BT- Testing

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BT1

Write test cases for below method specification

X,Y,Z is integer
START
・Check the value of X input
　　→If is 1 or 2
　　　　→Return A
　　→Else
　　　　・Check the value of Y input
　　　　　　→If Y <=10
　　　　　　　　→Return B
　　　　　　→Else
　　　　　　　　・Check the value of Z input
　　　　　　　　　　→If Z <5
　　　　　　　　　　　　→Return C
　　　　　　　　　　→Else
　　　　　　　　　　　　→Return D
END

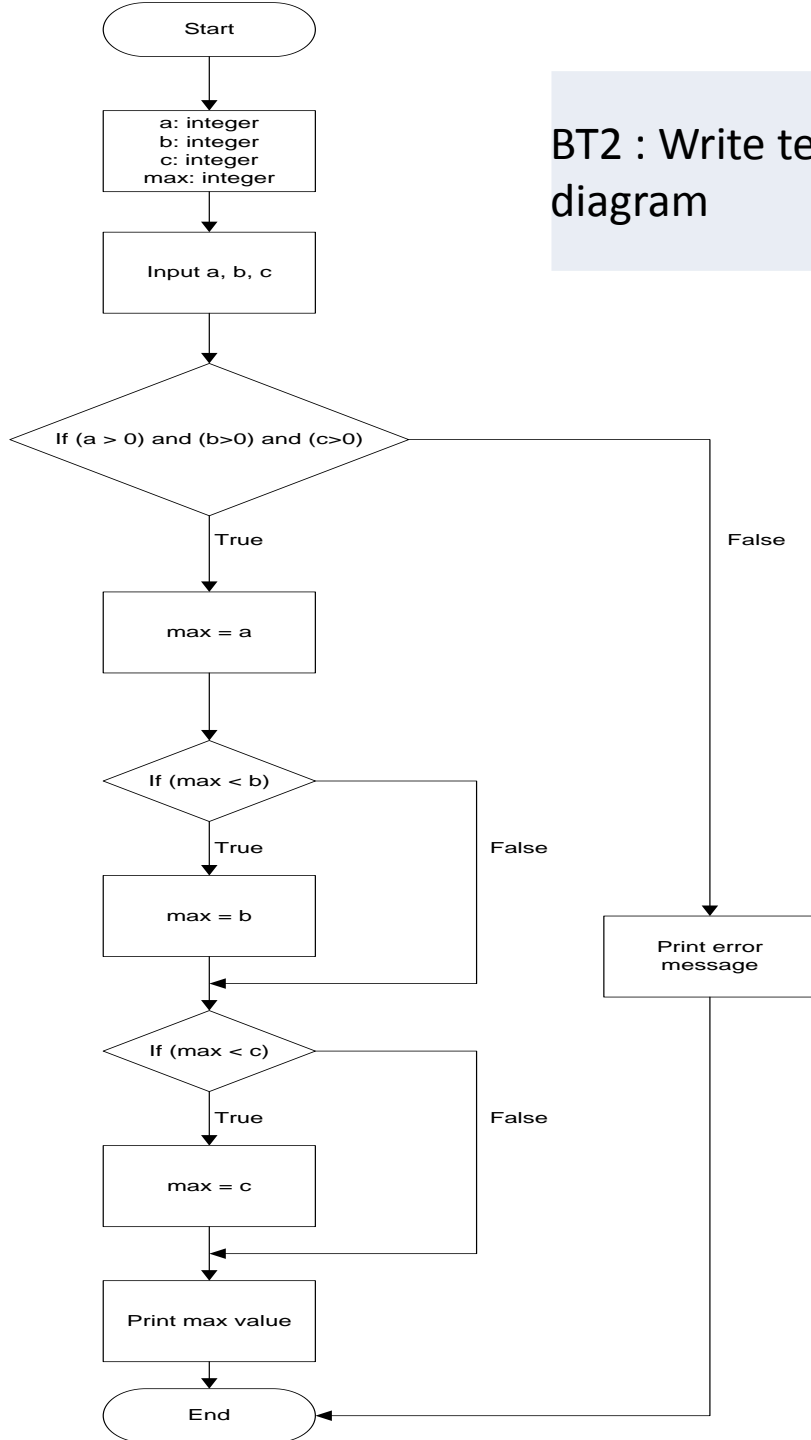| No	Input	Expected result	Type of test cases

DatV1:
Normal
Boundary
Abnormal

Answer (Number of test cases is at least 7)

