INTRODUCTION TO JAVA

Variables & Constants

Concept Of Algorithm: An algorithm defines the steps used to solve a problem. (It shows the steps of producing the desired outputs using the inputs.)

![Algorithm Diagram]

- An algorithm must have an input(s) & output(s).
- It must be correct.
- It must stop.
- It must be unambiguous (clear).

a = \sqrt{b}

b → \sqrt{b} → a

9 → 3

4 → 2

a = \text{max} (x, y)

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>a</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

a

BLACK BOX
Problem:

Find the maximum of two numbers. Algorithm in the form of a flowchart.

First of all let’s see the shapes that used in a flowchart.
And here is an example for a simple flowchart & the solution of our problem.
START

READ X, Y

X>Y?

YES (TRUE)

A=X

NO (FALSE)

A=Y

DISPLAY A

STOP
This was a simple flowchart. And now time to trace our flowchart.

```
<table>
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```

**PSEUDO CODE**

Start
Read x, y

If \((x>y)\) then
\[ a=x \]
Else
\[ a=y \]
End if

Display a

End

Let’s pass to another problem.

**Problem:**

\[ a=|b| \]

In this problem first we can draw a “Black Box” to understand it. Then we can draw our flowchart.
Black Box

\[ a = |b| \]

START

READ b

b > 0?

FALSE

a = -b

TRUE

a = b

DISPLAY a

STOP
Questions

1- Trace the algorithm \( a = \sqrt{x^2 + y^2} \) for the given \( x, y \) values. (12, 5), (4, 3), (8, 15)

2- Draw a flowchart which calculates \( \text{sgn}(A) = \begin{cases} 1, A > 0 \\ 0, A = 0 \\ -1, A < 0 \end{cases} \) and trace it for the given values. -3, 21, 0

3- Trace the algorithm “a” is the minimum of the three numbers for given numbers (2,7,4), (7,9,1), (4,2,8)

4- Draw a flowchart for the problem; if “\( x>y \)” draw a star (*), else draw a dot(.)

5- Draw a Black Box equation for \( a = |x| \ast |y| \)

Answers

1-

2-
3-

\[ a = \min(x, y, z) \]

\[
\begin{array}{ccc}
 x & y & z \\
 2 & 7 & 4 \\
 7 & 9 & 1 \\
 4 & 2 & 8 \\
\end{array}
\]

5-

\[ A = |x| \times |y| \]

\[
\begin{array}{ccc}
 x & y \\
\end{array}
\]