

Problem Solving is a skill that can be developed via Practice.

- Define the problem.
- What are the possible solutions?
- Decomposition.
 - ↳ Break down complex problems into smaller ones.
- Pattern recognition.
 - ↳ Based on experience solve similar problems.
- Abstraction
 - ↳ Identify important information while ignoring unrelated details.
- Algorithm.
 - ↳ Sequential set of steps to solve a problem.

→ Flow chart

→ Pseudo code.

Add 3 numbers

23, 5, 10

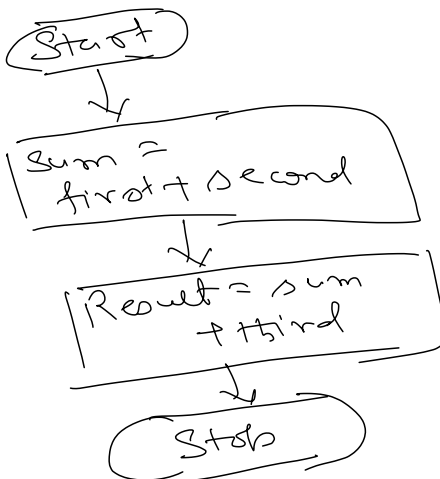
- ① Add first and second numbers and find sum.
- ② Add sum and third number to find result.
- ③ Stop.

$$\begin{array}{r} 23 \\ + 5 \\ \hline 28 \end{array}$$

$$\begin{array}{r} 28 \\ + 10 \\ \hline 38 \\ \hline \end{array}$$

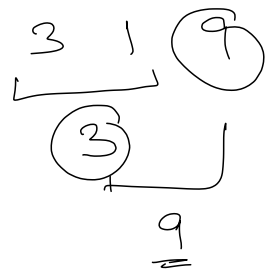
Algo

- ① $\text{Sum} = \text{first} + \text{second}$
 - ② $\text{Result} = \text{Sum} + \text{third}$
 - ③ Stop
- } Pseudocode