No	Input	Expected result	Type of test cases
1	X=1	A	Normal
2	X=2	A	Normal
3	X=5,Y=9	B	Normal
4	X=5,Y=10	B	Boundary
5	X=5,Y=15,Z=4	C	Normal
6	X=5,Y=15,Z=5	D	Boundary
7	X=5,Y=15,Z=6	D	Normal

```
                    ┌─────────────┐
                    │    Start    │
                    └──────┬──────┘
                           │
                    ┌──────▼──────┐
                    │  a: integer │
                    │  b: integer │
                    │  c: integer │
                    │ max: integer│
                    └──────┬──────┘
                           │
                    ┌──────▼──────┐
                    │ Input a, b, c│
                    └──────┬──────┘
                           │
              ◇ If (a > 0) and (b>0) and (c>0) ◇────── False
                           │ True
                    ┌──────▼──────┐
                    │   max = a   │
                    └──────┬──────┘
                           │
                    ◇ If (max < b) ◇────── False
                           │ True
                    ┌──────▼──────┐
                    │   max = b   │
                    └──────┬──────┘
                           │
                    ◇ If (max < c) ◇────── False
                           │ True
                    ┌──────▼──────┐
                    │   max = c   │
                    └──────┬──────┘
                           │
                    ┌──────▼──────┐
                    │Print max value│
                    └──────┬──────┘
                           │
                    ┌──────▼──────┐
                    │     End     │
                    └─────────────┘
```

BT2 : Write test cases to cover all execution paths in the diagram

Print error message

Answer

We need 7 test cases to cover all paths (white-box):

1. a <= 0print error
2. a > 0, b <= 0print error
3. a > 0, b > 0, c <= 0print error
4. a > 0, b > 0, c > 0, a < b, b >= cprint b
5. a > 0, b > 0, c > 0, a < b, b < cprint c
6. a > 0, b > 0, c > 0, a >=b, a >= cprint a
7. a > 0, b > 0, c > 0, a >=b, a < cprint c

Note: Day la thuat toan tim so lon nhat trong 3 so a,b,c

BT3

Write test cases for bellow class implements arithmetic operations for integer numbers

```
START
`
    int retInt = 0;
    if (num1 != 0 && num2 != 0) {
        retInt = num1 % num2;
    }


    return retInt;
}
END
```

Answer (Number of test cases is at least 4)

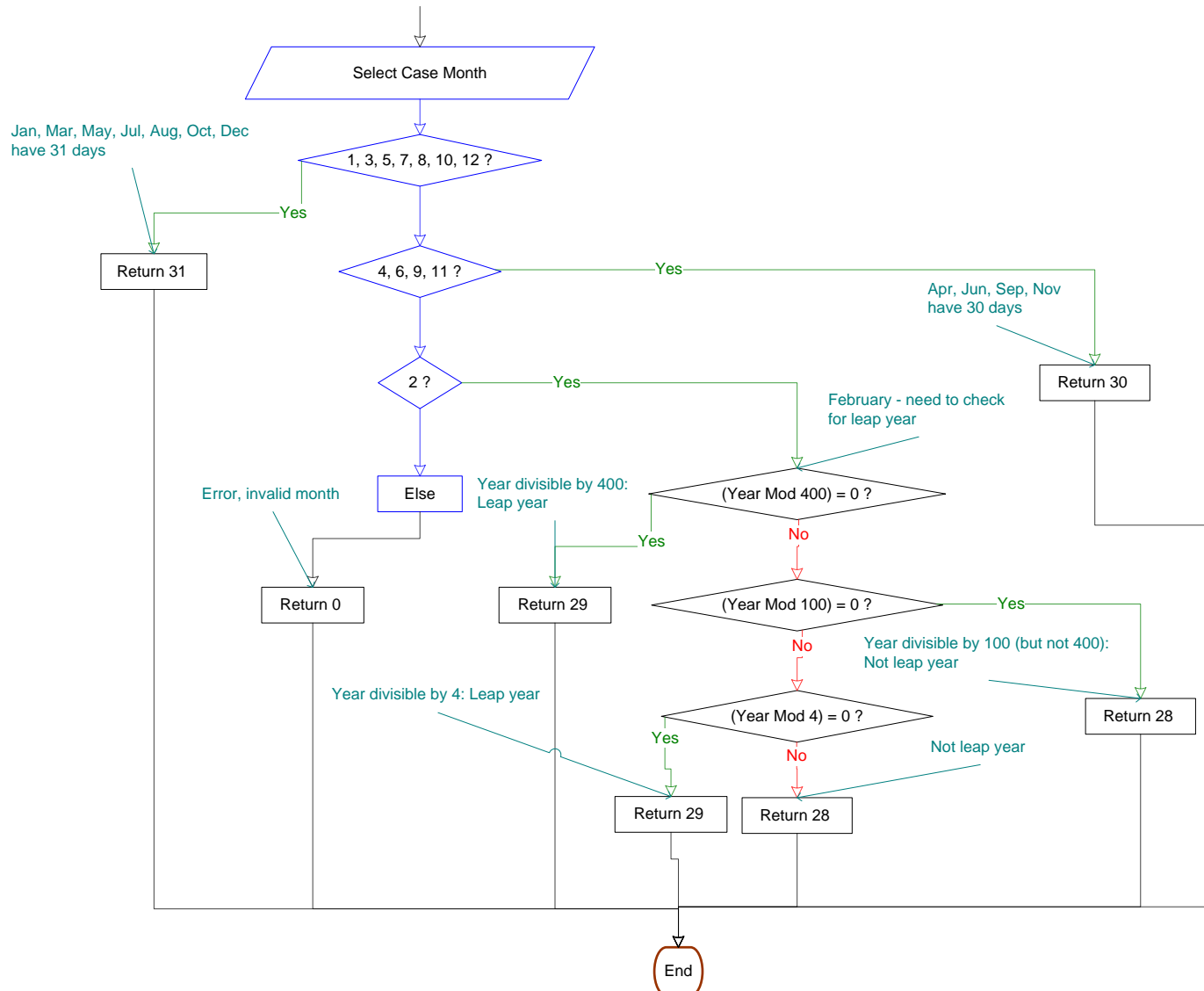| No	Input	Expected result	Type of test cases
1	num1=0	0	Normal
2	num2=0	0	Normal
3	num1=10, num2=2	0	Normal
4	num1=10, num2=3	1	Normal

