Bitcoin transaction tracking

Bitcoin is a crypto-currency which uses cryptographic techniques to track the ownership of virtual coins having different values. The central data structure of bitcoin is a so-called "block chain"; a public but hard-to-forge list of transactions.

Each virtual coin has a unique identifier. A bitcoin transaction consumes some number of coins, and produces a collection of coins, each with their own value. If a transaction produces more value than it consumes, then it is a "mining transaction": the owner of the resulting coins must do some computational work to generate the produced coins. If the value of the consumed coins is at least as much as the value of the produced coins, then the transaction simply transfers value from one set of coins to another; the difference between the input value and the output value is the "transaction fee", which pays for the cost of maintaining the bitcoin infrastructure.

Transactions are grouped into blocks; blocks are simply collections of transactions that are processed as a group by the bitcoin infrastructure.

For this problem, you will take as input a file containing a list of blocks, and output the identifiers of any bitcoins that have remaining value after all transactions are processed.

Sample data

In the `data/` directory, we have provided some sample data for you to play with. These are not real bitcoin blocks, they are a simplification of the data containing only the information you need to solve the problem.

Each line of the files represents a block. It has the format

```
<id>@<id>@<number of transactions> <transaction 1> <transaction 2> ...
```

The block id is repeated for historical reasons.

Each transaction has the form

```
<number of input coins> <number of output coins>
  <input 1> <input 2> ...
  <output 1> <value 1> <output 2> <value 2> ...
```

For example, the line

```
13@13@2 1 1 cbQLTF 4S14K 50000 0 2 3PMB3 10000 FMXRn 10000
```

represents block number 13, which contains two transactions. The first of these transactions consumes one coin (with id cbQLTF) and produces one coin (with id 4S14K and value 50000). The second transaction consumes zero coins, and produces two coins (coin 3PMB3 with value 10000 and coin FMXRn also with value 10000).

After processing this block, coin cbQLTF will have no value, while the other 3 coins will have value.

Real bitcoin

If you are curious, we encourage you to investigate the real bitcoin protocol, and implement this or any other bitcoin related computation instead.