York University

AS/AK/ITEC 1620 3.0 – Section C

OBJECT-BASED PROGRAMMING

Fall 2002

Midterm Test Sample

Examiner: S.Y. Chen
Duration: One Hour and 30 Minutes

This exam is closed textbook(s) and closed notes. Use of any electronic device (e.g. for computing and/or communicating) is NOT permitted.

Do not unstaple this test book – any detached sheets will be discarded. Answer all questions in the space provided. No additional sheets are permitted.

Work independently. The value of each part of each question is indicated. The total value of all questions is 60.

Write your name and student number in the space below. Do the same on the top of each sheet of this exam where indicated.

NOTE: YOU MAY USE PEN OR PENCIL, BUT ANSWERS IN PENCIL WILL NOT BE CONSIDERED FOR REGRADING.

Surname: _____

Given Names: _____

Student Number: _____

Q1. _____ **Q4.** _____

Q2. _____ **Q5.** _____

Q3. _____ **Q6.** _____

Total

Surname:_____ First name:_____ Student #: _____

Question 1 (10 marks) Short Answer:

Part 1 (**4 marks**): True/False – write "true" of "false" in the space provided.

a. All structured programming languages must have `if`, `for`, and `while` statements. **FALSE**

b. Any program written in an object-oriented programming language can be rewritten in a structured programming language. **TRUE**

c. The number 1 can be used to represent `true` in a truth table. **TRUE**

d. A `while` loop will always evaluate its condition at least once. **TRUE**

Part 2 (**6 marks**): Output/Error determination – write the output (if any) or "error" in the space provided.

a.
```
String true = "t";
String false = "f";
York.println(true + false);
```
error

b.
```
float a = (int) (5.5 + 3/2);
York.println(a);
```
6.0

c.
```
int a;
boolean flag = true;
if (flag)
     a = 1;
else if (!flag)
     a = 10;
York.println(a);
```
error

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Question 2a (5 marks) Evaluating Conditions:

When a condition is evaluated in JAVA, it is useful to know both its result (TRUE or FALSE) and which terms were evaluated. For the conditions listed below, please circle all terms that were evaluated and give the final result of the condition. Note: terms in a condition are only evaluated if the (sub) result is still unknown.

Example :

`boolean` a = `true`, b = `true`, c = `false`, d = `false`;

(! a && ((b || c) && ! d)) || ((a && ! c) || d) **TRUE**

After evaluating ! a, the left sub-result is known to be FALSE. Skipping to the next term in the OR expression, a is TRUE so the next term in the AND expresstion is evaluated. Upon evaluating ! c, (a && ! c) is TRUE and the right sub-result is known to be TRUE. The overall result is now known to be TRUE, so no further terms need to be evaluated.

Please answer both parts below.

Part 1 (**2.5 marks**):

`boolean` a = `true`, b = `false`, c = `false`, d = `true`;

(! b || (a && d)) || ((b || a) && d) || ((! b && c) || b) **TRUE**

Part 2 (**2.5 marks**):

`boolean` a = `true`, b = `false`, c = `true`, d = `false`;

((b && d) || ! a) && (((b && a) || d) || (c || (d && a))) **FALSE**

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Question 2b (5 marks) Designing if statements:

A student in her last semester at York suddenly realizes that she needs 6 more elective credits to graduate. In the calendar, there are only 3 courses with spaces left: BIRD1000 3.0 on Monday nights, EASY1000 3.0 on Tuesday nights, and LAST1000 3.0 on Wednesday nights.

In order to graduate, the student must take at least two of the three courses: BIRD1000, EASY1000, and LAST1000.

In a JAVA program, there are three boolean variables – **`bird`**, **`easy`**, and **`last`**. The value of each variable is **`true`** if that course will be taken, and **`false`** otherwise.

Write an **`if`** statement that will set the boolean variable **`graduate`** to **`true`** if the taken courses will produce enough credits to graduate, and to **`false`** if the student will not have enough credits.

Please write your answer below.

```
if ((bird && easy) || (easy && last) || (bird && last))
     graduate = true;
else
     graduate = false;
```

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Question 3 (10 marks) Evaluating JAVA Code:

Please answer both parts below. Note: you must show your work to receive any credit.

