Part-A

A1. (i)

59 ÷ 2 = 29 R 1

29 ÷ 2 = 14 R 1

14 ÷ 2 = 7 R 0

7 ÷ 2 = 3 R 1

3 ÷ 2 = 1 R 1

1 ÷ 2 = 0 R 1

Therefore, the answer is 111011_2

A1. (ii)

2473 ÷ 2 = 1236 R 1

1236 ÷ 2 = 618 R 0

618 ÷ 2 = 309 R 0

309 ÷ 2 = 154 R 1

154 ÷ 2 = 77 R 0

77 ÷ 2 = 38 R 1

38 ÷ 2 = 19 R 0

19 ÷ 2 = 9 R 1

9 ÷ 2 = 4 R 1

4 ÷ 2 = 2 R 0

2 ÷ 2 = 1 R 0

1 ÷ 2 = 0 R 1

Therefore, the answer is 100110101001_2

A2. (i)

16	8	4	2	1
1	1	0	1	1

16+8+2+1=27

Therefore, the answer is 27_{10}

A2. (ii)

32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1
1	0	0	1	1	0	1	1	1	0	0	1	1	1	0	1

32768+4096+2048+512+256+128+16+8+4+1=39837

Therefore, the answer is 39837_{10}

A3. (i)

$110_2 + 101_2 = 1011_2$

```
   1 1 0
+  1 0 1
  1          Carry
-------------------
  1 0 1 1
```

A3. (ii)

$10101011_2 + 11011100_2 = 110000111_2$

```
   1 0 1 0 1 0 1 1
+  1 1 0 1 1 1 0 0
  1 1 1 1 1        Carry
-------------------
  1 1 0 0 0 0 1 1 1
```

A4. (i)

$100011_2 - 11010_2 = 1001_2$

```
    1 0 0 0 1 1
-     1 1 0 1 0
    1 1             Borrow
-------------------------------
        1 0 0 1
```

A4. (ii)

$100100101_2 - 111010_2 = 11101011_2$

```
      1 0 0 1 0 0 1 0 1
-           1 1 1 0 1 0
      1 1 1   1   1         Borrow
-------------------------------------
        1 1 1 0 1 0 1 1
```

A5. (i)

```
3     6     1
↓     ↓     ↓
011   110   001
```

```
1111        0001
↓           ↓
F           1
```

Therefore, the answer is $F1_{16}$

A5. (ii)

7 1 5
↓ ↓ ↓
111 001 101

0001 1100 1101
↓ ↓ ↓
1 C D

Therefore, the answer is $1CD_{16}$

A6. (i)

4 E 7
↓ ↓ ↓
0100 1110 0111

010 011 100 111
↓ ↓ ↓ ↓
2 3 4 7

Therefore, the answer is 2347_{8}

A6. (ii)

3 F 9 B 0 5 D
↓ ↓ ↓ ↓ ↓ ↓ ↓
0011 1111 1001 1011 0000 0101 1101

011 111 110 011 011 000 001 011 101
↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
3 7 6 3 3 0 1 3 5

Therefore, the answer is 376330135_{8}

Part – B

B1.

C && !((C && B) || A) && A && !B is the same as
True && !((True && False) || False) && False && !False is the same as
True && !(False || False) && False && True is the same as
True && True && False && True is the same as
True && False && True is the same as
False && True is the same as
False

B2.

!(B && A) || (A && !B) && (!C || A) && !(!A) && !(B || C) is the same as
!(False && False) || (False && !False) && (!True || False) && !(!False) && ! (False || True)
is the same as
!(False) || (False && True) && (False || False) && False && False is the same as
True || False && False && False && False is the same as
True || False is the same as
True

B3.

!(!(A && (B || C && (!A && (B && !C))))) is the same as
!(!(False && (False || True && (!False && (False && True))))) is the same as
!(!(False && (False || True && (!False && False)))) is the same as
!(!(False && (False || True && True))) is the same as
!(!(False && True)) is the same as
False

B4.

