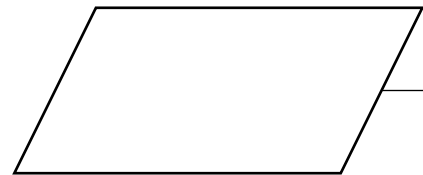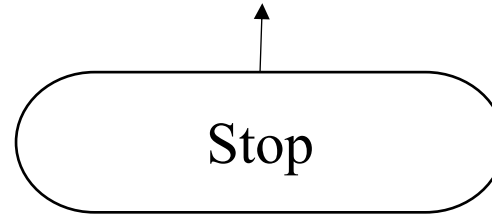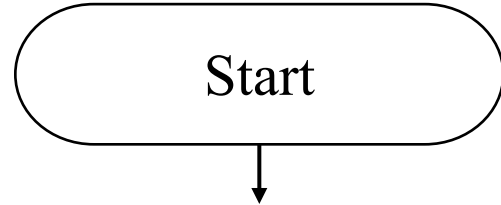# Flow Chart

- A flowchart is a means of describing ordering and expressing a solution to the problem.

- A flow chart is a graphical representation of the processes and operations that constitute the solution of the problem.

- Just as a contractor uses blueprints to build a house, the programmer should use a flowchart to write a program.

- The flowchart, if developed correctly, will ensure all the operation necessary to solve the problem.

- A flowchart consists a set of boxes, the shapes of which by convention indicate the nature of the operations described in the boxes along with the connecting lines and arrows that show the flow of control between the various operations.
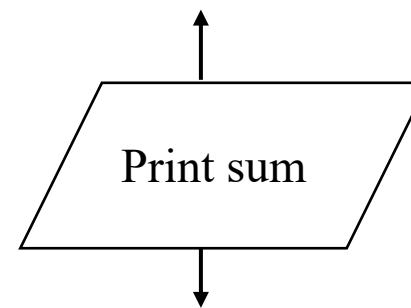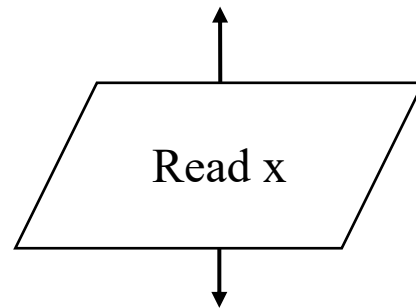
Terminal symbol: indicating the beginning or ending point of the program.
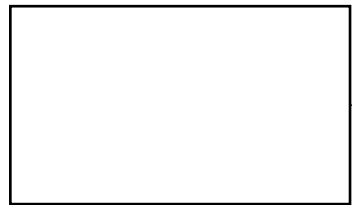
e.g.

Start

Stop

Parallelogram indicates an input or output operations.

e.g.

Read x

Print sum

Rectangle indicates any processing operation except a decision . Also indicate such as computation. The information in this symbol may be an english statement or an algebraic statement.

e.g.

1.

Calculate average (R).

2.

Set x=0.

3.

Increase counter by one.
Count = count+1
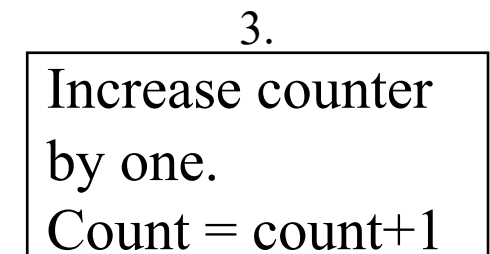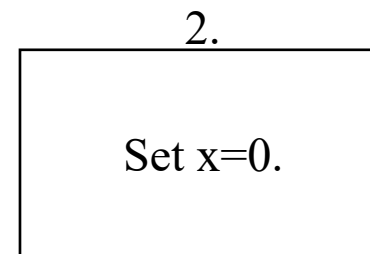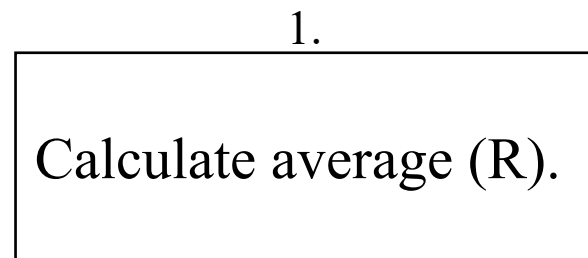
Block 1. provides the calculation of an average and the formula used to calculate the average.