BT4
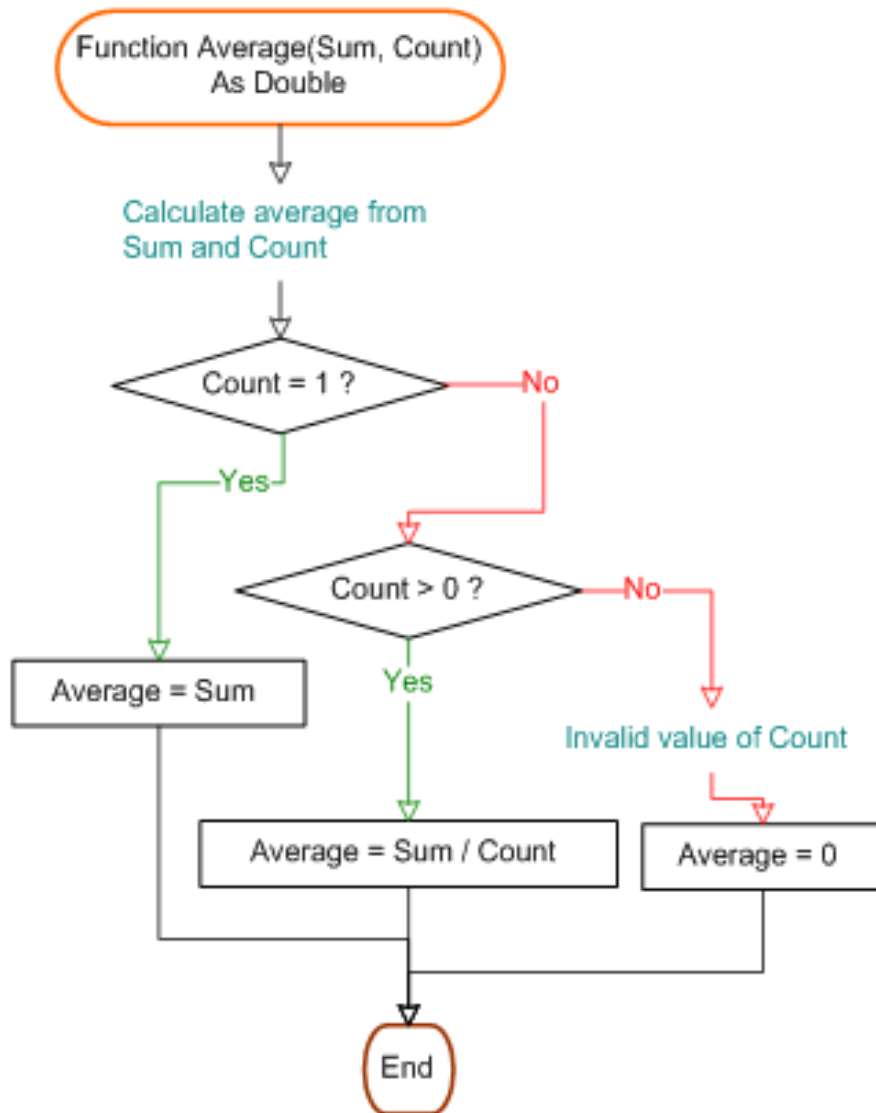
Public Function DaysInMonth(ByVal Year As UShort, ByVal Month As Byte) As Byte

