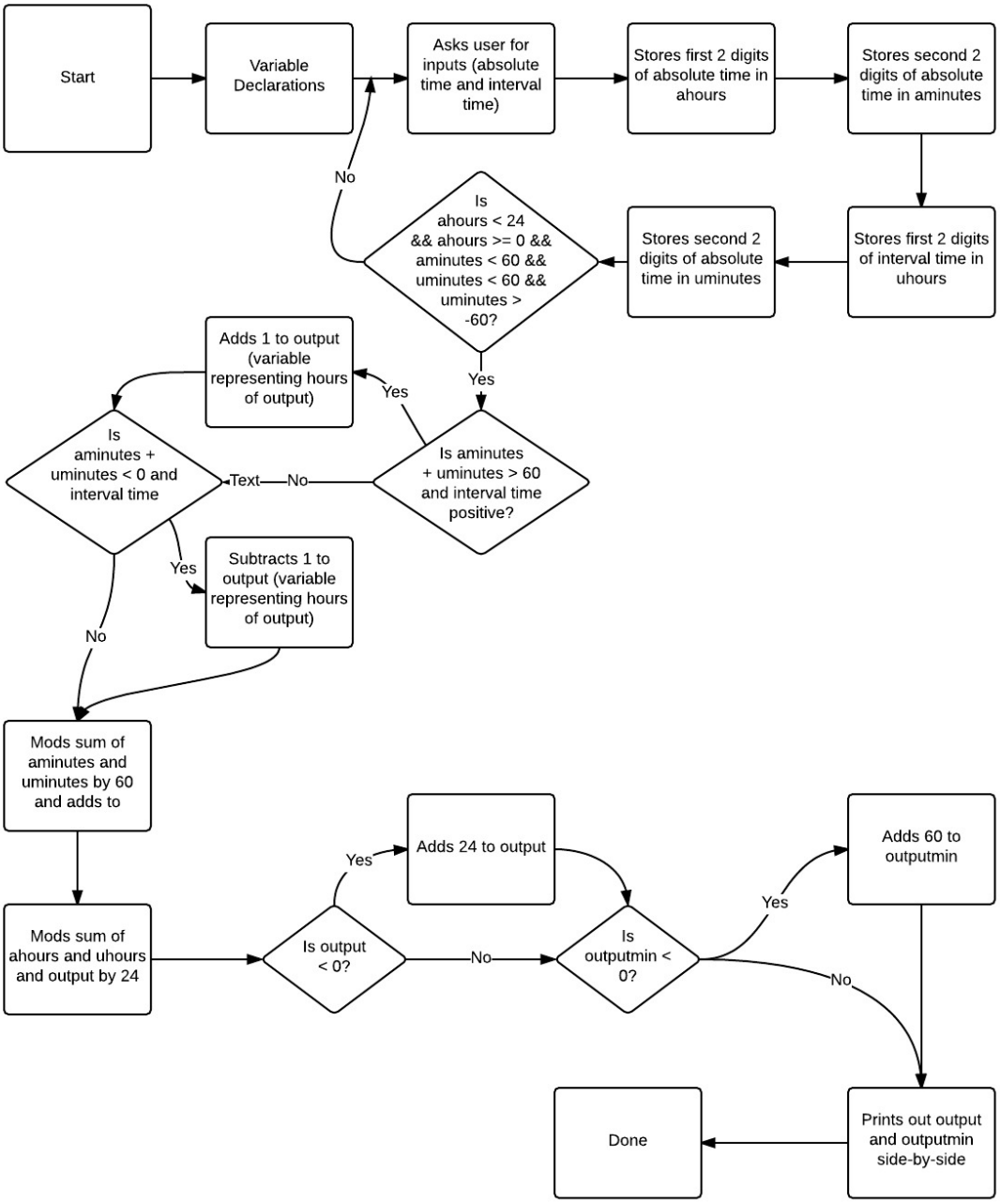
Program 1

```
/*
 *Program to compute times on a 24-hour clock
 *Author: Jeet Chakrabarty
 */
#include <stdio.h>

int main()
{
 //Variable declarations
 int day, duration, aminutes, ahours, uminutes, uhours;
 int boolean = 0, output = 0, outputmin = 0;

 //Input loop
 while (boolean == 0){
      //While loop repeats until valid input in accepted
      printf ("Enter a value to represent the time of day:\t");
      scanf ("%d", &day );
      printf ("Enter a value to represent time duration:\t");
      scanf ("%d", &duration );
      //Stores first 2 digits (hours) in a variable
      ahours = day / 100;
      //Stores second 2 digits (minutes) in a variable
      aminutes = day % 100;
      uminutes = duration % 100;
      uhours = duration / 100;
      if(ahours < 24 && ahours >= 0 && aminutes < 60 && uminutes < 60 &&
uminutes > -60) {
            //Checks if all numbers are valid
            boolean = 1;
            //Changing Boolean value results in loop stopping execution
      }
 }
 if (duration > 0 && aminutes + uminutes >= 60){
      //Adds 1 hour if sum of minutes totals an hour or more
      output = output + 1;
 }
 if (duration < 0 && aminutes + uminutes < 0){
      //Subtracts 1 hour if difference of minutes is less than 0
      output = output - 1;
 }
 //Calculates last 2 digits of output time
 outputmin = outputmin + (aminutes + uminutes) % 60;
 //Calculates first 2 digits of output time
 output = (output + (ahours + uhours) ) % 24;
 //Adds 24 hours if modulo hours results in negative number
 if (output < 0)
      output = output + 24;
 //Adds 60 minutes if modulo minutes results in negative number
 if (outputmin < 0)
      outputmin = outputmin + 60;
 printf("The final time of day is:\t\t\t%.2d%.2d \n", output, outputmin);
 return 0;
```

```
}

jeet@Jeet-PC:~/Downloads$ ./Program1
Enter a value to represent the time of day:      6420
Enter a value to represent time duration:  -456
Enter a value to represent the time of day:      2064
Enter a value to represent time duration:  +456
