

DUKE UNIVERSITY  
Department of Computer Science

CPS 1 - Section 1  
Spring 2001

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Midterm

READ THIS PAGE FIRST. *Please do not discuss this exam before Tuesday morning with people who haven't taken it.* Your exam should contain 7 problems on 9 pages. Officially, it is worth 35 points.

This is an open-book test. You have at least 70 minutes to complete it. There are 35 points on this test which means you should aim to spend no more than 2 minutes per point on each problem.

You may consult any books, notes, or other inanimate objects (other than computers) available to you. You may use any program text supplied in lectures, labs, or solutions. Please write your answers in the spaces provided in the test. Make sure to put your name, login, and lab section in the space provided below. Put your login and initials *clearly* on each page of this test and on any additional sheets of paper you use for your answers (**worth 1 point**).

Don't panic. Just read all the questions carefully to begin with, and first try to answer those parts about which you feel most confident. Do not be alarmed if some of the answers are obvious.

Your name: \_\_\_\_\_

Login: \_\_\_\_\_

Honor code  
acknowledgment (signature) \_\_\_\_\_

Lab: \_\_\_\_\_

1. \_\_\_\_\_/2

2. \_\_\_\_\_/2

3. \_\_\_\_\_/3

4. \_\_\_\_\_/12

5. \_\_\_\_\_/6

6. \_\_\_\_\_/9

7. \_\_\_\_\_/

TOT \_\_\_\_\_/35

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?

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.

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");

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

c. (3)        `i = j;`

d. (3)        `num = 1field.getInt();`

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?
- b. (2) What is the value stored in i2?
- c. (2) What is the value stored in i3?

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);

    }
}
```

- 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

You should probably use a `IntegerField` and `TextField` along with their respective methods `getInt` and `setText` which are discussed in the text and labs. Do not worry about checking for going over array bounds or any kind of improper input.

```
public void actionPerformed(ActionEvent event)
{
    Object cause = event.getSource();

    if (cause == calcButton)
    {

    }
}
}
```

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.

**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.

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