

# Homework 1

PROBLEM SOLVING IN C  
(CSCE 105, SUMMER 2006)

URL: <http://www.cse.unl.edu/~cstrope/csce105su06/>

Due on 14th July, 2006

*9th July, 2006*

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Name :  
Course No : **CSCE105**

## Instructions:

For question 1, fill in the table with the your answers. For questions 2 and 3, put your answer in the provided answer box. For questions 4–10, use a text editor **NOT Microsoft Word** or integrated development environment to type up your program and attach your source code. Also for questions 4–10, email your source code to  
cstrope AT cse DOT unl DOT edu.

1. (10 points)

Indicate which of the following are valid type **int**, **double**, **char** constants in C and which are not. Identify the data type of each valid constant.

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

2. (10 points) What is illegal about the following program fragment?

```
#include <stdio.h>
#define PI 3.14159
int
main(void) {
    double c, r;

    scanf("%lf%lf", c, r);
    PI = c / (2 * r);
    ...
}
```

**Answer Box:**

3. (10 points) Convert the program statements below to take input from the file data.txt 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);
```

**Answer Box:**

4. (10 points) Write a program to convert a temperature in degrees Fahrenheit, entered by the user, to degrees Celsius, using the equation

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

5. (10 points) Write a program that calculates the acceleration ( $\text{m/s}^2$ ) of a jet fighter launched from an aircraft-carrier catapult, given the jet's takeoff speed in  $\text{km/hr}$  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  $278 \text{ km/hr}$  and a distance of  $94 \text{ meters}$ . Relevant formulas ( $v = \text{velocity}$ ,  $a = \text{acceleration}$ ,  $t = \text{time}$ ,  $s = \text{distance}$ ),

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

6. (10 points) Write a program that calculates the speed of sound ( $a$ ) in the 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.

7. (10 points) Write a program that calculates mileage reimbursement for a salesperson at a rate of \$0.35 per mile. Your program should interact with the user in this manner.

#### MILEAGE REIMBURSEMENT CALCULATOR

Enter beginning odometer reading-> **13505.2**

Enter ending odometer reading-> **13810.6**

You traveled 305.4 miles. At \$.35 per mile,  
your reimbursement is \$106.89.

8. (10 points) Write a program that estimates the temperature in a freezer (in  $^{\circ}\text{C}$ ) given the elapsed time (hours) since a power failure. Assume this temperature ( $T$ ) is given by

$$T = \frac{4t^2}{t + 2} - 20$$

where  $t$  is the time since the power failure. Your program should prompt the user to enter how long it has been since the start of the power failure in whole hours and minutes. Note that you will need to convert the elapsed time into hours. For example, if the user entered 2 30 (2 hours and 30 minutes), you would need to convert this to 2.5 hours.

9. (20 points) DNA is a double-stranded molecule composed of four nucleic acids: Cytosine ('C'), Thymine ('T'), Adenine ('A'), and Guanine ('G'). Each nucleic acid on one strand will pair with a complementary nucleic acid on the other strand of DNA; A pairs with T, C pairs with G, and vice-versa. Thus, if we know the sequence of one strand, we can make the complementary strand. Write a program that will open the file "DNA.dat", read in the sequence, convert the sequence into the complementary strand, and write this to the file "DNA\_complement.dat". *You will need to use if statements.*

*Due: July 14, 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	20	
Total:	100	