

Homework 1

PROBLEM SOLVING IN C
(CSCE 105, SPRING 2006)

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

Due on 27th February, 2006

8th 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 1-4*), formatted as above
3. The programming portion of the homework (*Problems 5-10*, each program printed on a separate page, formatted as above), and
4. the grade sheet as on the last page.

1. (10 points) Indicate which of the following are valid type `int`, `double`, or `char` constants in C and which are not. Identify the data type of each valid constant, or write `invalid` if it is not a valid data type.

15.0		"X"		'&'	
&		25		3.14	
-0		.1		'q'	
"XYZ"					

2. (10 points) What value is assigned to `x` when `y` is 15.0?

```
(a) x = 25.0;
    if (y != (x - 10.0))
        x = x - 10.0;
    else
        x = x / 2.0;
(b) if (y < 15.0)
    if (y >= 0.0)
        x = 5 * y;
    else
        x = 2 * y;
    else
        x = 3 * y;
(c) if (y < 15.0 && y >= 0.0)
    x = 5 * y;
    else
        x = 2 * y;
```

3. (10 points) Write a program fragment that will read in an integer, a character, and a decimal number from the file named `input.dat` and prints them out into a file named `output.dat`. Declare all of the variables that you use to complete this task.

4. (10 points) Convert the program statements below to take input data and echo it in batch mode.

```
printf("Enter two characters> ");
scanf("%c%c", &c1, &c2);
printf("Enter three integers separated by spaces> ");
scanf("%d%d%d", &n, &m, &p);
```

5. (10 points) Write a program to convert a temperature in degrees Fahrenheit to degrees Celsius, using the equation

$$\text{celsius} = 5/9\text{fahrenheit} - 32 .$$

6. (10 points) Write a program that calculates the acceleration (m/s^2) of a jet fighter launched from an aircraft-carrier catapult, given the jet's takeoff speed in km/hr and the distance (meters) over which the catapult accelerates the jet from rest to takeoff. Assume constant acceleration. Also calculate the time (seconds) for the fighter to be accelerated to takeoff speed. When you prompt the user, be sure to indicate the units for each input. For one run, use a takeoff speed of 278 km/hr and a distance of 94 meters . Relevant formulas (v = velocity, a = acceleration, t = time, s = distance),

$$v = at$$

$$s = \frac{1}{2}at^2$$

7. (10 points) A cyclist coasting on a level road slows from a speed of 10 mi/hr to 2.5 mi/hr in one minute. Write a computer program that calculates the cyclist's constant rate of acceleration and determines how long the cyclist will take to come to rest, given an initial speed of 10 mi/hr . (HINT: Use the equation

$$a = \frac{v_f - v_i}{t}$$

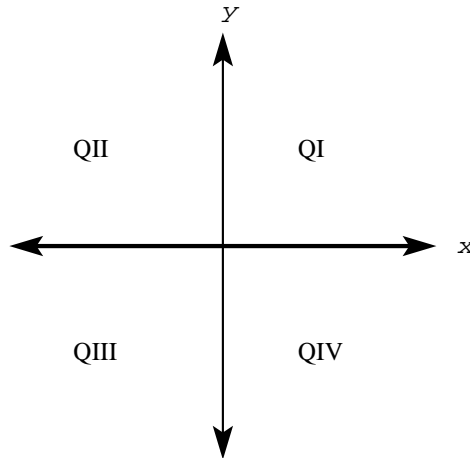
where a is acceleration, t is time interval, v_i is initial velocity, and v_f is final velocity.) Write and call a function that displays instructions to the program user and a function that computes a , given t , v_f , and v_i .

8. (10 points) Write a program that calculates the speed of sound (a) in air of a given temperature $T(^{\circ}\text{F})$. Use the formula:

$$a = 1086 \text{ ft} \sqrt{\frac{5T + 297}{247}}$$

Be sure your program does not lose the fractional part of the quotient in the formula shown. As part of your solution, write and call a function that displays instructions to the program user.

9. (10 points) Write a program that takes the x - y coordinates of a point in the Cartesian plane and prints out a message telling either an axis on which the point lies (x or y) or the quadrant in which it is found.



Sample lines of output:

```
(-1.0, -2.5) is in quadrant III  
(0.0, 4.8) is on the y axis
```

10. (10 points) Write a program that determines the day number (1 to 366) in a year for a date that is provided as input data. As an example, January 1, 1994, is day 1. December 31, 1993, is day 365. December 31, 1996, is day 366, since 1996 is a leap year. A year is a leap year if it is divisible by four, except that any year divisible by 100 is a leap year if it is divisible by 400. Your program should accept the month, day, and year as integers. Include a function `leap` that returns 1 if called with a leap year, 0 otherwise.

Due: February 27th, 2006

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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	