Block 2. indicates initialization, which is the process of presetting a memory cell to a specific value.

Block 3. indicates a process of increments a memory location.
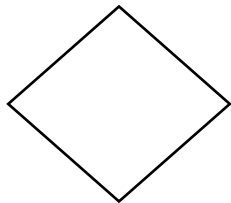
Decision symbol.
A diamond indicates a decision. The diamond is used to indicate two paths, one of which is chosen by the computer in the course of processing.

e.g.

N — $T<0$ — Y
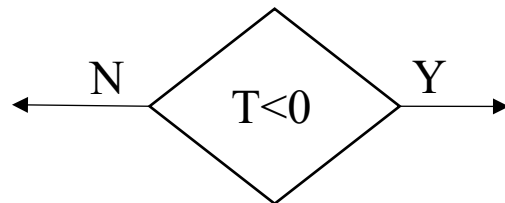
Note: The path that the computer decide to follow will depend on the presence or absence of the condition specified within the system.
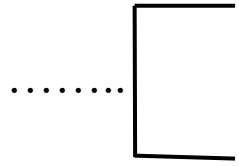
⌐ ⟶ Annotation symbol.

An open ended rectangle is used to provide descriptive comments or explanatory notes for clarification.

e.g.

SAL – annual salary
PAY – monthly payment
XND – no. of dependents
NAME – employees
YRS – years of employment.
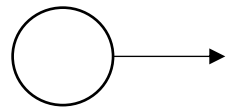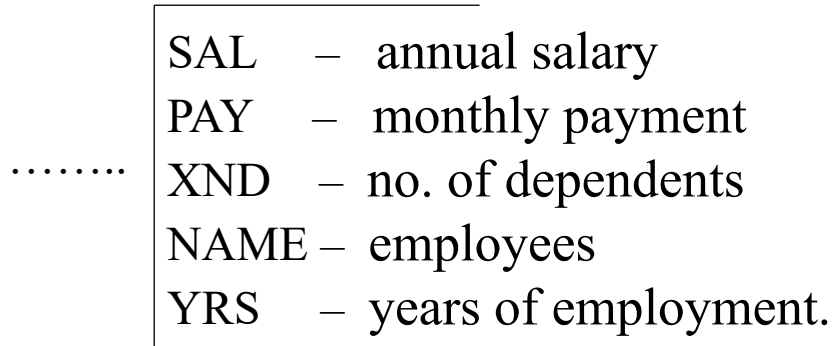
○⟶ A small circle indicates a connection between two points in a flowchart, where a connecting line would be too clumsy.

e.g.

(1)
Exit

(1)⟶
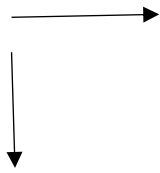
Arrows indicate the direction of flow through the flowchart. Every line should have an arrow on it.

:	compare (x:y)
=	equal to (x=y)
≠	not equal (x≠y)
>	greater than (x>y)
<	less than (x<y)
≥	greater than or equal to (x≥y)
≤	less than or equal to (x≤y)
Y	yes
N	no
	replace or assign

Examle: Draw a flowchart to find sum of three numbers.

Step 1. Input three numbers x1, x2 and x3

Step 2. Find sum = x1+x2+x3

Step 3. Print sum, x1, x2 and x3.