} Flow chart

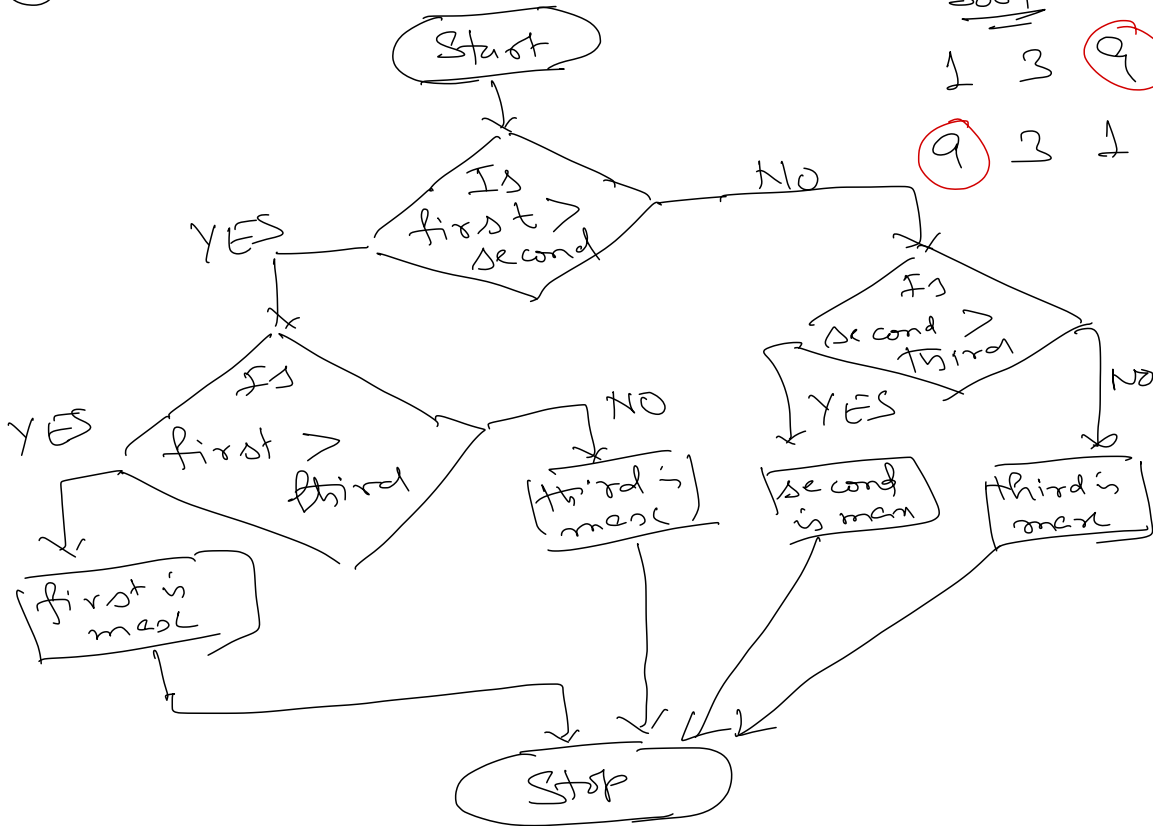
Find max of 3 numbers

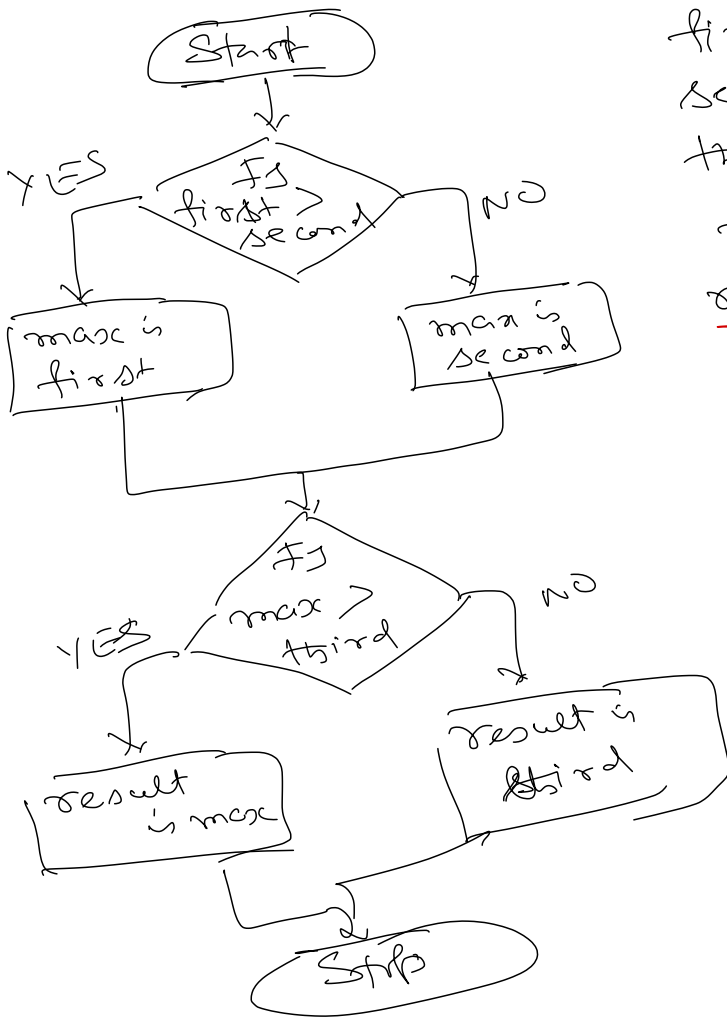


① Compare first and second number and find the larger number \rightarrow max.

② Compare max and third number and find the larger number \rightarrow result.

③ Stop





first $\rightarrow 10$
 second $\rightarrow 2$
 third $\rightarrow 9$
 max $\rightarrow 10$
result $\rightarrow 10$

\rightarrow Validity of solution.

\Rightarrow Dry Run.

\Downarrow
 use a set of input values to
 manually verify the correctness
 of algo/flowchart/pseudocode.

Basic blocks to express a solution

- ↳ sequence of instructions.
- ↳ conditional instruction.
- ↳ iteration / loop.

Find sum of first N numbers.

→ what is N ?

① Get value of N .

$$N = 4$$

② Set sum to 0.

1 2 3 4, ...

③ Set no to 1.

④ Repeat following while no $\leq N$.

⑤ Add no to sum.

sum → ~~0~~ 1
 ~~1~~ 3
 ~~3~~ 6
 ~~6~~ 10

⑥ Increment no by 1

⑦ Stop.