Enter a value to represent the time of day:      456
Enter a value to represent time duration:  +2064
Enter a value to represent the time of day:      456
Enter a value to represent time duration:  +500
The final time of day is:             0956
jeet@Jeet-PC:~/Downloads$ ./Program1
Enter a value to represent the time of day:      1234
Enter a value to represent time duration:  +3750
The final time of day is:             0224
jeet@Jeet-PC:~/Downloads$ ./Program1
Enter a value to represent the time of day:      1234
Enter a value to represent time duration:  -3750
The final time of day is:             2244
jeet@Jeet-PC:~/Downloads$ ./Program1
Enter a value to represent the time of day:      1234
Enter a value to represent time duration:  -1250
The final time of day is:             2344
jeet@Jeet-PC:~/Downloads$ ./Program1
Enter a value to represent the time of day:      123
Enter a value to represent time duration:  +456
The final time of day is:             0619
jeet@Jeet-PC:~/Downloads$ ./Program1
Enter a value to represent the time of day:      3
Enter a value to represent time duration:  +4
The final time of day is:             0007
```

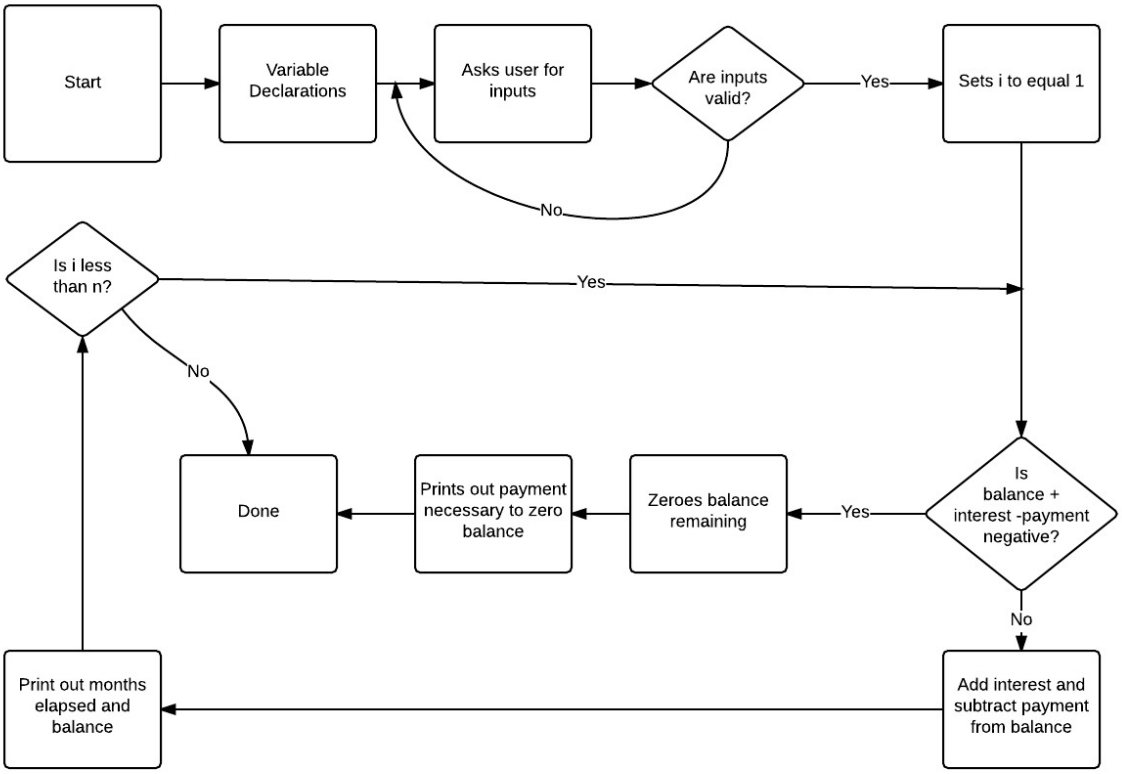

Start
Variable Declarations
Asks user for inputs (absolute time and interval time)
Stores first 2 digits of absolute time in ahours
Stores second 2 digits of absolute time in aminutes
Stores first 2 digits of interval time in uhours
Stores second 2 digits of absolute time in uminutes
Is ahours < 24 && ahours >= 0 && aminutes < 60 && uminutes < 60 && uminutes > -60?
No
Yes
Is aminutes + uminutes > 60 and interval time positive?
Yes
Adds 1 to output (variable representing hours of output)
Is aminutes + uminutes < 0 and interval time
Text
No
Yes
Subtracts 1 to output (variable representing hours of output)
No
Mods sum of aminutes and uminutes by 60 and adds to
Mods sum of ahours and uhours and output by 24
Is output < 0?
Yes
Adds 24 to output
No
Is outputmin < 0?
Yes
Adds 60 to outputmin
No
Prints out output and outputmin side-by-side
