

PAYING OFF CREDIT CARD DEBT

Each month, a credit card statement will come with the option for you to pay a minimum amount of your charge, usually 2% of the balance due. However, the credit card company earns money by charging interest on the balance that you don't pay. So even if you pay credit card payments on time, interest is still accruing on the outstanding balance.

Say you've made a \$5,000 purchase on a credit card with an 18% annual interest rate and a 2% minimum monthly payment rate. If you only pay the minimum monthly amount for a year, how much is the remaining balance?

You can think about this in the following way.

At the beginning of month 0 (when the credit card statement arrives), assume you owe an amount we will call b_0 .

Any payment you make during that month is deducted from the balance. Let's call the payment you make in month 0, p_0 . At the beginning of month 1, the credit card company will charge you interest on your new balance. So if your annual interest rate is r , then at the beginning of month 1, your new balance is your previous balance b_0 less the payment p_0 plus interest on this new balance for the month. In algebra, this new balance would be

$$b_1 = (b_0 - p_0) \cdot \left(1 + \frac{r}{12}\right)$$

In month 1, we will make another payment, p_1 . That payment has to cover some of the interest costs, so it does not completely go towards paying off the original charge, and thus at the beginning of month 2, our balance would be

$$b_2 = (b_1 - p_1) \cdot \left(1 + \frac{r}{12}\right)$$

If you choose just to pay off the minimum monthly payment each month, you will see that the compound interest will dramatically reduce your ability to lower your debt.

For example, if the minimum monthly payment is 2% of the current balance, we would have

| Month | Balance | Payment | Interest |
|-------|--------------------------------|--------------------------|---------------------------------------|
| 0 | 5000.00 | 100 (= 5000 * 0.02) | 73.50 (= (5000 - 100) * 0.18/12) |
| 1 | 4973.50 (= 5000 - 100 + 73.50) | 99.47 (= 4973.50 * 0.02) | 73.11 (= (4973.50 - 99.47) * 0.18/12) |

You can see that a lot of your payment is going to cover interest, and if you work this through, you will see that after a year, you will have paid \$1165.63 and yet you will still owe \$4691.11 on what was originally a \$5000.00 debt. Pretty depressing!

PROBLEM 1: PAYING THE MINIMUM : 10.0 POINTS

Write a program to calculate the credit card balance after one year if a person only pays the minimum monthly payment required by the credit card company each month.

The following variables contain values as described below:

1. `balance` - the outstanding balance on the credit card
2. `annualInterestRate` - annual interest rate as a decimal
3. `monthlyPaymentRate` - minimum monthly payment rate as a decimal

For each month, calculate statements on the monthly payment and remaining balance, and print to screen something of the format:

```
Month: 1  
Minimum monthly payment: 96.0  
Remaining balance: 4784.0
```

Be sure to print out no more than two decimal digits of accuracy - so print

```
Remaining balance: 813.41
```

instead of

```
Remaining balance: 813.4141998135
```

Finally, print out the total amount paid that year and the remaining balance at the end of the year in the format:

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```
Total paid: 96.0  
Remaining balance: 4784.0
```

A summary of the required math is found below:

Monthly interest rate = (Annual interest rate) / 12

Minimum monthly payment = (Minimum monthly payment rate) x (Previous balance)

Updated balance each month = (Previous balance - Minimum monthly payment) x (1 + Monthly interest rate)