

Homework 2

PROBLEM SOLVING IN C
(CSCE 105, SPRING 2006)

URL: <http://www.cse.unl.edu/~cstrobe/csce105s06/>

Due on 10th March, 2006

27th February, 2006

Name :
Course No : **CSCE105**

Instructions:

You must use some document processing package (e.g. L^AT_EX or MS Word) to write your homework submissions. If you are using Word, you must use **Courier New** font, with **font size 10**. To turn off the AutoCorrect options in Word, go to the Tools menu, AutoCorrect option, and uncheck the necessary options (particularly “Capitalize first letter of sentences”).

Homework submissions MUST be stapled!!

Failure to staple your homework will result in a deduction of 5 points and the possibility of losing some portions of the homework assignment.

Homework submissions will include:

1. The cover page (this page, Don't forget to write your name),
2. The written portion of the homework (*Problems 1–5*), formatted as above
3. The programming portion of the homework (*Problems 6–10*, each program printed on a separate page, formatted as above), and
4. the grade sheet as on the last page.

1. (10 points) Evaluate each of the following expressions if **a** is 10, **b** is -5, **c** is 15, and **flag** is 1. Which parts of these expressions are not evaluated due to short-circuit evaluation. (Write short-circuited evaluation, or write “none” if nothing is short-circuited).

Expression:	Evaluates to:	short-circuit cut-off:
a. <code>c == b - a !flag</code>		
b. <code>a != -a !flag && c <= (-b * a)</code>		
c. <code>!(a % b) && b <= -5</code>		
d. <code>!(a > 15) c < !a + b</code>		
e. <code>!!a == 10 && c >= 15 b</code>		

2. (10 points) Convert each of the following from pseudocode to proper C statements.

Answer Box:	
a. x is less than y and y is greater than z	
b. x is greater than y and x is less than or equal to z	
c. x is true and y is not equal to z or z is not equal to 42	
d. x is equal to y or x is equal to 1	
e. x is less than or equal to y and y is less than or equal to z	

3. (10 points) Rewrite the following mathematical expressions using C functions:

<p>a. $\sqrt{ z^3 - 2.0 }$</p> <p>b. $\frac{x^{\sin 2y}}{xy}$</p> <p>c. $\frac{-b + \sqrt{b^2 - 4ac}}{2a}$</p> <p>d. $e^x \sin y$</p>	
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4. (10 points) Write a function called `distance` that takes as input four values `x_1`, `y_1`, `x_2`, and `y_2` that specify two Cartesian points (x_1, y_1) and (x_2, y_2) and returns the distance between them computed by using the formula:

$$distance = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

Answer Box:

5. (10 points) Write a **switch** statement that takes the positive integer value `daily_emails_recvd` and prints a message based on the table below:

Number of emails received	Happiness level
0	woebegone
1-2	doleful
3	meloncholy
4-6	average
7	lighthearted
8	tickled
9	chipper
more	ecstatic!

6. (10 points) Write two functions, one that displays a triangle and one that displays a rectangle. Use these functions to write a complete C program from the following outline:

```
int main (void) {
    /* Draw triangle */
    /* Draw rectangle */
    /* Display two blank lines */
    /* Draw triangle */
    /* Draw rectangle */
}
```

7. (10 points) A handicapping system is used to determine the winner in power-lifting competitions. For male body weights over 125 kg and less than or equal to 165 kg, a coefficient C is determined from the following table:

Bodyweight (B)	Coefficient (C)
$125.1 \leq B < 135$	$0.5208 - 0.0012(B - 125)$
$135 \leq B < 145$	$0.5088 - 0.0011(B - 135)$
$145 \leq B < 155$	$0.4978 - 0.0010(B - 145)$
$155 \leq B < 165$	$0.4878 - 0.0009(B - 155)$

Each lifter is then assigned the value

$$C(S + BP + D)$$

where S is the weight lifted in the squat position, BP is the weight bench pressed, and D is the deadlift. The winner is the person with the largest value. Write a program that reads a body weight, squat weight, weight bench pressed, and deadlift for a lifter and prints the value assigned to the lifter.

8. (10 points) Write a program to control a bread machine. Allow the user to input the type of bread as 'W' for White and 'S' for Sweet. Ask the user if the loaf size is double and if the baking is manual. The following table details the time chart for the machine for each bread type. Display a statement for each step. If the loaf size is double, increase the baking time by 50 percent. If the baking is manual, stop after the loaf-shaping cycle and instruct the user to remove the dough for manual baking. Use functions to display instructions to the user and to compute the amount of time necessary to **bake** the bread.

Operation	White Bread	Sweet Bread
Primary kneading	15 mins	20 mins
Primary rising	60 mins	60 mins
Secondary kneading	18 mins	33 mins
Secondary rising	20 mins	30 mins
Loaf shaping	2 seconds	2 seconds
Final rising	75 mins	75 mins
Baking	45 mins	35 mins
Cooling	30 mins	30 mins

9. (10 points) Write a program to compute the sum of the first n terms of the series

$$\sum_{k=0}^{\infty} \frac{1}{k!}$$

Your program should ask the user for the integer n . Compare the value obtained for each number of n with the value of this series, which is $e = 2.718281828....$ *Note that $k!$ stands for the product $\prod_{i=1}^k i$.*

10. (10 points) The ancient Greek mathematician Euclid developed a method for finding the greatest common divisor of two integers, A and B . His method is
- If the remainder of A/B is 0, then B is the greatest common divisor.
 - If it is not 0, then find the remainder of A/B and assign B to A and the remainder to B .
 - Return to step 1. and repeat the process.

Write a program that uses a function to perform this procedure. Display the two integers and the greatest common divisor.

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
Total:	100	