BT5

Function that returns the number of days in the given month using the current Gregorian calendar
Example: DaysInMonth(2000, 2) = 29

Select Case Month

Jan, Mar, May, Jul, Aug, Oct, Dec have 31 days

1, 3, 5, 7, 8, 10, 12 ?

Yes

Return 31

4, 6, 9, 11 ?

Yes

Apr, Jun, Sep, Nov have 30 days

Return 30

2 ?

Yes

February - need to check for leap year

Error, invalid month

Else

Year divisible by 400: Leap year

(Year Mod 400) = 0 ?

Yes

No

Return 0

Return 29

(Year Mod 100) = 0 ?

Yes

No

Year divisible by 100 (but not 400): Not leap year

Return 28

Year divisible by 4: Leap year

(Year Mod 4) = 0 ?

Yes

No

Not leap year

Return 29

Return 28

End

Test cases:
1. Month = 1, 3, 5, 7, 8. 10. 12 (7 cases)
2. Month = 4, 6, 9, 11 (4 cases)
3. Month = 2, Year = 2000 (mod 400 = 0)
4. Month = 2, Year = 1900 (mod 400 > 0 but mod 100 = 0)
5. Month = 2, Year = 2004 (mod 400 > 0, mod 100 > 0, but mod 4 = 0)
6. Month = 2, Year = 2005 (mod 400 > 0, mod 100 > 0, but mod 4 > 0)
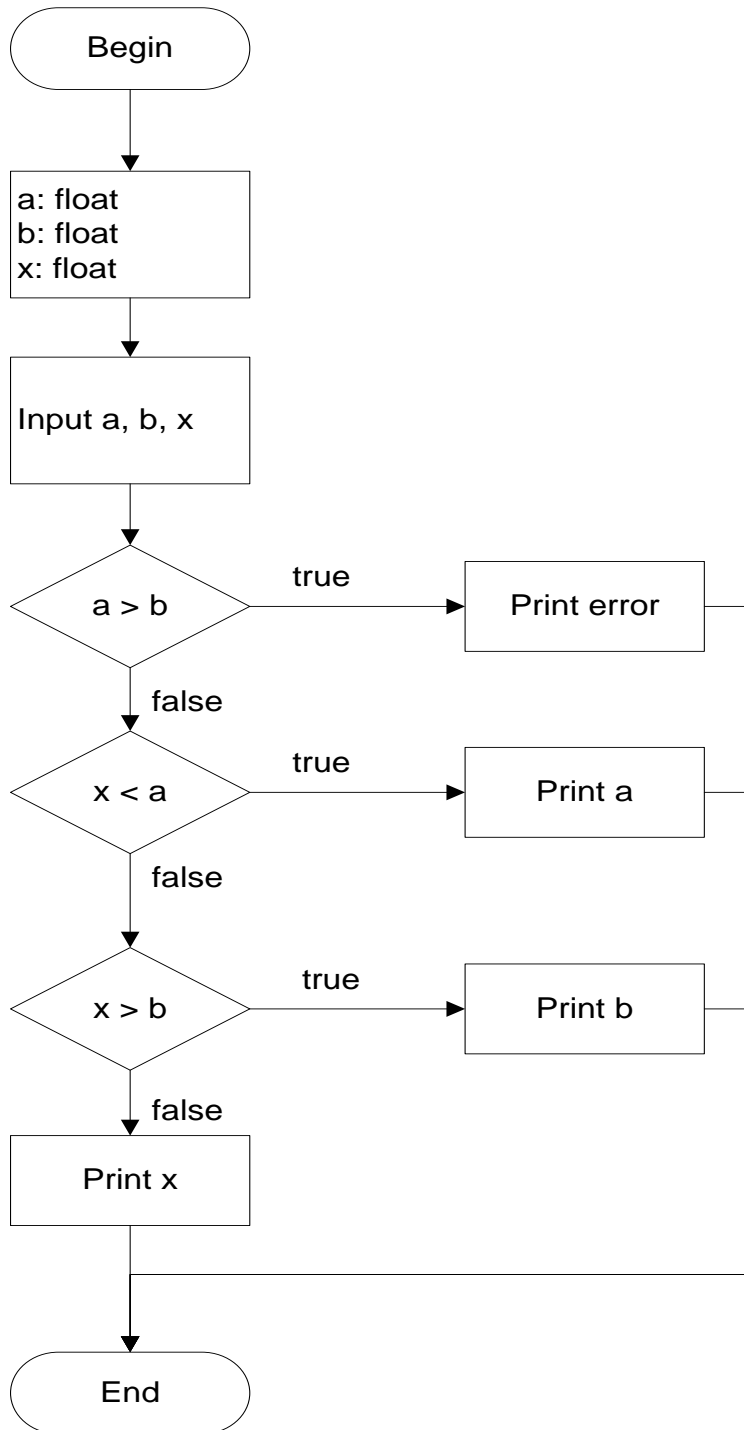7. Month = 13 (invalid month)

