STATISTICS Circuit
Specification

Function

Design the STATISTICS circuit capable of computing the first three largest numbers in the set of $k=2^m$ n-bit unsigned numbers provided at its input. In parallel, the circuit should also compute an average of all k inputs.

The circuit should be able to execute the following pseudocode, should be optimized for minimum latency (i.e., execute as many operations as possible in parallel), and should take as little resources as possible.

```
no_1 = no_2 = no_3 = sum = 0
wait for go

for i=0 to k-1 do

  sum = sum + din

  if din > no_1 then
    no_3 = no_2
    no_2 = no_1
    no_1 = din
  elseif (din > no_2) then
    no_3 = no_2
    no_2 = din
 elseif (din > no_3) then
     no_3 = din
 end if

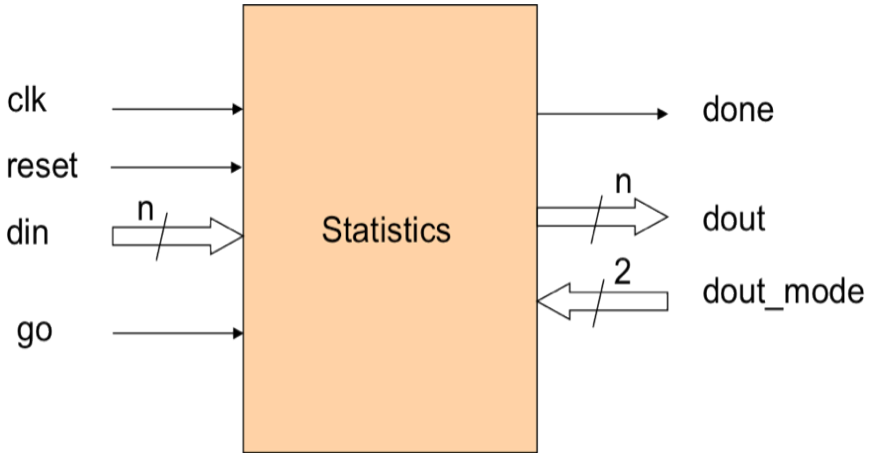
end for

avr = sum / k
```

Please clearly mark the widths of all buses in your circuit.

Interface

Assume the following interface to your circuit:



Port	Width	Meaning
clk	1	System clock.
reset	1	System reset. Active high.
din	n	Input Data.
go	1	Control signal indicating that the first input is ready. Active for one clock cycle.
done	1	Signal set to high after the output is ready.
dout	n	Output dependent on the dout_mode input.
dout_mode	2	Control signal determining value available at the output. 00: avr, 01: no_1, 10: no_2, 11: no_3.