Done

Program2

```
/*
 * Program to compute loan balances
 * Author: Jeet Chakrabarty
 */

#include <stdio.h>

int main()
{
 //Variable Declarations
 float amount, interest, monthlyp;
 int n, boolean = 0, i = 0;

 //While loop for input
 while (boolean == 0){
     //Loops continues to execute until valid input is obtained
     printf ("Enter the loan amount:\t");
     scanf ("%f", &amount );
     printf ("Enter the yearly interest rate (If 12%% type 0.12):\t");
     scanf ("%f", &interest );
     printf ("Enter the monthly payment:\t");
     scanf ("%f", &monthlyp );
     printf ("Enter the number of monthly payments:\t");
     scanf ("%d", &n );
     //Checks if inputs are valid inputs
     if(amount > 0 && interest > 0 && monthlyp > 0 && n > 0)
          //Chenges boolean to exit loop
          boolean = 1;
 }
 for (i = 1; i <= n; i++){
     //Checks if difference between balance and payment is less than 0
     if (amount*(1+interest/12)-monthlyp < 0) {
          //Changes amount to 0
          amount = 0;
          //Prints specified output (2nd is amount paid to zero account)
          printf("\t %d \t \t \t %.2f \n", i,amount*(1+interest/12));
          break;
     }
     else {
          //Calculates account balance after interest and payment
          amount = amount*(1+interest/12)-monthlyp;
          printf("\t %d \t \t \t %.2f \n", i,amount);
     }
 }
 return 0;
}
```

```
jeet@Jeet-PC:~/Downloads$ ./Program2
Enter the loan amount:     12345
Enter the yearly interest rate (If 12% type 0.12):    0.12
Enter the monthly payment: 1234
Enter the number of monthly payments: 15
       1               11234.45
       2               10112.79
       3               8979.92
       4               7835.72
       5               6680.08
       6               5512.88
       7               4334.01
       8               3143.35
       9               1940.78
       10              726.19
       11              0.00
jeet@Jeet-PC:~/Downloads$ ./Program2
Enter the loan amount:     12345
