Midterm

- Monday, February 10, 1:00 PM
- In class
- Closed book
- Chapters 1-4, 11, and Section 5.5 (Interfaces)
- Anything from readings and assignments

Midterm Topics

- Java syntax
- Java control flow and expression evaluation
- Java data types
- Java classes and methods
- Interfaces
- Recursion
- Number base conversion
Midterm Question Format

- Multiple choice questions
- Programming questions
- Calculation questions

Example Questions

Of the following types, which one cannot store a numeric value?

a) byte
b) float

[Circle] c) char

d) int
Example Questions

If x is an int and y is a float, which one of the following is not a legal assignment statement?

a) y = x;
(b) x = y;
(c) y = (float) x;
d) x = (int) y;

Example Questions

Assume that x, y, and z are all ints equal to 50, 20, and 6. What is the value of x / y / z?

a) 16
b) 12
c) 0
d) A syntax error as this is syntactically invalid
e) A run-time error since this is a division by 0
### Example Questions

If we have the statement

```java
String s = "Hello world";
```

What is returned by `s.charAt(1)`?

- a) 'H'
- **b) 'e'**
- c) 'l'
- d) "Hello"

### Example Questions

Suppose you have three String variables `a`, `b`, and `c`. The statement `c = a + b;` can also be achieved by:

- a) `c = a.length() + b.length();`
- b) `c = (int) a + (int) b;`
- **c) `c = a.concat(b);`**
- d) `c = b.concat(a);`
- e) `c = String.concat(a,b);`
Example Questions

Assume that q, x, y, and z are int variables with x = 1, y = 10, z = -3. Which of the following is true after this statement is executed?

\[ q = (x++ \ast y--) + ++z; \]

a) \( q == 7 \)
b) \( q == 16 \)
c) \( q == 22 \)
d) \( q == 8 \)

Example Questions

Assume that q, x, y, and z are int variables. Rewrite this statement as a sequence of simple statements without the increment and decrement operators, and with at most one operation in each statement.

\[ q = (x++ \ast y--) + ++z; \]

- \[ q = x \ast y; \]
- \[ x = x + 1; \]
- \[ y = y - 1; \]
- \[ z = z + 1; \]
- \[ q = q + z; \]
Example Questions

Assume that x is an int variable with x = 1. What will be the value of x after this loop terminates? \texttt{while (x < 100) x *= 2;}

a) 2
b) 101
c) 64
d) 128

Example Questions

Give a recursive definition of the number of ways to draw two cards from a deck of n cards.

Base case(s):
For n==2, \texttt{waysToDraw(n)} is 1

Recursive case:
For n>2, \texttt{waysToDraw(n)} is \texttt{waysToDraw(n-1) + (n-1)}
Another Recursion Question

Give a recursive definition of the number of subsets of a set with n elements (including empty set).

Base case(s):
For n==0, numSubsets(n) is 1

Recursive case:
For n>0, numSubsets(n) is

numSubsets(n-1) + numSubsets(n-1)

Base Conversions

Convert from binary to octal:

01111010 172

Convert from binary to hexadecimal:

01111010 7A
Example Questions

Fill in the code in a method to extract the first letter of each word in a String. A word consists just of letters. You may use the static method `Character.isLetter(ch)` which returns true if the character `ch` is a letter.

```java
String initials(String s) {
    String result = "";
    for (int i = 0; i < s.length(); ++i) {
        if (Character.isLetter(s.charAt(i)) &&
            (i == 0 || !Character.isLetter(s.charAt(i-1))))
            result += s.charAt(i);
    }
    return result;
}
```

Example Questions

Extract the first letter of each word.

```java
String initials(String s) {
    String result = "";
    for (int i = 0; i < s.length(); ++i) {
        if (Character.isLetter(s.charAt(i)) &&
            (i == 0 || !Character.isLetter(s.charAt(i-1))))
            result += s.charAt(i);
    }
    return result;
}
```
Example Questions

Fill in the code for classes Part and Labor that implement the interface Billable.

```java
public interface Billable {
    public final NumberFormat fmt =
        NumberFormat.getCurrencyInstance();

    // Compute charge for this item
    public double charge();

    // Realize the item as a String
    public String toString();
}
```

Interface Question Continued..

This driver shows use of Part and Labor.

```java
public class BillTest {
    public static void main(String args[]) {
        Billable p1 = new Part("oil filter", 1, 5.95);
        Billable p2 = new Part("oil", 5, 1.79);
        Billable l = new Labor(.5, 25.00);

        double total = 0.0;
        total += p1.charge();
        total += p2.charge();
        total += l.charge();

        System.out.println("Total charge is " +
            Billable.fmt.format(total));
        System.out.println("Detail of bill:");
        System.out.println(p1 + "\n" + p2 + "\n" + l);
    }
}
```
Fill in all needed methods of **Part**.

```java
public class Part implements Billable {
    private String desc;    // Description of item
    private int quantity;   // Number of items
    private double price;   // Item price

    Part(String d, int n, double p) {
        desc = d; quantity = n; price = p;
    }

    public double charge() { return quantity * price; }

    public String toString() {
        return desc + ": " + quantity + " at " +
                fmt.format(price);
    }
}
```

Fill in all needed methods of **Labor**.

```java
public class Labor implements Billable {
    private double hours;   // Hours of labor
    private double rate;    // Hourly labor rate

    Labor(double h, double r) {
        hours = h; rate = r;
    }

    public double charge() { return hours * rate; }

    public String toString() {
        return "Labor: " + hours + " hours at " +
                fmt.format(rate);
    }
}
```
Exam Strategy

- Do the multiple choice first
  - Over half of the points
  - Probably easiest
- Pace yourself
- Leave time to check your work
- Relax