!B && !A && (C || A) || !B || (A && C || (!A && !C)) is the same as

!False && !False && (True || False) || !False || (False && True || (!False && !True))

is the same as

True && True && True || True || (False && True || False) is the same as

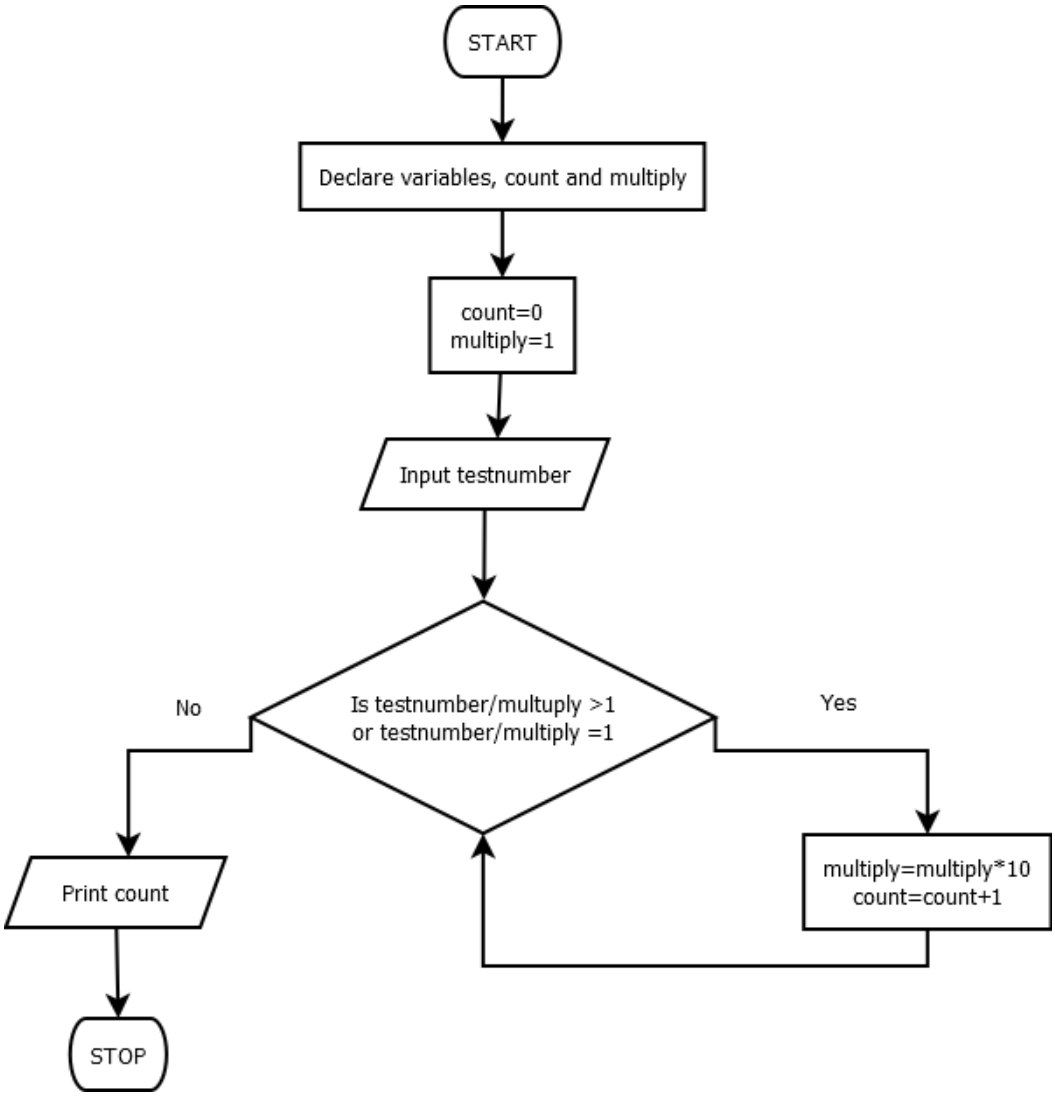
True && True && True || True || False is the same as

True || False is the same as

True

Part – C

C1.



