C Programming lab
Assignment 1

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Payback!

> *A penny saved is a penny earned* – Benjamin Franklin

This is your first C assignment. You may develop your code on your anywhere, but you must ensure it runs correctly on your dedicated system before submission.

Dr. M has gotten into hypermiling, where the game is to achieve significantly better gas mileage compared to EPA estimates. One way of doing this is to use certain gas-saving driving techniques such as *Pulse and Glide* and *Driving with Load*. Another way is to modify the vehicle so that it becomes more efficient. For example, Dr. M installed a high-flow air filter and drilled holes in his vehicle's air box to increase the amount of oxygen going into the engine cylinders. He figures this modification gained him a 3% increase in his fuel efficiency. He paid $56.99 for the filter (the hole drilling was free), but doesn't know if the increase in fuel economy was worth the cost of the filter.

Your task is to determine:

- the yearly cost of gasoline without the modification
- the yearly cost of gasoline with the modification
- how long it takes, in years and days, for his investment to pay off

Program behavior

Your program should prompt the user for the following information:

- the number of miles driven per year (an integer)
- the cost (in dollars) of a gallon of gasoline (a real number)
- the cost of the modification (a real number)
- the mpg before the modification (a real number)
- the mpg after the modification (a real number)

in the order given. It should report:

- the yearly cost of driving without the modification

- the yearly cost of driving with the modification
- the number of years and days it will take to break even on the modification

Program organization

Create a *assign1* directory off of your *home* directory and move into *assign1*.

Name your file *payoff.c*.

Getting the numbers

Here is how to get two numbers and return them:

```
scanf("%d",&m);
scanf("%d",&n);
```

Compliance Instructions

To make sure that you have implemented your program correctly, retrieve test file uploaded in LMS or dropbox. Move the test0 file into your *assign1* directory.

You should then be able to run the following command:

```
cat test0 | ./payoff
```

Using the data in test0, the yearly cost of gasoline, without the modification, should be $1140.00. With the modification, the yearly gas cost should be $1106.80, Finally, the modification should pay for itself in 1 year and 261 days. Don't worry if your costs have more than two decimal places or if your number of days is off by a day or two.

This method of running the program is called "piping in the input from a file". When you actually do this, the prompts your program makes for information will all be strung together on a single line. Don't worry about it; it's a natural consequence of the way the program was run.

If your code fails with a runtime error while running this test, then you will receive a zero for this assignment.

Note that your answers do not have to be correct for your program to be graded, only that it not fail. Of course, correct answers will yield a much higher grade.

HINT: Assume a day is $\frac{1}{365}$ of a year. Truncate the number of days to a whole number.

Challenges

Try to get your program to display output like:

```
2 years and 1 day
1 year and 37 days
49 days
```

instead of:

```
2 years and 1 days
1 years and 37 days
0 years and 49 days
```

Submission Instructions

Change to the *assign1* directory containing your assignment. Do an *ls* command. You should see something like this:

```
payoff.c   test0
```

Extra files are OK. Submit your program like this:

```
submit clab mr assign1 xxxxx
```

Remember to replace `xxxxx` with your iiitb.org email address.

Due Date

The due date for this assignment will be mentioned in the class.