

## Midterm Solutions

1. (2 points) What program do we use to convert our Java text files, like HelloWorld.java to HelloWorld.class? In very general terms, what does that program do?

javac is the program. It is a compiler that converts the Java code into a Java “bytecodes” which are then interpreted by the web browser when it runs the applet.

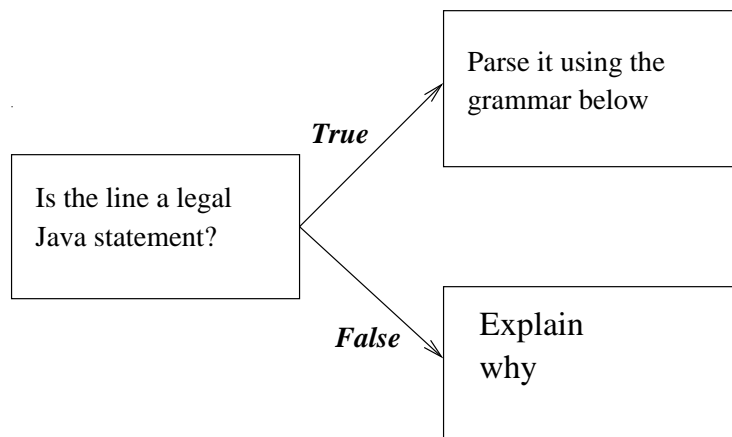
2. (2 points) What is the maximum number of guesses it will take to guess a number between 0 and 100 if one uses the binary search strategy? Briefly justify your answer.

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Each guess should split the number of possibilities in half. You can easily calculate that if you divide 100 by 2 7 times we will get a value less than 1. ( $2^7 = 128 > 100$ )

3. (3 points) The text for the next question is printed below. Please read it and draw a decision tree to visually depict the instructions put forth in the text.

*For the following lines of code, state whether each line is a legal syntactical statement. If it is not a legal Java statement, explain why. If it is a legal Java statement, show how to parse it using the grammar below.*



4. (12 points) For the following lines of code, state whether each line is a legal syntactical statement. If it is not a legal Java statement, explain why. If it is a legal Java statement, show how to parse it using the grammar below.

1. <name> ==> any string of alphanumeric symbols that begins with a letter
2. <statement> ==> <name> = <expression> ;
3. <statement> ==> <name> = new <class>(<arguments>);
4. <statement> ==> <name>.<method>(<arguments>) | <method>(<arguments>);
5. <arguments> == possibly empty list of <expression>s separated by commas
6. <expression> ==> <string-expression> | <int-expression> | <oth-expression>
7. <string-expression> ==> <string-expression> + <string-expression>
8. <string-expression> ==> <string>
9. <string> ==> " any sequence of characters "
10. <string> ==> <name>
11. <int-expression> ==> <name>
12. <int-expression> ==> <int-expression> <op> <int-expression>
13. <int-expression> ==> <pos-int> | - <pos-int>
14. <pos-int> ==> \it any sequence of digits
15. <op> ==> + | - | \* | / | %

16. <method> ==> setText | getText | getInt | setInt | add | actionPerformed  
 17. <class> ==> TextField | IntField | Button | ActionEvent

a. (3)            b1 = new Button("Button");

```

3 <statement> ==> <name> = new <class>(<arguments>);
5 <name> = new <class>(<expression>);
6 <name> = new <class>(<string-expression>);
8 <name> = new <class>(<string>);
9 <name> = new <class>("Button");
17 <name> = new Button("Button");
1 b1 = new Button("Button");

```

b. (3)            w1 + w2 = "The real deal";

Invalid Java syntax. There exists no grammar with an expression on the left hand side of an assignment. Neither rule 2 nor rule 3 apply.

c. (3)            i = j;

```

2 <statement> ==> <name> = <expression> ;
6 <name> = <int-expression> ;
11 <name> = <name> ;
1 i = <name> ;
1 i = j;

```

d. (3)            num = lfield.getInt()

Invalid java syntax. All statements end with a semicolon. All names must begin with a letter. Will not satisfy rule 2 or 4.

5. Given the following code fragment:

```

int i1, i2, i3;
String w1, w2;
String w1 = "luck";
String w2 = "Good" + "luck";

i1 = w1.indexOf("luck");
i2 = w2.indexOf("luck");
i3 = w2.length();

```

After execution:

a. (2) What is the value stored in i1?

0

b. (2) What is the value stored in i2?

4

c. (2) What is the value stored in i3?

8

6. (10 points) The Islamic calendar has 12 months with alternately 30 and 29 days:

30 29 30 29 30 29 30 29 30 29 30 29

We want to write an applet to tell the user how many days are in a particular month.

- a. (3) Change the code as much as necessary to add a functioning button with the label "Calculate". The button is already declared for you as `Button calcButton`;

```
import awb.*;
import java.awt.*;
import java.awt.event.*;

public class IslamicCalendar extends java.applet.Applet
    implements ActionListener
{
    int daysInMonth[];
    TextField promptField;
    IntField daysField;
    TextField outputField;
    Button calcButton;

    public void init()
    {
        daysInMonth = new int[12];
        daysInMonth[0] = 30;
        daysInMonth[1] = 29;
        daysInMonth[2] = 30;
        daysInMonth[3] = 29;
        daysInMonth[4] = 30;
        daysInMonth[5] = 29;
        daysInMonth[6] = 30;
        daysInMonth[7] = 29;
        daysInMonth[8] = 30;
        daysInMonth[9] = 29;
        daysInMonth[10] = 30;
        daysInMonth[11] = 29;

        promptField = new TextField(60);
        promptField.setText("Enter a month (1-12)");
        outputField = new TextField(60);
        daysField = new IntField();
        add(promptField);
        add(daysField);
        add(outputField);

        calcButton = new Button("Calculate");
        calcButton.addActionListener(this);
        add(calcButton);
    }
}
```

- b. (3) Now, we want to add code to output the number of days in the month. Add the necessary code to the applet to print out the number of days in the month.

For example, if the user types in 2 in the daysField box, the program output in the TextField referred to by outputField

The month 2 has 29 days

```

    public void actionPerformed(ActionEvent event)
    {
        Object cause = event.getSource();
        int day = daysField.getInt();

        if (cause == calcButton)
        {
            outputField.setText("The month " + day + " has " +
                                daysInMonth[day-1] + " days");
        }
    }
}

```

c. (3) We would like to make a web page to show off the applet we have created. Write the HTML required to display

1. A title and a header
2. The applet
3. A link to the java code with some label

Assume that the applet and the java code are in the same directory as the HTML file.

```

<head>
<title>Islamic Calendar</title>
</head>

<body>
<h1>Islamic Calendar</h1>

<applet code="IslamicCalendar" HEIGHT=400></applet>

A link to the <a href="IslamicCalendar.java">code</a>
</body>
</html>

```

## 7. (Extra Credit)

a. (2) For question 6, write a loop to calculate the total number of days in a year given the daysInMonth array. You must use Java code.

```

int k, monthsInYear, daysInYear;
k = 0;
daysInYear = 0;
monthsInYear = daysInMonth.length;
while (k < monthsInYear)
{
    daysInYear = daysInYear + daysInMonth[k];
    k = k + 1;
}
outputField.setText("The number of days in a year is " + daysInYear);

```

b. (1) Who won the 200 meter dash at the 1968 Olympics?

Tommie Smith or Irena Szewinska