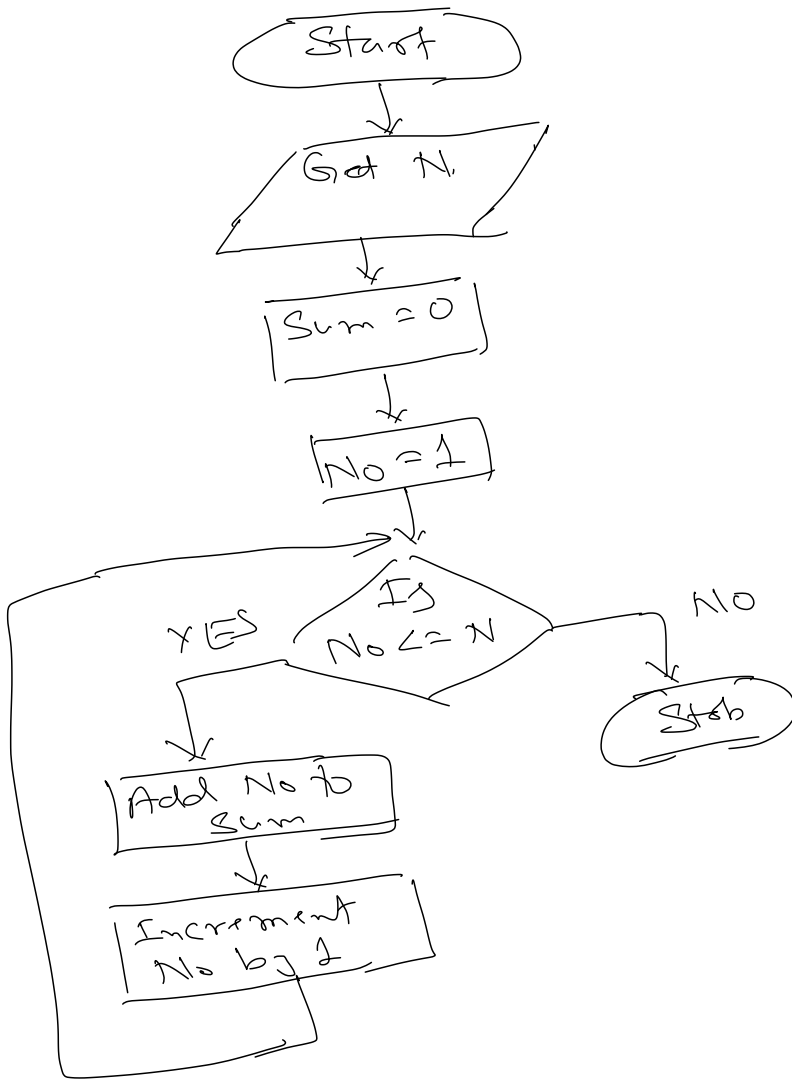
no → ~~1~~ 2 ~~3~~ 4
 5

① Get value of N

② Set sum to $N(N+1)/2$.

③ Stop.

⇒ Sum of first N numbers.



Check if a number is prime number or not.

① Get No.

② Set i to 2.

No/2

7
1 7
2 6

③ while $i < \text{No}$ do

$\text{No} \rightarrow 7$

④ if No is divisible
by i then

$i \rightarrow 2$

~~3~~

~~4~~

⑤ No is not prime

~~5~~

⑥ stop

~~6~~

⑦ increment i by 1.

~~7~~

No is
divisible by
 i if
remainder of
division is 0.

⑧ No is prime.

⑨ stop

23
2 3 4 5 6 7 8 9 10 11

12 13 14 15
16 17 18 19
20 21 22

$23/2$

12 \rightarrow 1, 12

\hookrightarrow 2, 6

\hookrightarrow 3, 4

Count number of digits in a number

① Get No.

② if No < 10 then

③ Count is 1.

④ Stop

⑤ if No < 100 then

⑥ Count is 2

⑦ Stop

⑧ if No < 1000 then

⑨ Count is 3

⑩ Stop

⋮

No = 541

Count = 3

No = 0

Count = 1

0 .. 9 \Rightarrow 1

10 .. 99 \Rightarrow 2

100 .. 999 \Rightarrow 3

⋮

positive
integer.

① Get No.

② Set count to 1.

③ while No \geq 10 do

④ Set No to
quotient of No / 10.

⑤ Increment Count by 1.

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Divide by 10

\Downarrow

Remainder
is digit
at ONE's
Place.

Quotient is
rest of number

⑤ Step.

$$\begin{array}{l}
 \text{No} \rightarrow 5 \\
 \text{Count} \rightarrow 1
 \end{array}
 \left| \begin{array}{cc}
 \cancel{12} & 1 \\
 \cancel{1} & 2
 \end{array} \right)
 \begin{array}{cccc}
 & & 1 & \\
 & & +0 & \\
 \cancel{10} & \cancel{10} & \cancel{10} & \\
 \cancel{1} & \cancel{2} & \cancel{3} & 4
 \end{array}
 \left| \begin{array}{r}
 10 \overline{) 541} \\
 \underline{50} \\
 41 \\
 \underline{40} \\
 \boxed{1} R
 \end{array}
 \right.$$

$$\begin{array}{r}
 10 \overline{) 541} \\
 \underline{50} \\
 41 \\
 \underline{40} \\
 \boxed{1} R
 \end{array}$$

\downarrow
 Q
 R