

CSCE 235: Introduction to Discrete Structures  
Prerequisite test  
January 12, 2007

Name:

Have you taken CSCE 155/155H? If so, what was your grade?

Have you taken MATH 106/108H?

This test consists of five questions worth a total of 30 points. You have 20 minutes to complete the test. You must show all steps, including any computations or explanations, that led you to your answers.

1. (5 points) Let  $\max(a, b)$  be the function that returns the maximum of the two numbers  $a$  and  $b$ , and let  $\min(a, b)$  be the function that returns the minimum of the two numbers  $a$  and  $b$ . What is the value of

$$\max\left(a, \min\left(\max(b, \min(a, b)), \min(a, \max(a, b))\right)\right)?$$

2. (4 points) In *The Hitchhiker's Guide to the Galaxy*, Douglas Adams says that the answer to the Question of Life, the Universe, and Everything is 42. Express the decimal number 42 in

(a) binary.

(b) base 5.

3. (4 points)

(a) A document is enlarged by a factor of 150% on a photocopier. By what factor must the copy be reduced to produce a copy the same size as the original?

(b) Sam and Kim both started new jobs at the beginning of 2005, with the same starting salary. At the end of 2005, Sam received a 10% raise, while Kim's salary was reduced by 5%. At the end of 2006, however, it was Kim who received the 10% raise, and Sam's salary fell by 5%. After these two sets of salary adjustments, whose salary is larger?

4. (8 points) What is the output of the following pseudocode?

```
n := 13
while n > 1 do
  output n
  if n is even then
    n := n/2
  else
    n := 3n + 1
  end
end
end
```

5. (9 points) An economist predicts, “If the United States does not reduce its trade deficit, then the country will fall into a recession.”

(a) Based on this prediction, is it reasonable to conclude that “if the United States falls into a recession, it must be because the trade deficit was not reduced”? Why or why not?

(b) Based on this prediction, is it reasonable to conclude that “if the United States does not fall into a recession, then the trade deficit must have been reduced”? Why or why not?

(c) Based on this prediction, is it reasonable to conclude that “if the United States reduces its trade deficit, then the country will not fall into a recession”? Why or why not?