Need total: 16 test cases

Note: Day la thuat toan tim so ngay cua 1 thang

```
                    ┌─────────┐
                    │  Begin  │
                    └────┬────┘
                         │                    BT6
                         ▼
                  ┌──────────────┐
                  │ a: float     │
                  │ b: float     │
                  │ c: float     │
                  │ delta: float │
                  └──────┬───────┘
                         │
                         ▼
                  ┌──────────────┐
                  │ Input a, b, c│
                  └──────┬───────┘
                         │
      true               ▼
  ┌──────────────    ◇ a = 0 ◇
  │
  │                 false │
  │                       ▼
  │              ┌────────────────────┐
  │              │ delta = b*b − 4*a*c│
  │              └─────────┬──────────┘
  │                        │
  ▼                        ▼         true  ┌──────────────────┐
┌─────────────┐       ◇ delta < 0 ◇ ─────▶ │ Print: no results│
│ Print error │                            └────────┬─────────┘
└──────┬──────┘        false │
       │                     ▼
       │                               true ┌──────────────┐
       │              ◇ delta = 0 ◇ ──────▶ │ Print -b/(2*a)│──▶
       │                                    └──────────────┘
       │                false │
       │                      ▼
       │         ┌──────────────────────────┐
       │         │ Print:                   │
       │         │ (-b - sqrt(delta))/(2*a) │
       │         │ (-b + sqrt(delta))/(2*a) │
       │         └────────────┬─────────────┘
       │                      │
       └──────────────────────┤
                              ▼
                         ┌─────────┐
                         │   End   │
