

1. What does the following algorithm do?

Algorithm

Input: A natural number $n \in \mathbb{N}$

Output: ?

begin

 while ($n > 1$) do
 | $n := n - 2$

 end

 if ($n = 0$) then

 | output "Yes"

 else

 | output "No"

 end

end

← while loop keeps subtracting 2 from n until 1 or 0 is obtained

If n is even, this leaves $n=0$
If n is odd, this leaves $n=1$

Answer Algorithm returns "Yes" if n is even.
Algorithm returns "No" if n is odd

1. What does the following algorithm do?

Algorithm

Input: A natural number $n \in \mathbb{N}$

Output: ?

begin

$y := 1$

$k := n$

 while ($k > 0$) do

 | $y := y \cdot k$

 | $k := k - 1$

 end

 output y

end

| iteration | y | k |
|-----------|---------------------------------------|-------|
| 0 | 1 | n |
| 1 | n | $n-1$ |
| 2 | $n(n-1)$ | $n-2$ |
| 3 | $n(n-1)(n-2)$ | $n-3$ |
| 4 | $n(n-1)(n-2)(n-3)$ | $n-4$ |
| ⋮ | ⋮ | ⋮ |
| n | $n(n-1)(n-2) \dots 3 \cdot 2 \cdot 1$ | 0 |

Answer : Output is $y = n(n-1)(n-2)(n-3) \dots 3 \cdot 2 \cdot 1$
i.e. Output is $n!$