Part 1 (**5 marks**):

```
int x = 0;
for (int i = 0; i < 10; i++)
{
        if (i %  4 == 0)
                x += 50;
        else if (i % 2 == 0)
                x += 30;
}
```

i	x
0	50
1	50
2	80
3	80
4	130
5	130
6	160
7	160
8	210
9	210

What is the final value of x?

210

Part 2 (**5 marks**):

```
int x = 0;
int y = 5;
while (y <= 30)
{
        if (x == y)
                y += 10;
        else
                x += 5;
}
```

x	y
0	5
5	5
5	15
10	15
15	15
15	25
20	25
25	25
25	35

What is the final value of x?

25

Question 4 (10 marks) Converting Flowcharts:

Write a program in JAVA that will output all rectangles with integer lengths and widths that have a perimeter less than or equal to the input (integer) length.

For example, your program must have output like the following (user input is underlined):

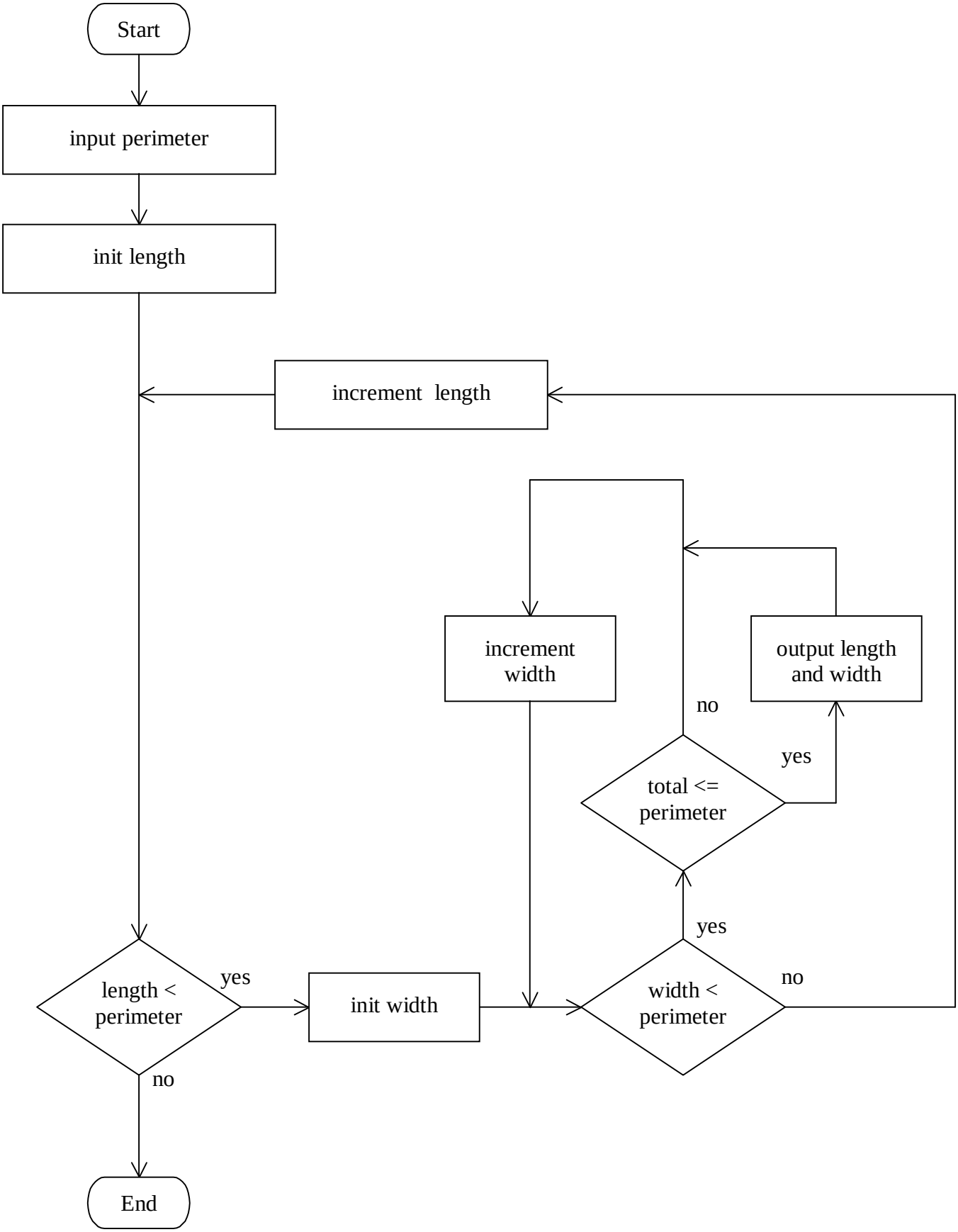
Example 1:

