Midterm

- Monday, February 8
- In class
- Text book: Chapters 1-6, and 9-10
- Anything from slides
- Anything from readings and assignments

Midterm Topics

- Java syntax, data types
- Java control flow, expression evaluation
- Object Oriented concepts
- Classes and methods
- Constructors
- Objects and references
- 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  
c) boolean  
d) int
Example Questions

Which of the following are Object Oriented principles?

a) encapsulation
b) data hiding
c) abstraction
d) all of the above

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) \( y = \text{(float)} \ x; \)
d) \( x = \text{(int)} \ y; \)
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

```
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 \( a, b, c \). The statement \( c = a + b; \) can also be achieved by:

a) \( c = a.length() + b.length(); \)

b) \( c = (\text{int}) a + (\text{int}) b; \)

c) \( c = a.concat(b); \)

d) \( c = b.concat(a); \)

e) \( c = \text{String.concat}(a,b); \)

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.

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

\[ q = x \times y; \]
\[ x = x + 1; \]
\[ y = y - 1; \]
\[ z = z + 1; \]
\[ q = q + z; \]

Example Questions

What value will z have after the statement:

```java
int z = 5.0 / 10;
```

a) 0
b) 0.5
c) 5.0
d) 2.0
e) none of the above, a compile-time error arises because z is an int and 5.0 / 10 is a double
Example Questions

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

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

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 class Rectangle so that it works with this test driver code.

```java
public static void main(String[] args) {
    // Create two Rectangle objects
    Rectangle rect1 = new Rectangle(4, 11);
    Rectangle rect2 = new Rectangle(7, 7);
    System.out.println("area of rect1 is " + rect1.area());
    if (rect2.isSquare())
        System.out.println("rect2 is a square");
    System.out.println("rect1 is" + rect1);
    System.out.println("rect2 is" + rect2);
    rect1.growByFactor(2.5);
    System.out.println("rect1 is" + rect1);
}
```

Output:
area of rect1 is 44
rect2 is a square
rect1 is Rectangle with dimensions 4 and 11
rect2 is Rectangle with dimensions 7 and 7
rect1 is Rectangle with dimensions 10 and 27

Class Coding Continued..

```java
class Rectangle {
    private int length, width;
    public Rectangle(int length, int width) {
        this.length = length;
        this.width = width;
    }
    public int area() { return length*width; }
    public boolean isSquare() {
        if (length == width) return true;
        else return false;
    }
    public void growByFactor(double factor) {
        length = (int)(length * factor);
        width = (int)(width * factor);
    }
    public String toString() {
        return "Rectangle with dimensions " + length + " and " + width;
    }
}
```
Exam Strategy

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