Flowchart

```
              START
                │
                ▼
           ┌─────────┐
          /  READ X1  /
         └─────────┘
                │
                ▼
           ┌─────────┐
          /  READ X2  /
         └─────────┘
                │
                ▼
           ┌─────────┐
          /  READ    /
         /   X3     /
        └─────────┘
                │
                ▼
        ┌───────────────┐
        │ SUM = X1+X2+X3 │
        └───────────────┘
                │
                ▼
        ┌──────────────────┐
       /  PRINT SUM, x1,    /
      /    x2, x3          /
     └──────────────────┘
                │
                ▼
              STOP
```
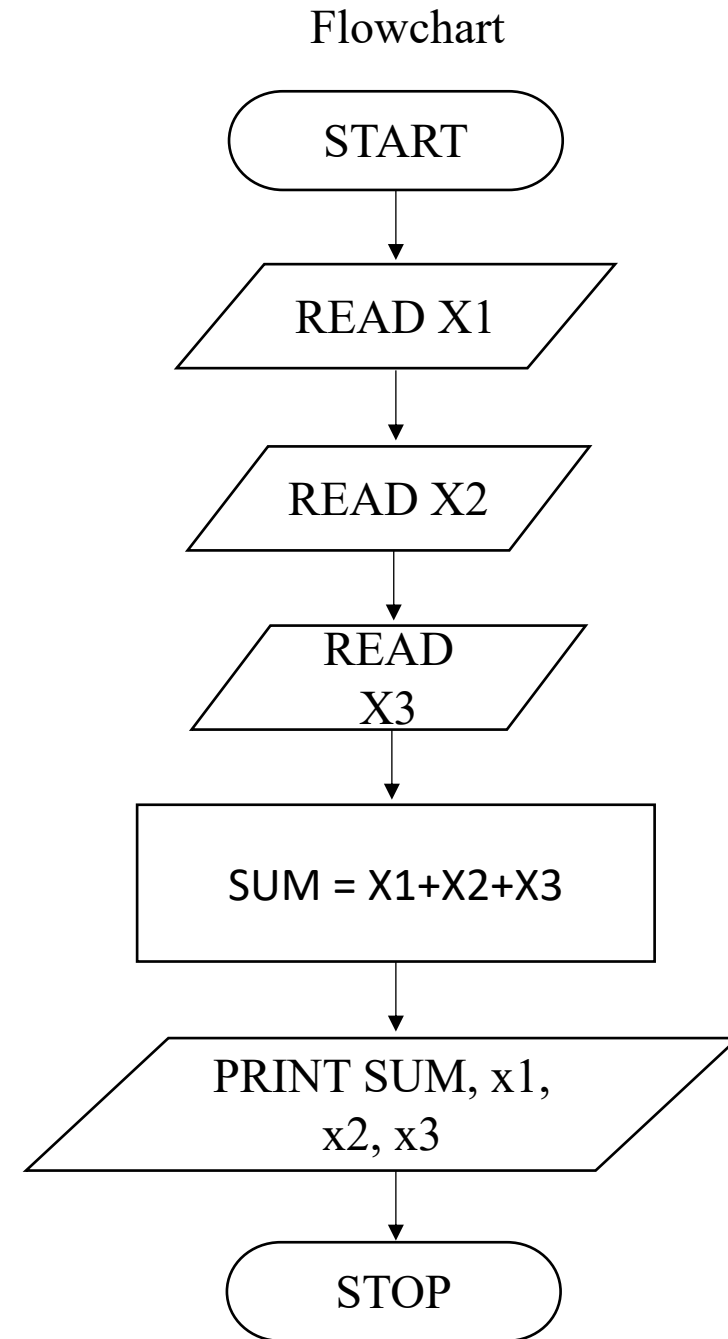
Draw a flowchart to find sum of N numbers x1, x2, x3,…xN. All xi's are given at a time.

