

Homework Nine

A201/A597/I210—Spring Semester 2005

Due in person, in lab, April 21-22

Abstract

Read and solve the problems below. Turn in your complete answers to your AI, in lab, as indicated in the last section of the document.

The Computer Science Department¹ and the School of Informatics² clearly specify the rules of academic honesty and academic integrity, so please read the documents and make sure you comply.

Posting solutions or major hints on the bulletin board is not allowed.

1 Review of Conditionals

1. Given that `x`, `y`, and `z` are `int` variables containing the values 4, 6, and 8, respectively, evaluate each of the following boolean expressions.

- a) `x < 4`
- b) `x <= 4`
- c) `x > 4 || y == 6`
- d) `x > 4 && y == 6`
- e) `!(x > 4)`
- f) `x != 4 || x != 5`
- g) `x + 2 != y`
- h) `x == 8 || y == 8 || z == 8`
- i) `(y < z && y < x) || y >= x`
- j) `x != 4 && z / (x - 4) == 1`
- k) `z / (x - 4) == 1 && x != 4`

2. Given that `i` and `j` are `int` variables, simplify each of the following:

- a) `!(i < 10 && j > 10)`
- b) `!(i < 10 || j > 10)`
- c) `!(i < 10 && j == 10)`
- d) `!(i <= 10 && i > 0)`

¹<http://www.cs.indiana.edu/Academics/integrity.html>

²<http://www.informatics.indiana.edu/courses/honesty.asp>

- e) `!(i <= 10 && i > 0) || j > 0`
- f) `!(i != 0 || j != 0)`

3. For which values of the `int` variable `i` is the expression

`(i != 1 || i != 0)`

true? Compute the negation of this expression, and check against the negation of your original answer.

4. Given that `x`, `y`, and `z` are `int` variables, write a boolean expression that will be true:

- a) if `x` is greater than `y`
- b) if `x` is greater than both `y` and `z`
- c) if `x` is greater than either `y` or `z`
- d) if `x` is equal to the product of `y` and `z`
- e) if `x` ends in 0, that is, if `x` is divisible by 10
- f) if `x` is even
- g) if `x` is between `y` and `z`, inclusive, where `y` is known to be less than `z`

5. Assume that `x` is an `int` variable. For each of code fragments below, state which initial values of `x` will result in `x` being incremented by 4.

a)

```
if (x == 1)
    x = x + 1;
else if (x == 2)
    x = x + 2;
else if (x == 3)
    x = x + 3;
else
    x = x + 4;
```

b)

```
if (x == 1)
    x = x + 1;
if (x == 2)
    x = x + 2;
if (x == 4)
    x = x + 4;
```

6. Though the `while` statement is the most commonly used statement for iteration, and is the simplest and easiest to verify, Java provides two other looping constructs: the `do` statement and the `for` statement. The `do` statement is similar to the `while`, except that the condition follows the body of the loop. The syntax for the `do` statement is

```
do
    statement
while (condition) ;
```

Write a program that produces random integers in the range `[0,100]`, counting and printing them, and stopping immediately after the first multiple of 19 has been generated and printed. Why is `do` loop more suited to this problem than a `while` loop?

7. Write code that reads n and calculates the alternate sum

$$1 - 2 + 3 - 4 + 5 - 6 + \dots + (-1)^n n$$

For example if $n = 6$ then the calculated sum is

$$1 - 2 + 3 - 4 + 5 - 6$$

and if $n = 7$ the calculated sum will be

$$1 - 2 + 3 - 4 + 5 - 6 + 7$$

8. How many times is the assignment statement

```
count = count + 1
```

executed in each of the following?

```
a) int count = 0;
   int i = 0;
   while (i < 3) {
     int j = i;
     while (j < 3) {
       count = count + 1;
       j = j + 1;
     }
     i = i + 1;
   }
```

```
b) int count = 0;
   int i = 0;
   int j = 0;
   while (i < 3) {
     while (j < 3) {
       count = count + 1;
       j = j + 1;
     }
     i = i + 1;
   }
```

9. Write a program that converts feet to meters. The program should display feet from 3 to 30 in 3-foot increments and the corresponding meter equivalents. Use the relationship that 3.28 feet equal 1 meter.

10. Four experiments are performed, each consisting of six tests, with the following results. Write a Java program using a nested loop to compute and display the average of the test results for each experiment.

```
Experiment 1 results: 23.2 31.5 16.9 27.5 25.4 28.6
Experiment 2 results: 34.8 45.2 27.9 36.8 33.4 39.4
Experiment 3 results: 19.4 16.8 10.2 20.8 18.9 13.4
Experiment 4 results: 36.9 39.5 49.2 45.1 42.7 50.6
```

11. Write a Java program to reverse the digits of a positive integer number. For example, if the number 8735 is entered, the number displayed is 5378.

12. Given that `i` is an `int` variable indicate the number of times the body of each of the following loops will be performed:

- a) `i = 1; while (i <= 10) { ... i = i + 1; }`
- b) `i = 0; while (i <= 10) { ... i = i + 1; }`
- c) `i = 0; while (i < 10) { ... i = i + 1; }`
- d) `i = 0; while (i <= 10) { ... i = i + 2; }`
- e) `i = 10; while (i > 0) { ... i = i - 1; }`
- f) `i = 10; while (i > 1) { ... i = i - 1; }`
- g) `i = 10; while (i > 0) { ... i = i - 1; }`
- h) `i = 10; while (i != 0) { ... i = i - 1; }`
- i) `i = 9; while (i != 0) { ... i = i - 2; }`
- j) `i = 0; while (i != 10) { ... i = i + 3; }`

13. For each of the following, how many times will the phrase "Please wait" be written?

- a)

```
int i = 1;
while (i < 3) {
    System.out.println("Please wait");
    i = i + 1;
}
```
- b)

```
int i = 1;
while (i < 0) {
    System.out.println("Please wait");
    i = i + 1;
}
```
- c)

```
int i = 1;
while (i > 0) {
    System.out.println("Please wait");
    i = i + 1;
}
```
- d)

```
int i = 1;
while (i > 0)
    System.out.println("Please wait");
    i = i + 1;
```

14. Assume that `a` and `b` are `int` variables with initial values 18 and 48 respectively. Trace the following program fragments and indicate what will be written.

- a)

```
while (a != b)
    if (a > b)
        a = a - b;
    else
        b = b - a;
System.out.println("result is: " + a);
```

b)

```
int q = 0;
int r = a;
while (r > b) {
    q = q + 1;
    r = r - b;
}
System.out.println("q = " + q + " and r = " + r);
```

Try different values for **a** and **b**. What happens if **a** is 1 and **b** is 0?

15. Consider the following, where **i** and **sum** are **int** variables:

```
i = 1;
sum = 0;
while (i != 10) {
    sum = sum + i;
    i = i + 1;
}
```

- a) What is the final value of **i**? of **sum**?
- b) What does this loop compute?

16. Consider the following, where **i** and **sum** are **int** variables:

```
i = 1;
sum = 0;
while (i != 10) {
    sum = sum + i;
    i = i + 2;
}
```

- a) What is the final value of **i**? of **sum**?
- b) What does this loop compute?

2 What to Turn In

Print this document, write your answers in pencil next to the questions, or attach additional pages if need be, and turn this in to your lab instructor at the beginning or during the lab for the week of Apr 21-22.