Enter the yearly interest rate (If 12% type 0.12):    0.12
Enter the monthly payment: 543.21
Enter the number of monthly payments: 15
       1               11925.24
       2               11501.28
       3               11073.08
       4               10640.61
       5               10203.80
       6               9762.63
       7               9317.05
       8               8867.01
       9               8412.47
       10              7953.38
       11              7489.70
       12              7021.39
       13              6548.40
       14              6070.67
       15              5588.17
jeet@Jeet-PC:~/Downloads$ ./Program2
Enter the loan amount:     54321
Enter the yearly interest rate (If 12% type 0.12):    0.12
Enter the monthly payment: 543.21
Enter the number of monthly payments: 15
       1               54321.00
       2               54321.00
       3               54321.00
       4               54321.00
       5               54321.00
       6               54321.00
       7               54321.00
       8               54321.00
       9               54321.00
       10              54321.00
       11              54321.00
       12              54321.00
       13              54321.00
```

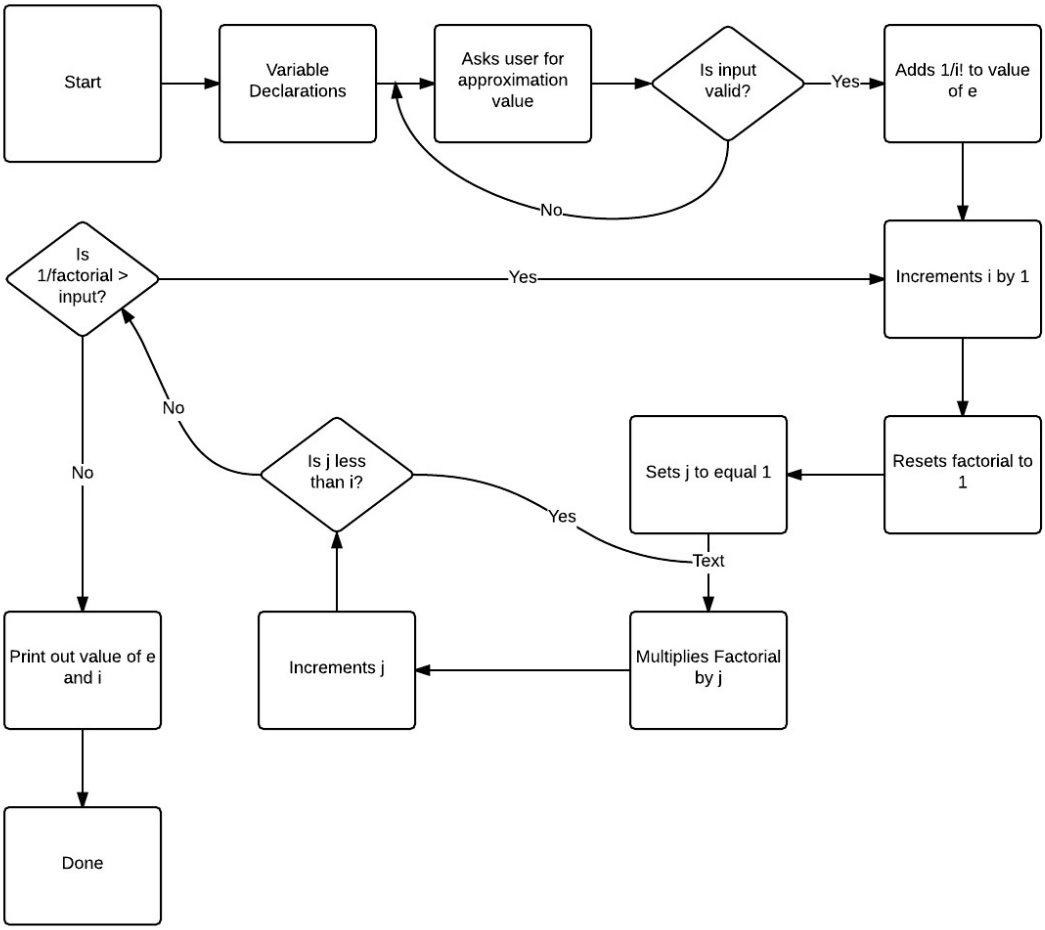
```
      14              54321.00
      15              54321.00
jeet@Jeet-PC:~/Downloads$ ./Program2
Enter the loan amount:     54321
Enter the yearly interest rate (If 12% type 0.12):    0.12
Enter the monthly payment: 321
Enter the number of monthly payments: 15
      1               54543.21
      2               54767.64
      3               54994.32
      4               55223.26
      5               55454.49
      6               55688.03
      7               55923.91
      8               56162.15
      9               56402.77
      10              56645.80
      11              56891.25
      12              57139.16
      13              57389.55
      14              57642.45
      15              57897.88
```


Start
Variable Declarations
Asks user for inputs
Are inputs valid?
