

EECS 10: Assignment 4

October 15, 2004

Due Monday 10/25/2004 12:00pm

1 Time Value of Money [20 points]

Given initial principal amount, monthly payment amount (monthly installment), APR (Annual Percentage Rate), number of years, write a C program that computes and prints the interest and total value at the end of every month. For example, if

Principal Value = \$1200
APR = 1.5% (Floating point value 1.5)
Monthly Payment = \$20
Number of Years = 2

Your program should compute and print following data as below:

no.	year/mo	balance	payment	interest	total
1	1/01	1200.00	20.00	1.50	1221.50
2	1/02	1221.50	20.00	1.53	1243.03
3	1/03	1243.03	20.00	1.55	1264.58
.					
.					
10	1/10	1394.47	20.00	1.74	1416.21
11	1/11	1416.21	20.00	1.77	1437.98
12	1/12	1437.98	20.00	1.80	1459.78
13	2/01	1459.78	20.00	1.82	1481.61
14	2/02	1481.61	20.00	1.85	1503.46
15	2/03	1503.46	20.00	1.88	1525.34
.					
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22	2/10	1657.19	20.00	2.07	1679.26
23	2/11	1679.26	20.00	2.10	1701.36

24	2/12	1701.36	20.00	2.13	1723.49
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Summary:

Total Months	Init. Balance	Tot. Payment	Tot. Interest	Total Balance
24	1200.00	480.00	43.49	1723.49

The first column is the "Number of Month". For example, if the number of years = 2, then this column will run from 1 to 24. If number of years = 5, then it runs from 1 to 60 and so on..

The second column is the year and the month. It starts with 1/1, meaning first year and first month.

The third column is the "balance" at the start of every month. For the very first month Principal Value becomes the "balance". For the subsequent months, previous month's "total" will become the "balance".

The fourth column is the monthly payment which will be constant in this case.

The fifth column is the interest earned by the "balance". The values in this column are computed as:

$$interest = balance * (apr/100)/12$$

The sixth column is the total amount at the end of the month. It is computed as

$$total = balance + payment + interest$$

Implement this problem in C and get the results for the following two cases:

- savings account example: Principal Value = \$1200, APR = 1.5%, monthly deposit = \$20
What is the value after 5 years?
- mortgage example: Borrowed Amount = \$-290000, APR = 6.5%, monthly pament = \$1800
What is the amount still owed to the bank after 10 years?

2 Prime Number Enumeration [20 points + 5 points (extra credit)]

A prime number can only be divided by 1 and itself. Please write a program to print out all prime numbers from 1 to n. The program should ask the user to input the upper bound value, i.e., n. Print at most 6 numbers per line, and keep at least one space between adjacent numbers. The format of the output is shown below:

```

2    3    5    7    11   13
17   19   23   29   31   37
...

```

HINT

In this program, two loops should be used. The outside loop iterates over the potential prime number, i.e., p, from 1 to n, and the inner loop iterates over the divisor, i.e., q, from 2 to (p-1). If p can be divided by q, p is NOT a prime number. Please set n to 1000 when the script file is generated.

For **5 extra credits**: Please propose a more efficient algorithm to search all prime numbers from 1 to n.

3 What to turn in

Use the submission method as for the previous assignments to submit the following files:

- `tvm.c`
- `tvm.script`
- `prime.c`
- `prime.script`
- `prime.extra.txt`