

**University of Toronto
Faculty of Arts and Science**

April 2010 Examinations

CSC 104H1S

Duration: 3 hours

No aids allowed

Last name:

First name(s):

Student number:

Make sure you have all 12 pages (including this page).
(Don't panic about the page count—there's lots of space for answers.)

Answer *all* questions. Answer questions in the space provided. Answers not in the correct space will not be graded unless a note in the correct space says “see page ...” and the answer on that page is clearly labelled with the question number.

Be careful not to get stuck on some questions to the complete exclusion of others. The amount of marks or answer-space allotted does not indicate how long it will take you to complete the question, nor does the size of the answer-space indicate the size of the correct answer.

Do not open this booklet until you are instructed to.

Do not write anything in the following table:

question	value	grade	question	value	grade
1	8		7	16	
2	4		8	6	
3	5		9	12	
4	5		10	8	
5	8		11	8	
6	10		12	10	
subtotal			total	100	

1. [8 marks]

Consider the algorithm “walk down the street until you see a white building on the left”.

(a) In Computer Science we generally require algorithms to “terminate when followed”. Under what circumstances would the above algorithm not terminate when followed?

(b) How could you change the statement of the algorithm so that it meets this requirement?

2. [4 marks]

(a) The ASCII character code mentions letters (lower-case and upper case), digits, and some other characters. Give two examples of other characters which are included in the ASCII character code (other than letters and digits).

(b) Give one example of a character which is not included in the ASCII character code.

3. [5 marks]

You have a user name and password for the CDF computers.

(a) What is the purpose of the user name?

(b) What is the purpose of the password?

4. [5 marks]

(a) State one advantage of the modern “desktop” graphical user interface over a command-line interface (e.g. the Terminal window).

(b) State one advantage of a command-line interface over the graphical user interface.

5. [8 marks]

State the output from each of these Python programs:

(a)

```
x = 3
y = 5
print 'x'
```

(b)

```
sum = 0
for i in range(2,5):
    sum = sum + i
print sum
```

(c)

```
sum = 0
for i in range(2,5):
    sum = sum + i
print sum
```

(d)

```
x = 2
while x < 10:
    x = x * 2
print x
```

6. [10 marks]

Write a Python program to print the following output, using a loop. Note that you “square” a number by multiplying it by itself, and note that the “6” line is missing below.

```
1 squared is 1
2 squared is 4
3 squared is 9
4 squared is 16
5 squared is 25
7 squared is 49
8 squared is 64
9 squared is 81
10 squared is 100
```

7. [16 marks]

Here is a spreadsheet modelling the growth of bacteria in a confined space:

	A	B	C	D	E
1	initial count	1234			
2	crowd limit	5000			
3	creation rate	0.1			
4	death rate	0.05			
5					
6	hour	start	new	died	end
7	0	1234	123	62	1295
8	1	1295	130	65	1360
9	2	1360	136	68	1428
10	3	1428	143	71	1500
11	4	1500	150	75	1575
12	5	1575	158	79	1654
13	6	1654	165	83	1736
14	7	1736	174	87	1823
15	8	1823	182	91	1914
16	9	1914	191	96	2009
17	10	2009	201	100	2110
18	11	2110	211	106	2215
19	12	2215	222	111	2326
20	13	2326	233	116	2443
21	14	2443	244	122	2565
22	15	2565	257	128	2694
23	16	2694	269	135	2828
24	17	2828	282	141	2970

The table in the first four lines is entered manually. After that, each row represents the progress within one hour. We list the bacteria count at the start of the hour, the number of new bacteria created, the number of bacteria which die, and the bacteria count at the end of the hour (which is the bacteria count at the beginning of the next hour).

The new-bacteria value is the start amount times the creation rate, using the ROUND built-in function to make this an integer (there's no such thing as a live fractional bacterium).

Similarly there is a death rate. *At least* this many bacteria will die. However, there is also a crowding limit. The most bacteria which can survive at once is the crowding limit in cell B2. Thus, the "end" column will never show a value greater than the B2 value.

Write the formulas for these cells as directed below, in the style of a spreadsheet program such as Gnumeric.

A7:

B7:

C7 (to be copied down):

D7 (to be copied down):

E7 (to be copied down):

A8 (to be copied down):

B8 (to be copied down):

8. [6 marks]

In this course we have limited ourselves to the “structural” HTML tags, avoiding the “appearance-oriented” HTML tags.

(a) What is an advantage of using only the structural tags?

(b) What is a disadvantage of using only the structural tags?

(c) Imagine using *none* of the structural tags, and specifying everything only by font name and size, etc. What would be the consequence?

9. [12 marks]

Write HTML code to produce a web page which looks like the following. There is no available character for “ $\frac{1}{3}$ ” but there is a small picture file you can use (just as was done in assignment three for the fancy letter O) at <http://www.dgp.toronto.edu/~ajr/gen/13.gif>
(You can skip copying out all of the words below so long as your intention is clear.)

Vinyl Records

Vinyl records were recorded at different speeds. Standard speeds were 16, $33\frac{1}{3}$, 45, and 78 RPM.

Some people miss them, but I like my MP3 player better.

```
<html>  
<head>
```

```
</head>  
<body>
```

```
</body>  
</html>
```


10. [8 marks]

Convert the following base ten numbers to base two (binary):

(a) 30

(b) 28

Convert the following base two numbers to base ten:

(c) 100101

(d) 101100

11. [8 marks]

Assignment four involved sorting the array containing the piles of sticks.

(a) Describe the sorting algorithm briefly.

(b) We then got rid of zeroes at the beginning of the array. Suppose the array is named “gamestate”. Write Python code to check whether the first element of gamestate is zero, and if so, to remove that item from the array.

12. [10 marks]

Write a Python program to prompt for and input two positive numbers (integers). Add together all of the integers from 1 to the first number, and *multiply* together all of the integers from 1 to the second number, and tell the user which one is larger.

(For example, if the first number were 5, you would compute $1+2+3+4+5$, which is 15; and if the second number were 4, you would compute $1*2*3*4$, which is 24.)

Extra space if needed
(you must write “see page 12” in the usual answer space for the given question)

End of exam. Total marks: 100. Total pages: 12.

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