Flowchart

Step 1. Input N and numbers x1, x2, x3,….xN.

Step 2. Find sum = x1+x2+x3+….+xN

Step 3. Print sum

```
         ┌─────────────┐
         │    START    │
         └──────┬──────┘
                │
          ╱─────────────╲
         ╱  READ N, X1,   ╲
         ╲  X2,…,XN       ╱
          ╲─────────────╱
                │
        ┌───────────────────┐
        │ SUM = X1+X2+X3+…+XN │
        └─────────┬─────────┘
                  │
          ╱───────────────╲
         ╱   PRINT SUM      ╲
         ╲───────────────╱
                │
         ┌─────────────┐
         │    STOP     │
         └─────────────┘
```
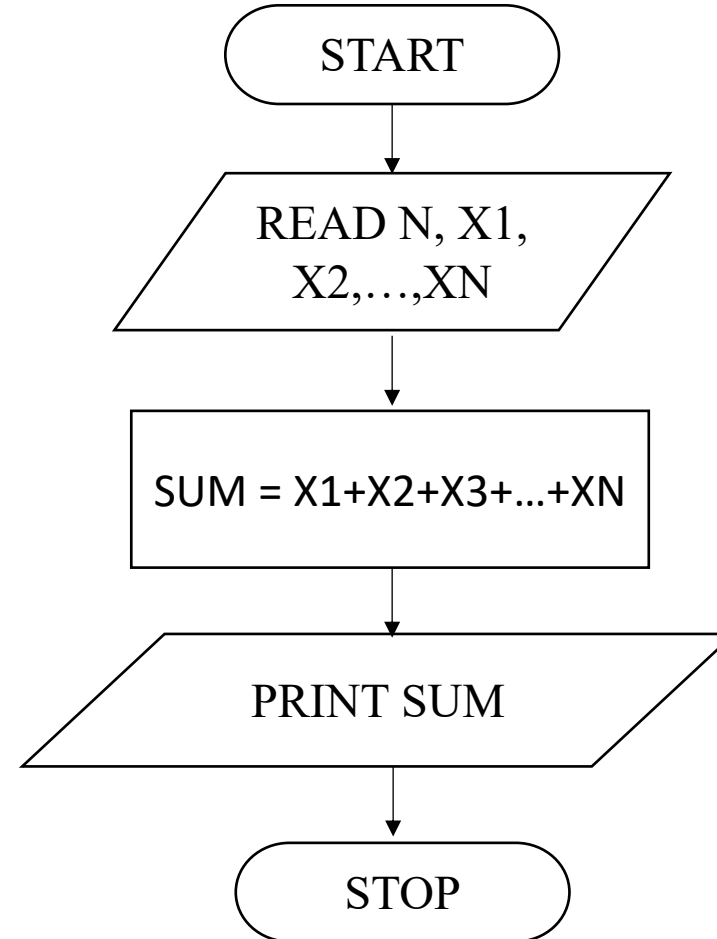
Example: Draw a flowchart to find sum of given N numbers. Numbers are given one by one.

```
        ┌─────────────┐
        │    START    │