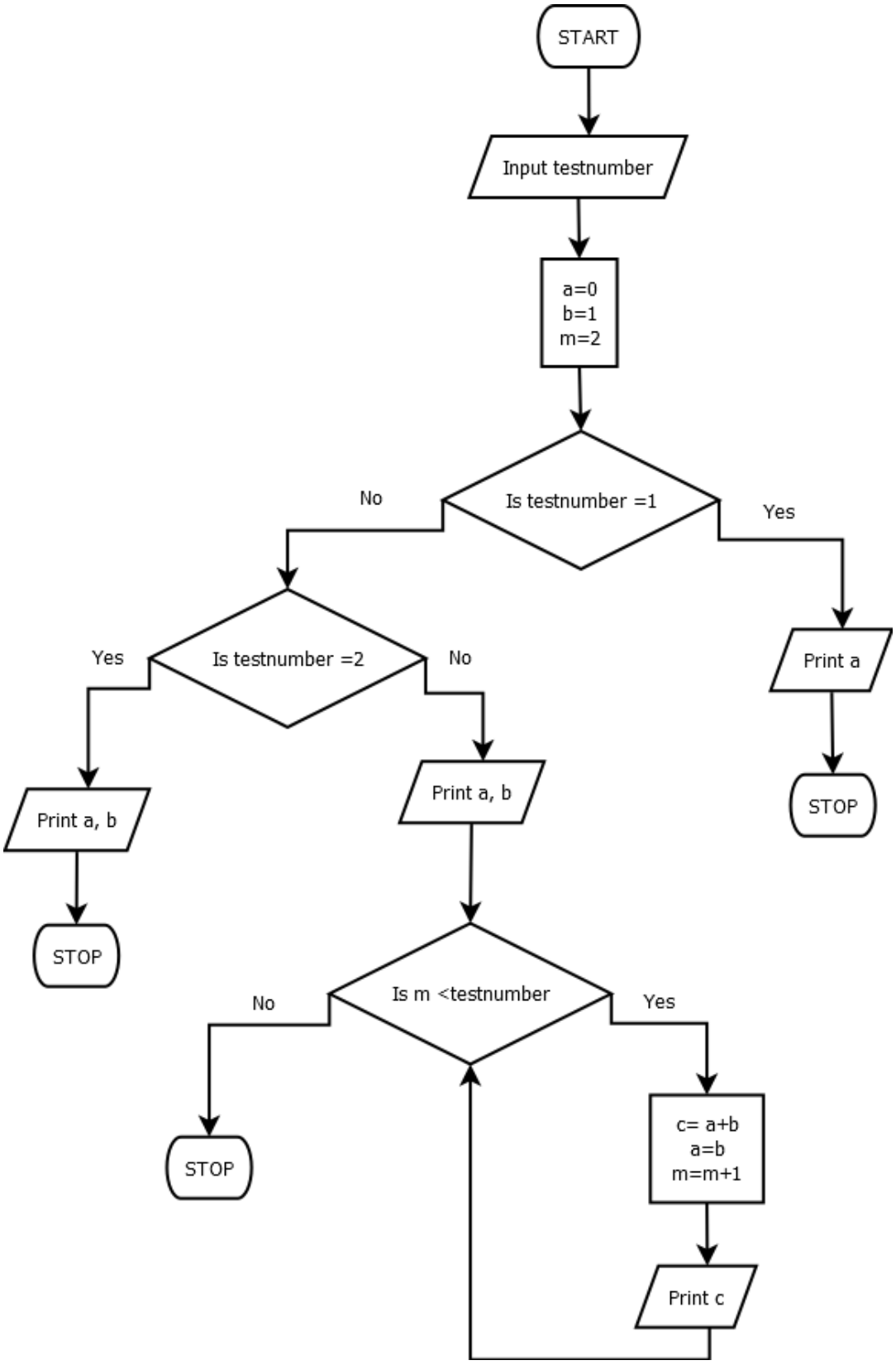
C2.

```
Step 1: Start
Step 2: Input testnumber
Step 3: outcome← testnumber
Step 4: If testnumber←o then
            outcome←1
Step 5: Print outcome
Step 6: If testnumber >0
            while testnumber >2
                outcome ← outcome*(testnumber-1)
                testnumber←testnumber-1
Step 7: Print outcome
Step 8: Stop
```

C3A.

```
Step 1: Start
Step 2: Input testnumber
Step 3 : a ← 0
         b ← 1
         m ← 2
Step 4: If testnumber = 1
Step 5: Print a
Step 6: If testnumber = 2
            Print a, b
         Else
            Print a, b
            While m < testnumber
                c ←a+b
                a ←b
                b ←c
                m←m+1
                Print c
Step 7: Stop
```

C3B.


START
Input testnumber
a=0
b=1
m=2
Is testnumber =1
No
Yes
Print a
STOP
Is testnumber =2
Yes
No
Print a, b
STOP
Print a, b
Is m <testnumber
No
Yes
STOP
c= a+b
a=b
m=m+1
Print c

C4A.

