

CS29206 Systems Programming Laboratory

Second Programming Assignment

Topic: Programming in gawk

Last Date of Submission: 20-March-2022

You have a bank account in the Foo Pradesh Bank of Barland. Your account starts with an opening balance on a date. After that, your account undergoes a sequence of transactions. The transactions are as follows.

Debit transactions

You make ATM withdrawals, e-payments to merchants, and bank transfers to other accounts.

Credit transactions

Your salary is deposited to your account on the first day of every month.

On December 31 of every year, the bank deposits (yearly) interest to your account. The interest rate is constant (5% per annum). If your account balance is B for n consecutive days, the interest is computed at the rate of 5% for n days. If your balance changes to B' because of a debit from or a credit to your account, the interest will be calculated on the updated balance for as long as the balance remains B' . However, the interest is not deposited to your account until the last day of the year. The interest should be maintained as a floating-point value. While depositing, the bank converts it to the nearest integer by rounding. After this, your yearly interest for the next year is reset to zero. Notice that the per-day interest is slightly lower in a leap year than it is in a non-leap year.

You need to update your passbook from time to time. Your bank maintains your account details in a central server. However, for passbook printing at your local branch, the local server does not contact the central server. The local server instead keeps a copy of your transactions in a text file *account.txt*. This file is always kept sorted in the increasing order of the transaction dates. Each line of the file is a record of five fields separated by colons.

Date:Credit Amount:Debit Amount:Balance:Type of transaction

When you open your account, only the following line is added to *account.txt*:

```
22-10-2019:::31201:ACCOUNT OPENED
```

This line means that you open your account on Oct 22, 2019 with an opening balance of 31201. After that, you make transactions to/from your account. These transactions are stored in the file *account.txt* without the balance being calculated. For example, consider the following transactions on the first few days after opening the account. Each transaction is either a credit transaction or a debit transaction, that is, exactly one of the second and the third fields in each line should contain a positive integer, and the other field would be empty. The file *account.txt* looks as follows.

```
22-10-2019:::31201:ACCOUNT OPENED
01-11-2019:61872:::SALARY
02-11-2019::6924::EPAY TO MERCHANT
06-11-2019::7000::ATM WITHDRAWAL
08-11-2019::6160::BANK TRANSFER
22-11-2019::4000::ATM WITHDRAWAL
01-12-2019:61872:::SALARY
03-12-2019::2467::BANK TRANSFER
17-12-2019::4196::EPAY TO MERCHANT
19-12-2019::3036::EPAY TO MERCHANT
23-12-2019::4148::EPAY TO MERCHANT
29-12-2019::2938::BANK TRANSFER
01-01-2020:62832:::SALARY
01-01-2020::4684::EPAY TO MERCHANT
14-01-2020::11000::ATM WITHDRAWAL
17-01-2020::11000::ATM WITHDRAWAL
```

The gray entries do not have the balance field filled up. Moreover, this file does *not* store the interest paid by the bank on the last day of 2019 until you update your passbook. When you update your passbook, all the missing balances are calculated, and the interest(s) deposited (if any) at the end of the year(s) is/are also added. Therefore, if you update your passbook on January 20, 2020, the file *account.txt* updates as follows (assume that there are no transactions after January 17, 2020). The new items added are highlighted in red. The last line printed in italics is not added to *account.txt*.

```

22-10-2019:::31201:ACCOUNT OPENED
01-11-2019:61872::93073:SALARY
02-11-2019::6924:86149:EPAY TO MERCHANT
06-11-2019::7000:79149:ATM WITHDRAWAL
08-11-2019::6160:72989:BANK TRANSFER
22-11-2019::4000:68989:ATM WITHDRAWAL
01-12-2019:61872::130861:SALARY
03-12-2019::2467:128394:BANK TRANSFER
17-12-2019::4196:124198:EPAY TO MERCHANT
19-12-2019::3036:121162:EPAY TO MERCHANT
23-12-2019::4148:117014:EPAY TO MERCHANT
29-12-2019::2938:114076:BANK TRANSFER
31-12-2019:859::114935:INTEREST
01-01-2020:62832::177767:SALARY
01-01-2020::4684:173083:EPAY TO MERCHANT
14-01-2020::11000:162083:ATM WITHDRAWAL
17-01-2020::11000:151083:ATM WITHDRAWAL
+++ Interest of this year up to the last transaction = 374

```

Notice that the passbook printer, in addition to computing the balance after every transaction, also computes the interest that you get in 2019, and adds a credit entry with the date 31-12-2019. The last line is not for storing in the file *account.txt*. You may consider this as a user message shown to you on the display of the passbook-printing machine.