14

length 1, width 1
length 1, width 2
length 1, width 3
length 1, width 4
length 1, width 5
length 1, width 6
length 2, width 1
length 2, width 2
length 2, width 3
length 2, width 4
length 2, width 5
length 3, width 1
length 3, width 2
length 3, width 3
length 3, width 4
length 4, width 1
length 4, width 2
length 4, width 3
length 5, width 1
length 5, width 2
length 6, width 1

On the following page, there is a flowchart for the required program

Please write your program on the page after the flowchart. This program must be an exact conversion of the given flowchart.


Start
input perimeter
init length
increment length
increment width
output length and width
no
yes
total <= perimeter
yes
length < perimeter
yes
init width
width < perimeter
no
no
End

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```
public class Question4
{
  public static void main( String args [] )
  {
     int perimeter = York.readInt();

     int length = 1;
     while (length < perimeter)
     {
       int width = 1;
       while (width < perimeter)
       {
          if (2*(length+width) <= perimeter)
            York.println("length " + length +
                         ", width " + width);

          width++;
       }

       length++;
     }
  }
}
```

OR

```
public class Question4
{
  public static void main( String args [] )
  {
     int perimeter = York.readInt();

     for (int length = 1; length < perimeter; length++)
     {
       for (int width = 1; width < perimeter; width++)
       {
          if (2*(length+width) <= perimeter)
            York.println("length " + length +
                         ", width " + width);
       }
     }
  }
}
```

Question 5 (10 marks) JAVA programming:

Write a program in JAVA that will multiply three integers by repeated addition.

For example, your program must have output like the following (user input is underlined):

Example 1:

4
2
6

48

Example 2:

5
0
3

0

Example 3:

7
1
2

14

Please write your program on the following page.
You may use this page for rough work, but anything on this page will not be graded.

Surname:_____ First name:_____ Student #: _____

```
public class Question5
{
  public static void main( String[] args )
  {
     int num1 = York.readInt();
     int num2 = York.readInt();
     int num3 = York.readInt();

     int product12 = 0;

     for (int i = 0; i < num2; i++)
       product12 += num1;

     int product = 0;

     for (int i = 0; i < num3; i++)
       product += product12;

     York.println(product);









  }
}
```

Question 6 (10 marks) JAVA programming:

Write a program in JAVA that will determine whether or not the described four-sided polygon is a square. Each of these polygons will be described by the length of its four sides and its area. Your program will receive these five values as inputs.

For example, your program must have output like the following (user input is underlined):

Example 1:

1
2
3
4
5

not a square

Example 2:

2
2
2
2
4

square

Example 3:

3
3
3
3
6

not a square

Please write your program on the following page.
You may use this page for rough work, but anything on this page will not be graded.

Surname:_____ First name:_____ Student #: _____

```
public class Question6
{
  public static void main( String[] args )
  {
     int side1 = York.readInt();
     int side2 = York.readInt();
     int side3 = York.readInt();
     int side4 = York.readInt();
     int area = York.readInt();

     boolean isSquare = true;

     if(side1 != side2 || side1 != side3 || side1 != side4)
       isSquare = false;
     else if(side2 != side3 || side2 != side4)
       isSquare = false;
     else if(side3 != side4)
       isSquare = false;
     else if(side1 * side2 != area)
       isSquare = false;

     if(isSquare)
       York.println(“square”);
     else
       York.println(“not a square”);









  }
}
```