Step 1: Start

Step 2 : a ←1

b ←1

c ←1

m ←3

Step 3: If testnumber =1

Step 4: Print a

Step 5: If testnumber =2

Step 6: Print a, b

Step 7: If testnumber =3

Print a, b, c

Else

While m <testnumber

Print a, b, c

d ←a+ b

a ←b

b ←c

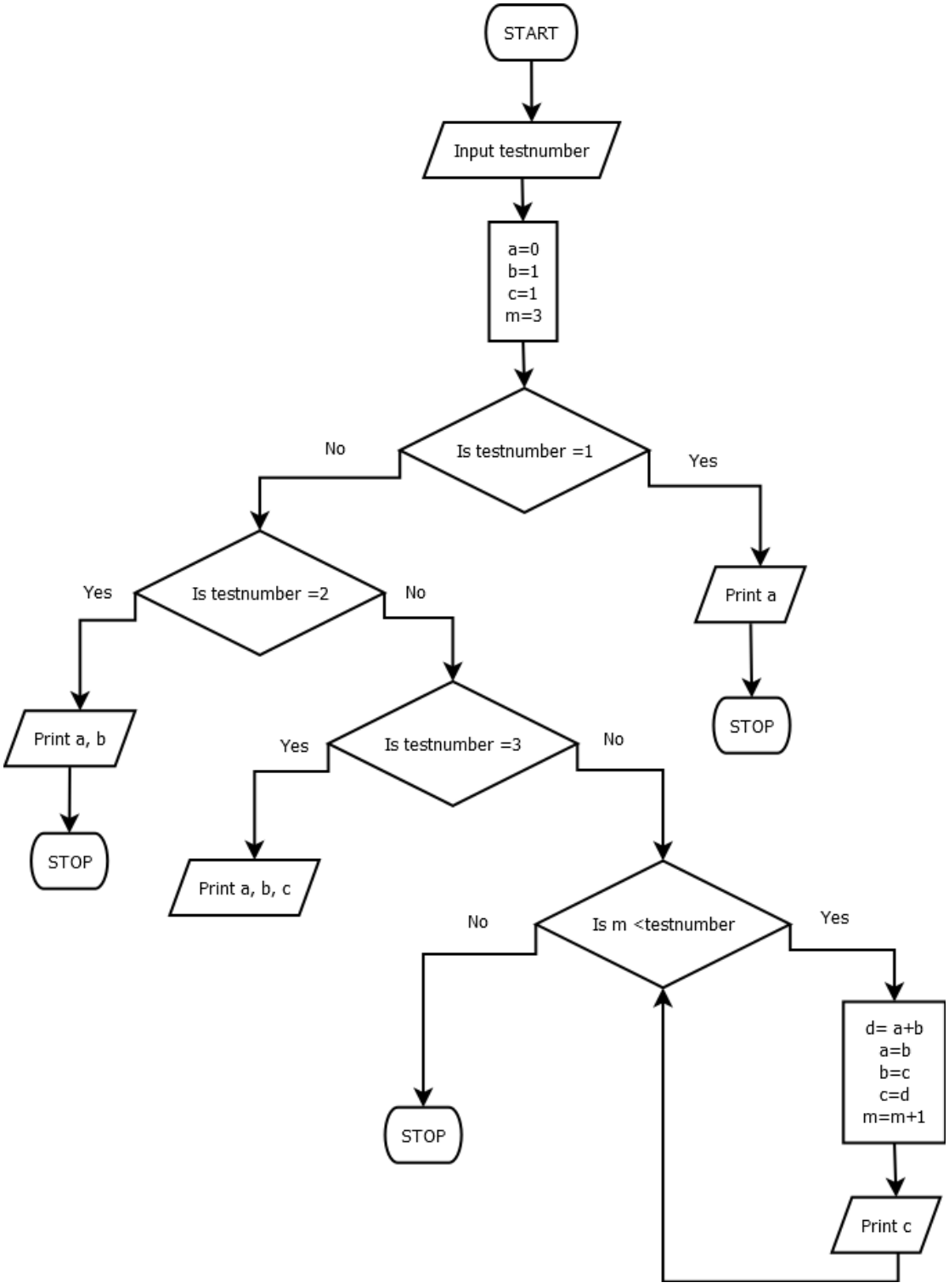
c ←d

m ←m+1

Print d

Step 8: Stop

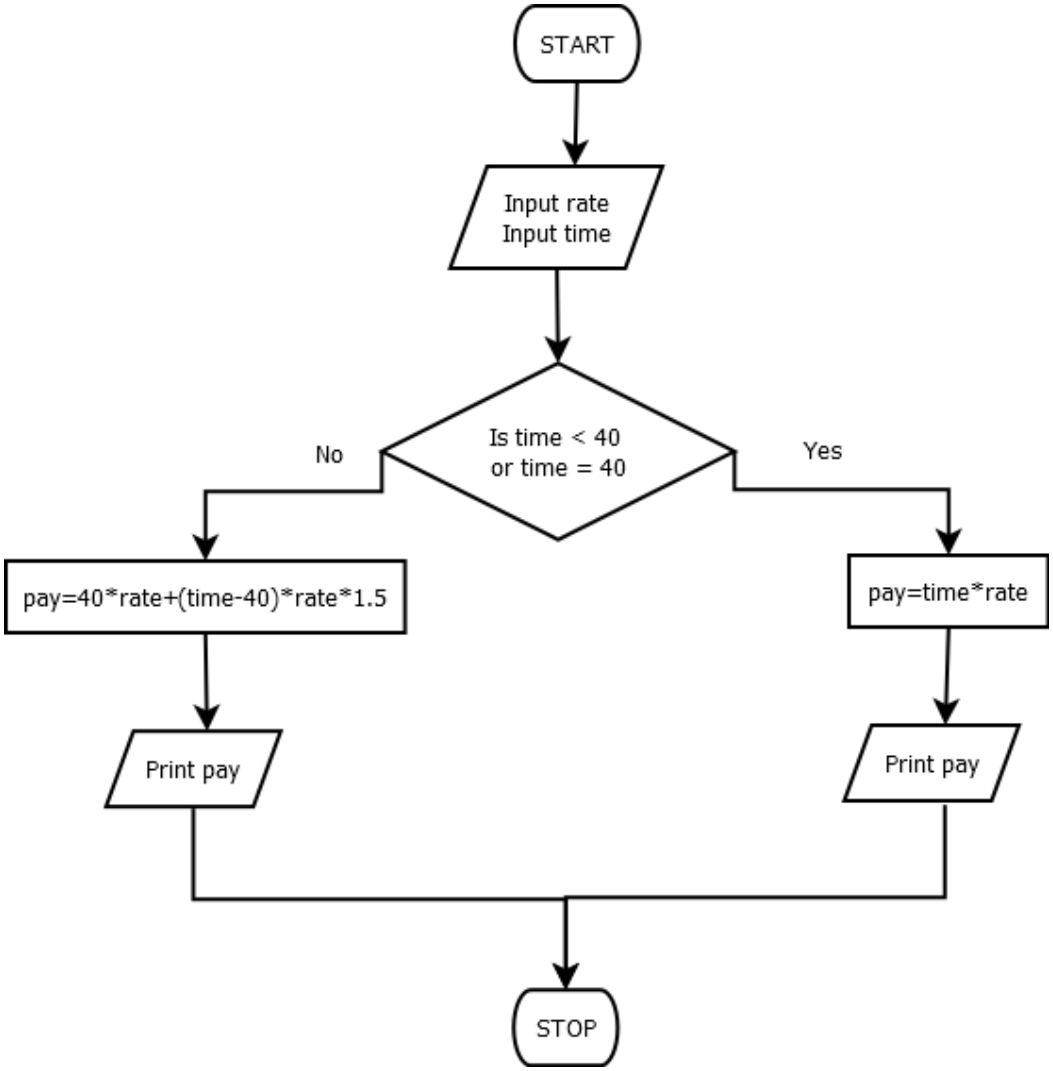
C4B.


