Tutorial: Algorithms, flowcharts and pseudocode

Solutions

1. 20, 108
2. See figure with Solution 2, Tax flowchart.

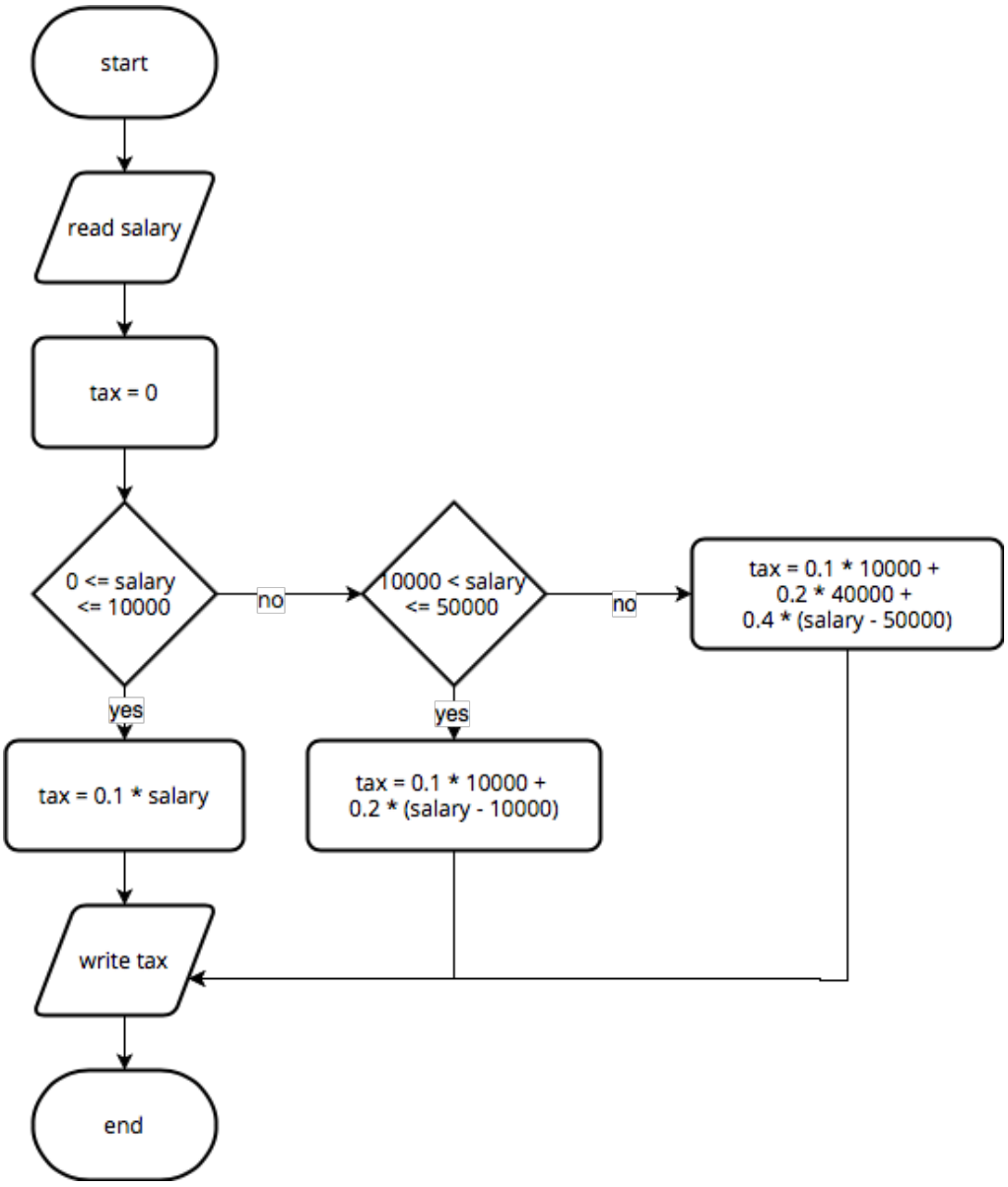

Figure 1: Solution 2, Tax flowchart

3. See figure with Solution 3, Binary Flowchart.

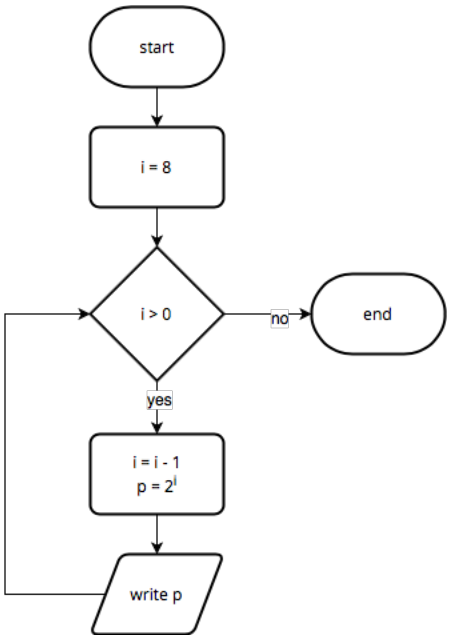

Figure 2: Solution 3, Binary Flowchart

4.

```
start
    read a,b
    if a < b
        a = a + 2 * b
        if a < 20
            b = b + 10
        else
            b = b + 5 * a
        end if
    else
        a = a^2 + b
        b = b + 5 * a
    end if
    write a, b
stop
```

5.

a) Using enumeration loop (Enumeration loops run for a set number of loops):

```
start
    read n
```

```
    if n > 0
        fact = 1
        for i = 2 to n by 1
            fact = i * fact
        end for
        write fact
    else
        write 'Invalid input n must be > 0'
    end if
end
```

b) Using pre-test loop (Pre-test loops test the condition before executing the body of the loop):

```
start
    read n
    if n > 0
        fact = 1
        i = 2
        while i <= n do
            fact = i * fact
            i = i + 1
        end while
        write fact
    else
        write 'Invalid input n must be > 0'
    end if
end
```

(c) Using post-test (Post-test loops execute the body of the loop and then test the condition):

```
start
    read n
    if n > 0
        fact = 1
        i = 1
        repeat
            fact = i * fact
            i = i + 1
        until i > n
        end do
        write fact
    else
        write 'Invalid input n must be > 0'
```

```
14      end if
15  end
```

6.

```
1   start
2       read n
3       read list x1, x2, x3 .... xn.
4       min = x1
5       for i = 2 to n by 1 do
6           if xi < min
7               min = xi
8           end if
9       end for
10      write min
11  end
```

If the condition less than $<$ inside of the enumeration loop (line 6) is replaced by greater than $>$, the algorithm will find the largest number (min becomes max). This can also be solved using pre-test and post-test loops.