Suppose that you make some other transactions after this passbook printing, and the file *account.txt* now stores the following records.

```

22-10-2019:::31201:ACCOUNT OPENED
01-11-2019:61872::93073:SALARY
02-11-2019::6924:86149:EPAY TO MERCHANT
06-11-2019::7000:79149:ATM WITHDRAWAL
08-11-2019::6160:72989:BANK TRANSFER
22-11-2019::4000:68989:ATM WITHDRAWAL
01-12-2019:61872::130861:SALARY
03-12-2019::2467:128394:BANK TRANSFER
17-12-2019::4196:124198:EPAY TO MERCHANT
19-12-2019::3036:121162:EPAY TO MERCHANT
23-12-2019::4148:117014:EPAY TO MERCHANT
29-12-2019::2938:114076:BANK TRANSFER
31-12-2019:859::114935:INTEREST
01-01-2020:62832::177767:SALARY
01-01-2020::4684:173083:EPAY TO MERCHANT
14-01-2020::11000:162083:ATM WITHDRAWAL
17-01-2020::11000:151083:ATM WITHDRAWAL
24-01-2020::10000::ATM WITHDRAWAL
01-02-2020:62832:::SALARY
08-02-2020::6000::ATM WITHDRAWAL
12-02-2020::8667::EPAY TO MERCHANT
24-02-2020::6357::BANK TRANSFER
27-02-2020::9383::BANK TRANSFER
01-03-2020:62832:::SALARY

```

The balances made after the last passbook printing are not calculated. On March 05, 2020, you update your passbook again. At this point, the balances are updated, and the records are changed as follows. The new items added are again highlighted in red. The interest is calculated but not deposited because that is done only once at the end of the year.

```

22-10-2019:::31201:ACCOUNT OPENED
01-11-2019:61872::93073:SALARY
02-11-2019::6924:86149:EPAY TO MERCHANT
06-11-2019::7000:79149:ATM WITHDRAWAL
08-11-2019::6160:72989:BANK TRANSFER

```

```

22-11-2019::4000:68989:ATM WITHDRAWAL
01-12-2019:61872::130861:SALARY
03-12-2019::2467:128394:BANK TRANSFER
17-12-2019::4196:124198:EPAY TO MERCHANT
19-12-2019::3036:121162:EPAY TO MERCHANT
23-12-2019::4148:117014:EPAY TO MERCHANT
29-12-2019::2938:114076:BANK TRANSFER
31-12-2019:859::114935:INTEREST
01-01-2020:62832::177767:SALARY
01-01-2020::4684:173083:EPAY TO MERCHANT
14-01-2020::11000:162083:ATM WITHDRAWAL
17-01-2020::11000:151083:ATM WITHDRAWAL
24-01-2020::10000:141083:ATM WITHDRAWAL
01-02-2020:62832::203915:SALARY
08-02-2020::6000:197915:ATM WITHDRAWAL
12-02-2020::8667:189248:EPAY TO MERCHANT
24-02-2020::6357:182891:BANK TRANSFER
27-02-2020::9383:173508:BANK TRANSFER
01-03-2020:62832::236340:SALARY
+++ Interest of this year up to the last transaction = 1432

```

Your task is to write the software for the passbook printer. You use the gawk programming language to that effect. Your program named *update.awk* should do the following.

1. Read the file *account.txt* which stores the transactions in the increasing sequence of dates. The date of the last passbook printing is not stored. Once a blank entry is located in the balance field in a record, all the remaining input lines starting from this line have blank balance entries.
2. If there are no new entries that need updates, a user message is displayed as follows.

```
+++ No new transactions found
```

On the other hand, if there are entries that need updates, the following user message is printed. Also, the last balance before the first new transaction is printed (see the last page).

```
+++ New transactions found
```

3. The updated lines including new balances calculated and interests deposited (if any) are printed as user messages. Use the format as described in the sample output shown on the last page.
4. The interest accrued so far is also printed as the last user message.
5. The old *account.txt* file is replaced by a new file (with the same name) to store the new records starting from the day of opening the account and ending at the last transaction.