Yes
No
Sets i to equal 1
Is i less than n?
Yes
No
Done
Prints out payment necessary to zero balance
Zeroes balance remaining
Yes
Is balance + interest -payment negative?
No
Print out months elapsed and balance
Add interest and subtract payment from balance

Program 3

```
/*
 * Program to approximate value of e
 * Author: Jeet Chakrabarty
 */

#include <stdio.h>

int main()
{
 //Variable declarations
 double n, e = 0;
 int boolean = 0, factorial = 1, i = 0, j;

 //Loop for valid input
 while (boolean == 0){
     printf ("Enter the value of approximation:\t");
     scanf ("%lf", &n );
     //Changes value of boolean to exit loop when condition met
     if(n > 0)
          boolean = 1;
 }

 //loop executes until 1/n! is less than input specified by user
 while (1/(double)factorial > n) {
     //Adds next term to e
     e = e + 1/(double)factorial;
     //Increments i
     i++;
     //Resets factorial value
     factorial = 1;
     //Loop to calculate factorial
     for (j = 1; j <= i; j++){
          factorial = factorial*j;
     }
 }
 printf ("The value of e is:\t %.15lf and the value of i is: \t %d\n", e,
i);
 return 0;
}
```

```
jeet@Jeet-PC:~/Downloads$ ./Program3
Enter the value of approximation:     0.01
The value of e is:     2.708333333333333 and the value of i is:   5
jeet@Jeet-PC:~/Downloads$ ./Program3
Enter the value of approximation:     0.001
The value of e is:     2.718055555555555 and the value of i is:   7
jeet@Jeet-PC:~/Downloads$ ./Program3
Enter the value of approximation:     0.0001
The value of e is:     2.718253968253968 and the value of i is:   8
jeet@Jeet-PC:~/Downloads$ ./Program3
Enter the value of approximation:     0.00001
The value of e is:     2.718278769841270 and the value of i is:   9
jeet@Jeet-PC:~/Downloads$ ./Program3
Enter the value of approximation:     0.000001
The value of e is:     2.718281525573192 and the value of i is:   10
jeet@Jeet-PC:~/Downloads$ ./Program3
Enter the value of approximation:     0.0000001
The value of e is:     2.718281801146385 and the value of i is:   11
jeet@Jeet-PC:~/Downloads$ ./Program3
Enter the value of approximation:     0.00000001
The value of e is:     2.718281826198493 and the value of i is:   12
jeet@Jeet-PC:~/Downloads$ ./Program3
Enter the value of approximation:     0.000000001
The value of e is:     2.718281828286169 and the value of i is:   13
jeet@Jeet-PC:~/Downloads$ ./Program3
Enter the value of approximation:     0.0000000001
The value of e is:     2.718281830583527 and the value of i is:   17
jeet@Jeet-PC:~/Downloads$ ./Program3
Enter the value of approximation:     0.00000000001
The value of e is:     2.718281830583527 and the value of i is:   17
```


Start
Variable Declarations
Asks user for approximation value
Is input valid?
Yes
No
Adds 1/i! to value of e
Increments i by 1
Resets factorial to 1
Sets j to equal 1
Is 1/factorial > input?
Yes
No
Is j less than i?
No
Yes
Text
Multiplies Factorial by j
Increments j
Print out value of e and i
Done