        └─────────────┘
               │
               ▼
        ╱─────────────╲
       ╱    READ N     ╲
      ╱─────────────────╲
               │
               ▼
        ┌─────────────┐
        │   SUM = 0   │
        └─────────────┘
               │
               ▼
        ╱─────────────╲
       ╱    READ X     ╲
      ╱─────────────────╲
               │
               ▼
        ┌─────────────┐
        │ SUM = SUM+X │
        └─────────────┘
               │
               ▼
        ╱─────────────╲
       ╱   PRINT SUM   ╲
      ╱─────────────────╲
               │
               ▼
        ┌─────────────┐
        │    STOP     │
        └─────────────┘
```
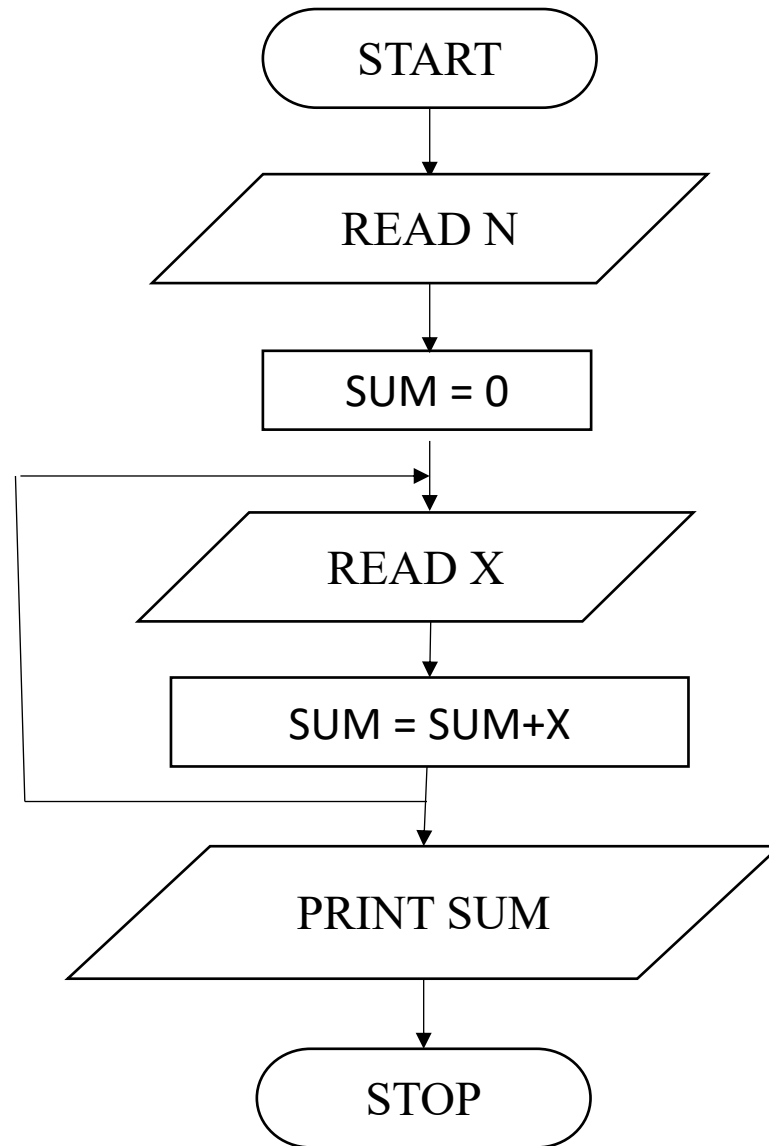
Note: In a similar manner one can also draw a flowchart to find sum of first N natural numbers.