Assume that all user messages go to your terminal. That includes the beginning line in 2, the previous balance, all updated lines of 3 (do not print the lines that are updated earlier), and the final interest notification of 4. In a real-life situation, you should also have a printer interface for writing the new lines (in some format) to your passbook, but you do not have to do this.

Submit a single file *update.awk* which should be an executable gawk script. This should be run as

```
$ ./update.awk account.txt
```

without any redirection. The program should print the user messages to your terminal, and overwrite the old file *account.txt*.

The behavior of your program for the second example of passbook printing mentioned earlier is given on the next page. Some other sample input files will be provided in the course website.

The input file *account.txt*

```
22-10-2019:::31201:ACCOUNT OPENED
01-11-2019:61872:::93073:SALARY
02-11-2019::6924:86149:EPAY TO MERCHANT
06-11-2019::7000:79149:ATM WITHDRAWAL
08-11-2019::6160:72989:BANK TRANSFER
22-11-2019::4000:68989:ATM WITHDRAWAL
01-12-2019:61872:::130861:SALARY
03-12-2019::2467:128394:BANK TRANSFER
17-12-2019::4196:124198:EPAY TO MERCHANT
19-12-2019::3036:121162:EPAY TO MERCHANT
23-12-2019::4148:117014:EPAY TO MERCHANT
29-12-2019::2938:114076:BANK TRANSFER
31-12-2019:859:::114935:INTEREST
01-01-2020:62832:::177767:SALARY
01-01-2020::4684:173083:EPAY TO MERCHANT
14-01-2020::11000:162083:ATM WITHDRAWAL
17-01-2020::11000:151083:ATM WITHDRAWAL
24-01-2020::10000:::ATM WITHDRAWAL
01-02-2020:62832:::SALARY
08-02-2020::6000:::ATM WITHDRAWAL
12-02-2020::8667:::EPAY TO MERCHANT
24-02-2020::6357:::BANK TRANSFER
27-02-2020::9383:::BANK TRANSFER
01-03-2020:62832:::SALARY
```

What your program should print

```
+++ New transactions found
Last balance = 151083
January 24, 2020      Debit of 10000 for ATM WITHDRAWAL      Balance = 141083
February 01, 2020    Credit of 62832 for SALARY             Balance = 203915
February 08, 2020    Debit of 6000 for ATM WITHDRAWAL      Balance = 197915
February 12, 2020    Debit of 8667 for EPAY TO MERCHANT    Balance = 189248
February 24, 2020    Debit of 6357 for BANK TRANSFER      Balance = 182891
February 27, 2020    Debit of 9383 for BANK TRANSFER      Balance = 173508
March 01, 2020      Credit of 62832 for SALARY            Balance = 236340
+++ Interest of this year up to the last transaction = 1432
```

The updated file *account.txt*

```
22-10-2019:::31201:ACCOUNT OPENED
01-11-2019:61872:::93073:SALARY
02-11-2019::6924:86149:EPAY TO MERCHANT
06-11-2019::7000:79149:ATM WITHDRAWAL
08-11-2019::6160:72989:BANK TRANSFER
22-11-2019::4000:68989:ATM WITHDRAWAL
01-12-2019:61872:::130861:SALARY
03-12-2019::2467:128394:BANK TRANSFER
17-12-2019::4196:124198:EPAY TO MERCHANT
19-12-2019::3036:121162:EPAY TO MERCHANT
23-12-2019::4148:117014:EPAY TO MERCHANT
29-12-2019::2938:114076:BANK TRANSFER
31-12-2019:859:::114935:INTEREST
01-01-2020:62832:::177767:SALARY
01-01-2020::4684:173083:EPAY TO MERCHANT
14-01-2020::11000:162083:ATM WITHDRAWAL
17-01-2020::11000:151083:ATM WITHDRAWAL
24-01-2020::10000:141083:ATM WITHDRAWAL
01-02-2020:62832:::203915:SALARY
08-02-2020::6000:197915:ATM WITHDRAWAL
12-02-2020::8667:189248:EPAY TO MERCHANT
24-02-2020::6357:182891:BANK TRANSFER
27-02-2020::9383:173508:BANK TRANSFER
01-03-2020:62832:::236340:SALARY
```

If you run *update.awk* again before any other transactions, your program should print:

```
+++ No new transactions found
+++ Interest of this year up to the last transaction = 1432
```

Moreover, the updated *account.txt* will be identical to its input (that is, pre-update) version.