                         └─────────┘
```
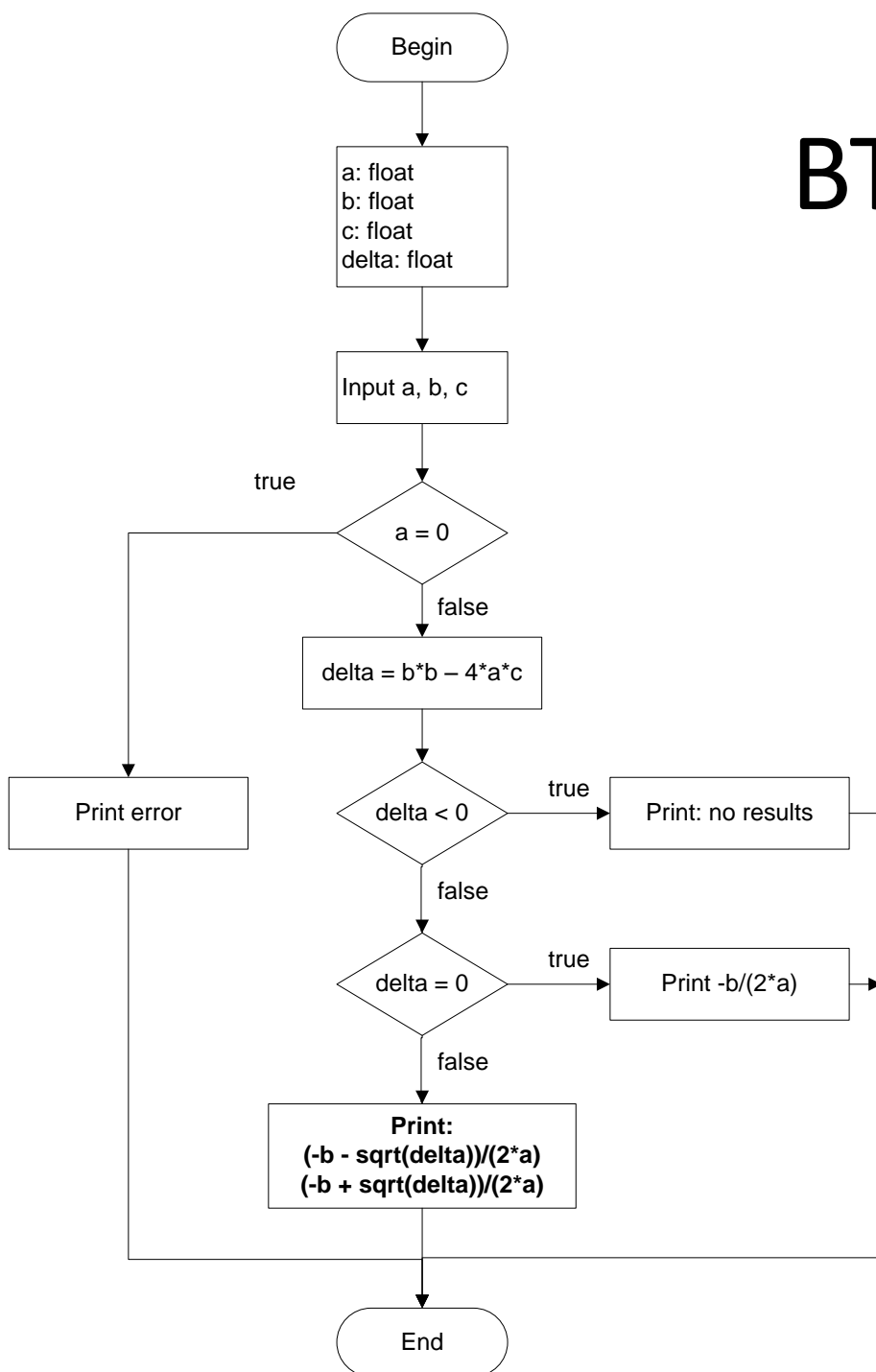
- We need 4 test cases to cover all paths:
- 1. a = 0 print error
- 2. a <> 0, b*b-4*a*c < 0 print no results
- 3. a <> 0, b*b-4*a*c = 0 print –b/(2*a)
- 4. a <> 0, b*b-4*a*c > 0 print
- (-b + sqrt(b*b-4*a*c))/(2*a),
- (-b - sqrt(b*b-4*a*c))/(2*a)

```
          ┌─────────────┐
          │    Begin    │
          └──────┬──────┘
                 │                        BT7
                 ▼
          ┌─────────────┐
          │ a: float    │
          │ b: float    │
          │ x: float    │
          └──────┬──────┘
                 │
                 ▼
          ┌─────────────┐
          │ Input a, b, x│
          └──────┬──────┘
                 │
                 ▼
              ╱╲        true        ┌─────────────┐
             ╱ a ╲────────────────▶│ Print error │
             ╲ > b╱                 └─────────────┘
              ╲╱
               │ false
               ▼
              ╱╲        true        ┌─────────────┐
             ╱x<a╲────────────────▶│   Print a   │
             ╲   ╱                  └─────────────┘
              ╲╱
               │ false
               ▼
              ╱╲        true        ┌─────────────┐
             ╱x>b╲────────────────▶│   Print b   │
             ╲   ╱                  └─────────────┘
              ╲╱
               │ false
               ▼
          ┌─────────────┐
          │   Print x   │
          └──────┬──────┘
                 │
                 ▼
          ┌─────────────┐
          │     End     │
          └─────────────┘
```

- We need 4 test cases to cover all paths:
- 1. a > b print error
- 2. a <= b, x < a print a
- 3. a <= b, x > b print b
- 4. a <= b, x >=a, x <=b print x

Note: Giới hạn một số trong khoảng (a, b): x < a return a, x > b return b, a <= x <= b return x