Number N is not known a priori
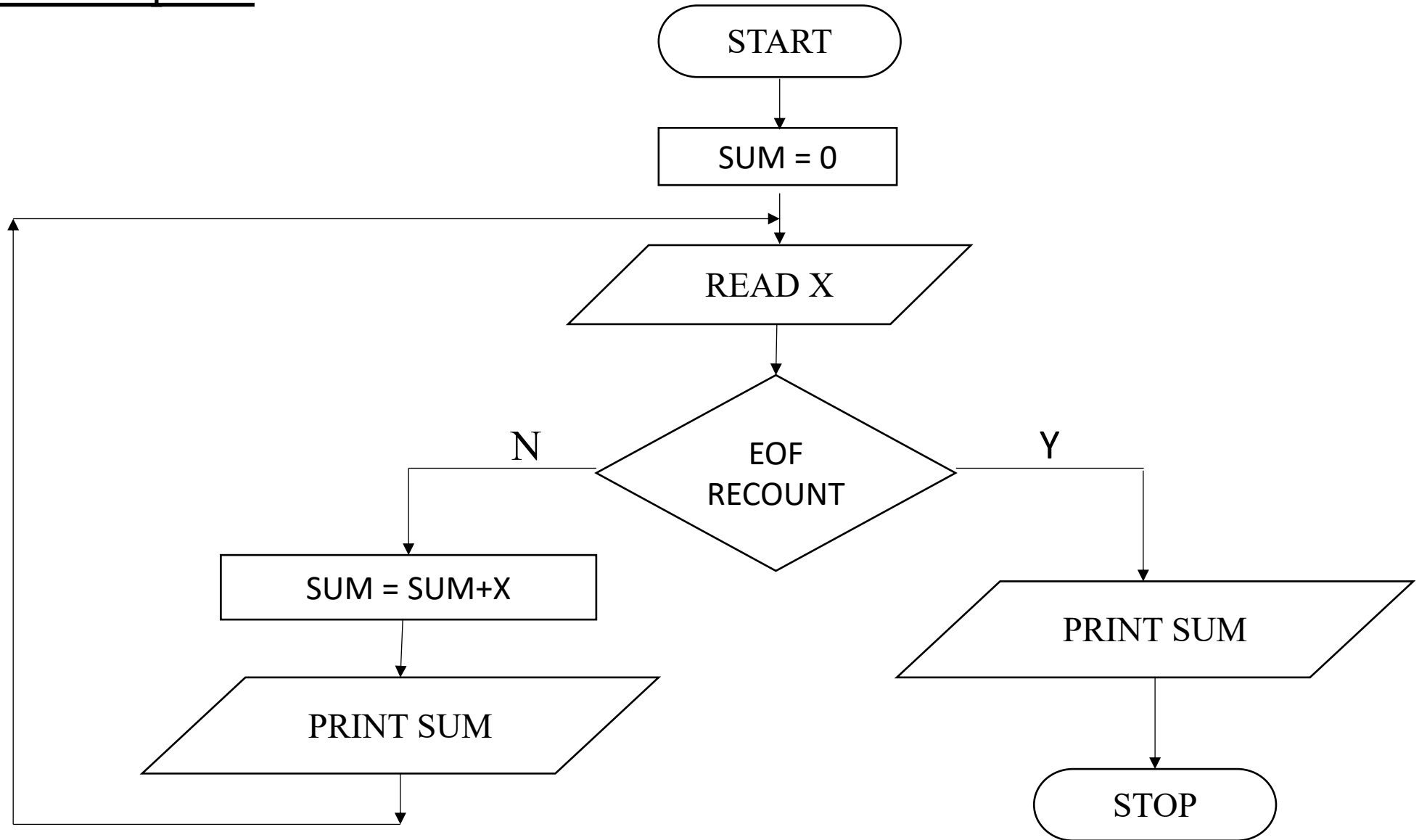
Examaple: Flowchart to find solution of linear system of equations with given coefficients a, b, c, d, e, and f.

Equations are:

$$ax + by = c \qquad (1)$$

$$dx + ey = f \qquad (2)$$

Now multiply eq. (1) with d and (2) with a, one gets

$$dax + dby = dc \qquad (3)$$

$$adx + aey = af \qquad (4)$$

Now eq. (3) $-$ (4), one gets

$$y(bd - ae) = dc - af$$

$$\Rightarrow y = \frac{af - cd}{ae - bd}$$

$$similarly \ x = \frac{ec - bf}{ea - bd}$$

$$\Rightarrow \frac{x}{-bf + ce} = \frac{y}{-cd + af} = \frac{1}{ae - bd}$$

START

READ a, b, c, d, e and f

$ae - bd = 0$

N

Y

$$x = \frac{ec - bf}{ea - bd}, y = \frac{af - cd}{ea - bd}$$

PRINT solution does not exist

PRINT x, y

STOP

STOP