START
Input testnumber
a=0
b=1
c=1
m=3
Is testnumber =1
No
Yes
Print a
STOP
Is testnumber =2
Yes
No
Print a, b
STOP
Is testnumber =3
Yes
No
Print a, b, c
Is m <testnumber
No
Yes
STOP
d= a+b
a=b
b=c
c=d
m=m+1
Print c

C5A.

```
start procedure compute gross pay;
      assign the values rate;
      assign the values time;
   if time is equal or smaller than 40
      pay← time*rate
      print pay
   else
      pay← 40*rate + (time-40)*rate*1.5
      print pay
   end if
end procedure
```

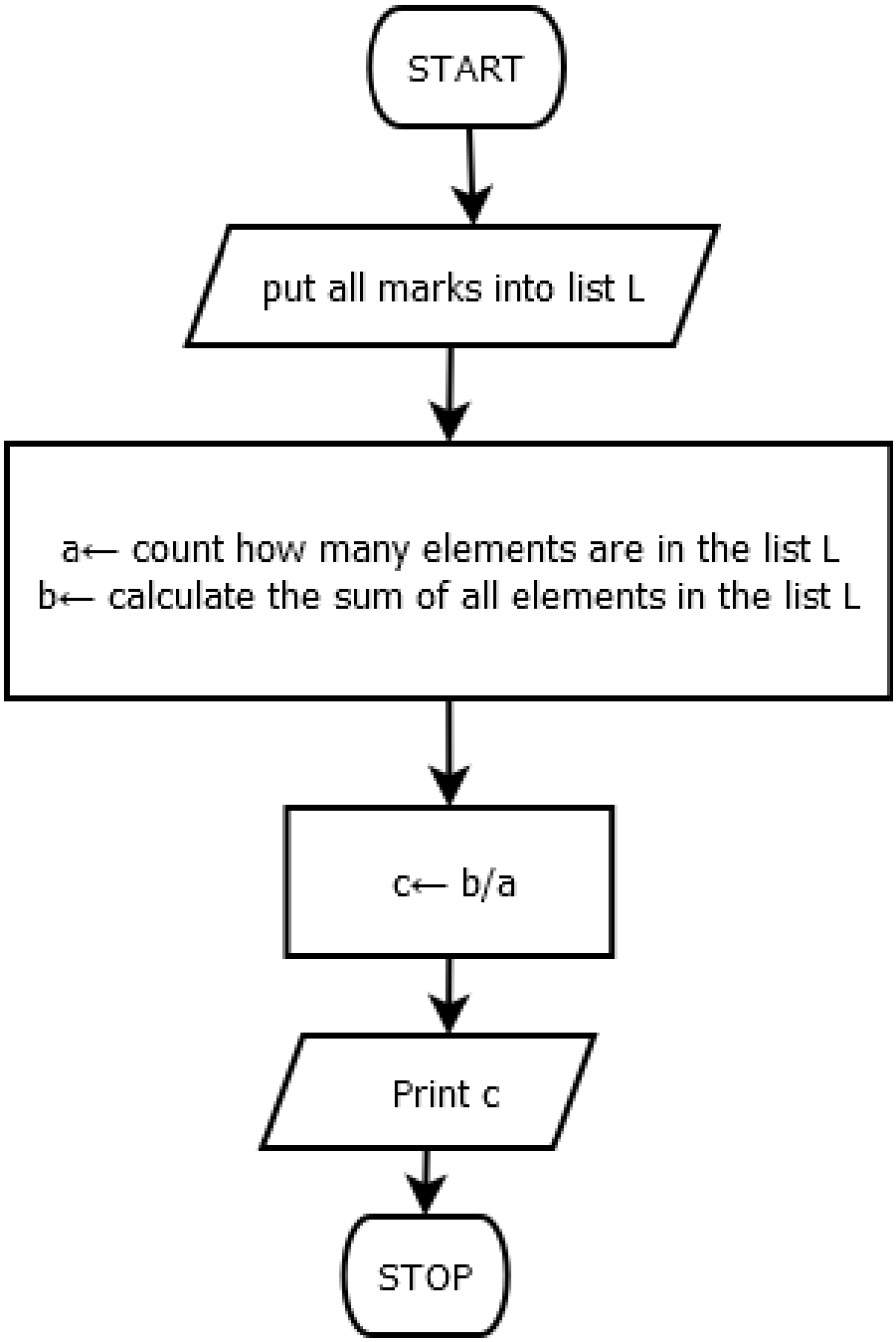
C5B.



