

Datatypes and Wrapper Class



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Announcements

TODO Reminders:

Readings are due **before** lecture

- Reading 8 (zybooks) – you should have already done that ☺
- Lab 05
- Reading 9 (zyBooks) – you should have already done that ☺
- Lab 06
- Reading 10 (zybooks)
- Keep practicing your RPAs in a spaced and mixed manner ☺



Recall Activity - Attendance

What is a wrapper class?

Explain using your own words and providing examples.

Binary

Binary – two state system

- 1 for on
- 0 for off

Bit

- Each 0 and 1 is called a bit
- 8 bits is called a byte
- Contains 255 states ($128+64+32+16+8+4+2+1$)

Binary

- Every bit is a exponential of 2
 - 1 + 2 + 4 + 8, etc

Take

1001

$$= 2^3 * 1 + 2^2 * 0 + 2^1 * 0 + 2^0 * 1$$

$$= 8 + 0 + 0 + 1$$

$$= 9$$

Binary

```
public class BinaryToDecimal {  
    public static int convertBinaryToDecimal(String binaryString){  
        int dec = Integer.parseInt(binaryString, 2);  
        return dec;  
    }  
    public static void main(String args[]){  
        int answer = convertBinaryToDecimal("110");  
        System.out.println(answer);  
        System.out.println(Integer.toBinaryString(answer));  
        answer = convertBinaryToDecimal("1001");  
        System.out.println(answer);  
        System.out.println(Integer.toBinaryString(answer));  
    }  
}
```

Numeric data types

Declaration	Size	Supported number range
byte myVar;	8 bits	-128 to 127
short myVar;	16 bits	-32,768 to 32,767
int myVar;	32 bits	-2,147,483,648 to 2,147,483,647
long myVar;	64 bits	-9,223,372,036,854,775,808 to 9,223,372,036,854,775,807

Declaration	Size	Supported number range
float x;	32 bits	-3.4×10^{38} to 3.4×10^{38}
double x;	64 bits	-1.7×10^{308} to 1.7×10^{308}

Casting:

This is also why an int will automatically convert to a double, but a double can't convert to an int without explicit casting - possible loss of information!

Numeric data types – Formatting to Hexadecimal

```
public class FormatHexadecimal {  
    public static void main(String args[]){  
        short red = 127;  
        short green = 135;  
        short blue = 255;  
        String htmlCode = String.format("#%02X%02X%02X", red, green, blue);  
        System.out.println(htmlCode);  
    }  
}
```

Can we use byte instead of short?

#7F87FF

Wrapper Class

- A *primitive type* variable directly stores the data for that variable type, such as int, double, or char.
- A *reference type* variable can refer to an instance of a class, also known as an object.
- *Wrapper classes* that are built-in reference types that augment the primitive types

Wrapper Class

Reference type	Associated primitive type
Character	char
Integer	int
Double	double
Boolean	boolean
Long	long

Wrapper Class Conventions

- Autoboxing - automatic conversion of primitive types to the corresponding wrapper classes

Scenario	Examples
Assign primitive type to wrapper class variable	<pre>Double floorArea = 20.25; // Autoboxing of 20.25 to a Double Integer calcResult; calcResult = 5 / 2; // Autoboxing of expression result to Integer int num1 = 23; Integer num2 = num1; // Autoboxing of num1 to Integer</pre>
Pass primitive type to a method with wrapper class parameter	<pre>public void setRate(Double rate) { // ... } setRate(50.2); // Autoboxing of 50.2 to Double double newRate = 97.2; setRate(newRate); // Autoboxing of newRate to Double</pre>

Wrapper Class Conventions

- Unboxing - automatic conversion of wrapper class objects to the corresponding primitive types

Scenario	Examples
Assign wrapper class variable to primitive type	<pre>Double num1 = 3.14; Character letter1 = 'A'; double num2 = num1; // Unboxing of Double to double char letter2 = letter1; // Unboxing of Character to char</pre>
Pass wrapper class variable to a method with primitive type parameter	<pre>public void setInitial(char letter) { // ... } Character userInitial = 'Z'; setInitial(userInitial); // Unboxing of userInitial to a char</pre>
Combine wrapper class and primitive types in expression	<pre>Double currTemp = 95.2; double tempDiff = 100.0 - currTemp; // Unboxing of currTemp to double Integer numItems = 11; if (numItems % 2 == 0) { // Unboxing of numItems to int // ... }</pre>

Character Wrapper Class

- char is a primitive
 - No methods by itself
- Character “wrapper” exists
 - Methods (mostly static) to help you learn about **char**
- Common and useful methods
 - Character.isDigit(char)
 - Example:

```
char chDigit = '9';  
boolean dig = Character.isDigit(chDigit); // true
```
 - Character.isWhitespace(char)
 - All whitespace including \t and \n
 - Character.isLetter(char)
- These are often paired with String charAt, and loops!

Coding Along

- Write a method in Java that receives a string as a parameter and removes the whitespaces from the string and print the number of whitespaces removed.

Solution to the Code Along



hellohowareyou
Whitespace removed 5

```
String str = "hello  how are  you?";  
int counter = 0;  
String nospace = "";  
for(int i = 0; i < str.length(); i++) {  
    char tmp = str.charAt(i);  
    if(Character.isWhitespace(tmp)) {  
        counter++;  
    }else {  
        nospace += tmp;  
    }  
}  
System.out.println(nospace);  
System.out.printf("Whitespace removed %d%n", counter)
```