x = y;
    y = t;
    out.println(x + " " + y);
}

//test code
int one=5, two=7;
out.println(one + " " + two);
swap(one,two);
out.println(one + " " + two);
```

OUTPUT

```
5 7
7 5
5 7
```

Passing by Value

```
public static void swap( int x, int y)
{
   int t = x;
   x = y;
   y = t;
}
```

This attempted swap has local effect, but does not affect the original variables. Copies of the original variable values were passed to method swap.

Passing by Value

```
public static void swap(Integer x, Integer y){
   Integer t=x;
   x=y;
   y=t;
   out.println(x + " " + y);
}

//test code
Integer one=8, two=9;
out.println(one + " " + two);
swap(one,two);
out.println(one + " " + two);
```

OUTPUT

```
8 9
9 8
8 9
```

Passing by Value

```
public static void swap( Integer x, Integer y )
{
   Integer t=x;
   x=y;
   y=t;
}
```

This attempted swap has local effect, but does not affect the original variables. Copies of the original references were passed to method swap.

passbyvalueone.java

Passing by Value

```
public static void changeOne(int[] ray)
{
  ray[0] = 0;
  ray[1] = 1;
}
```

OUTPUT

```
[5, 4, 3, 2, 1]
[0, 1, 3, 2, 1]
```

```
//test code
int[] nums = {5,4,3,2,1};
out.println(Arrays.toString(nums));
changeOne(nums);
out.println(Arrays.toString(nums));
```

Passing by Value

```
public static void changeOne(int[] ray)
{
  ray[0] = 0;
  ray[1] = 1;
}
```

Changing the values inside the array referred to by ray is a lasting change.
A copy of the original reference was passed to method changeOne, but that reference was never modified.

Passing by Value

```
public static void changeTwo(int[] ray)
{
  ray = new int[5];
  ray[0]=2;
  out.println(Arrays.toString(ray));
}

//test code
int[] nums = {5,4,3,2,1};
changeTwo(nums);
out.println(Arrays.toString(nums));
```

OUTPUT

```
[2, 0, 0, 0, 0]
[5, 4, 3, 2, 1]
```

Passing by Value

```
public static void changeTwo(int[] ray)
{
  ray = new int[5];
  ray[0]=2;
}
```

Referring ray to a new array has local effect, but does not affect the original reference.
A copy of the original reference was passed to method changeTwo.

passbyvaluetwo.java

Passing by Value

```
class A{
  private String x;
  public A( String val ){
    x = val;
  }
  public void change( ){
    x = "x was changed";
  }
  public String toString(){
     return x;
  }
}

class B{
  public void mystery(A one, A two) {
    one = two;
    two.change();
  }
}

//test code in the main in another class
B test = new B();
A one = new A("stuff");
A two = new A("something");
System.out.println(one + " " + two);
test.mystery(one,two);
System.out.println(one + " " + two);
```

OUTPUT

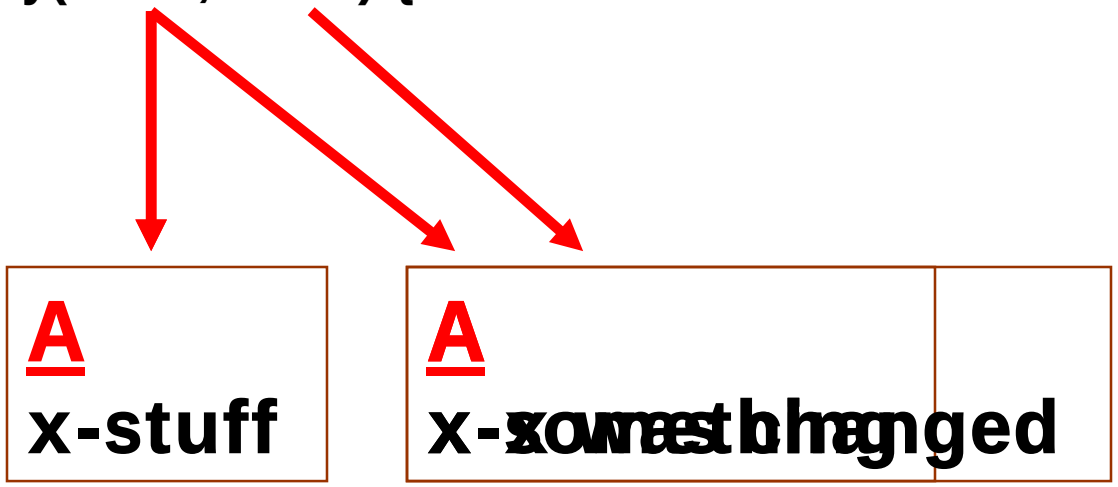
stuff something

stuff x was changed

Passing by Value

```
class A{
   private String x;
   public A( String val ){
     x = val;
   }
   public void change( ){
     x = "x was changed";
   }
   public String toString(){
      return x;
   }
}

class B{
   public void mystery(A one, A two) {
     one = two;
     two.change();
   }
}
```



Passing by Value

```
class A{
  private String x;
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    x = val;
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    x = "x was changed";
  }
  public String toString(){
     return x;
  }
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class B{
  public void mystery(A one, A two) {
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//test code in the main in another class
B test = new B();
A one = new A("stuff");
A two = new A("something");
System.out.println(one + " " + two);
test.mystery(one,two);
System.out.println(one + " " + two);
```

mystery() is passed the address of one and the address of two.

two's address is copied to one. This copy has local effect.

two.change() changes the value in the A referred to by two. This change effects the entire program.

passbyvaluethree.java

Work on Programs!

Crank

Some Code!

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