C6A.

```
start procedure calculate average quiz marks
   put all marks into list L
   a← count how many elements are in the list L
   b← calculate the sum of all elements in the list L
   c← b/a
   print c
end procedure
```

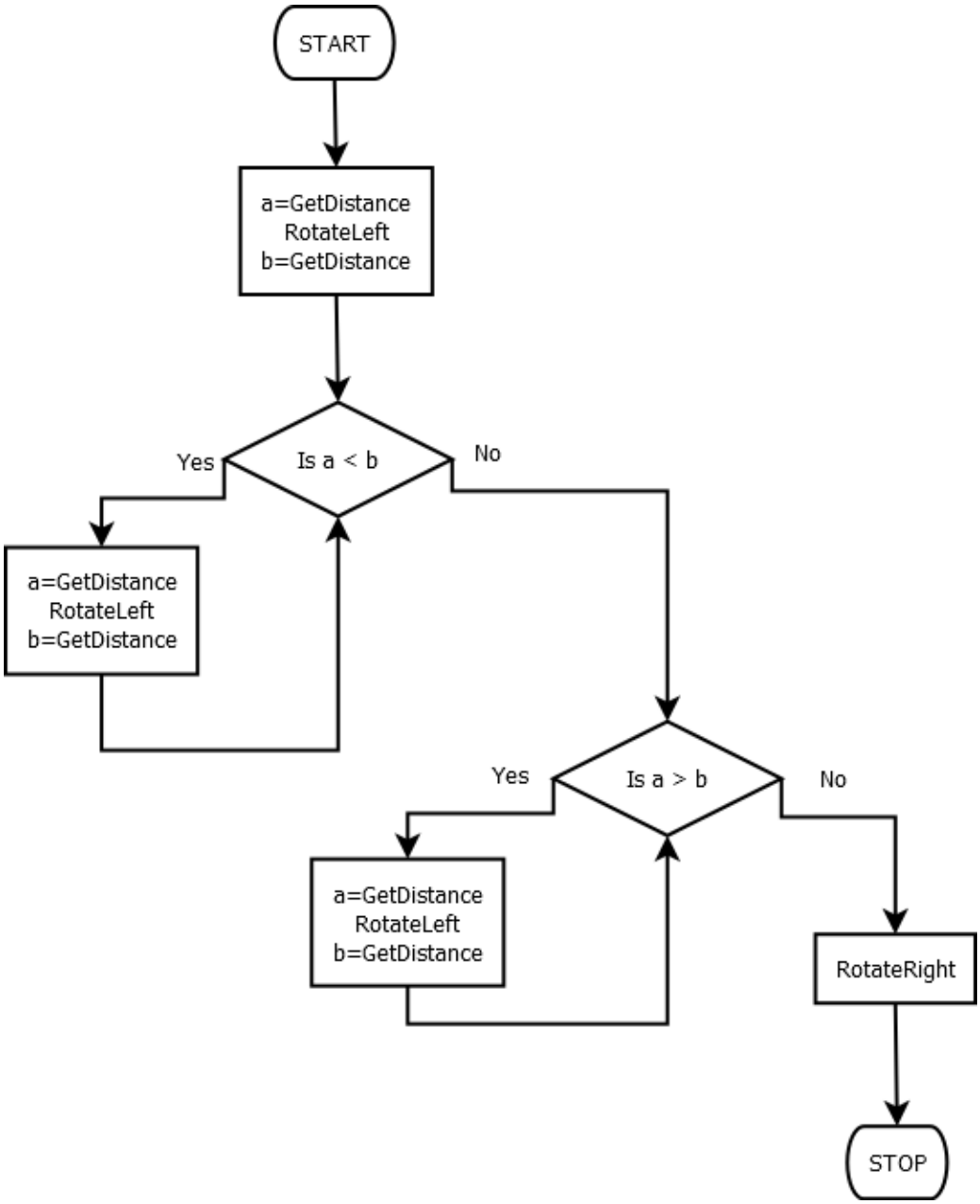
C6B.



C7A.

```
start procedure turn the robot in the desired direction
    a←GetDistance
    RotateLeft
    b←GetDistance
    while a is less than b
        a←b
        RotateLeft
        b←GetDistance
    endwhile
    while a is greater than b
        a←b
        RotateLeft
        b←GetDistance
    endwhile
    RotateRight
end procedure
```

C7B.


START
a=GetDistance
RotateLeft
b=GetDistance
Is a < b
Yes
No
a=GetDistance
RotateLeft
b=GetDistance
Is a > b
Yes
No
a=GetDistance
RotateLeft
b=GetDistance
RotateRight
STOP