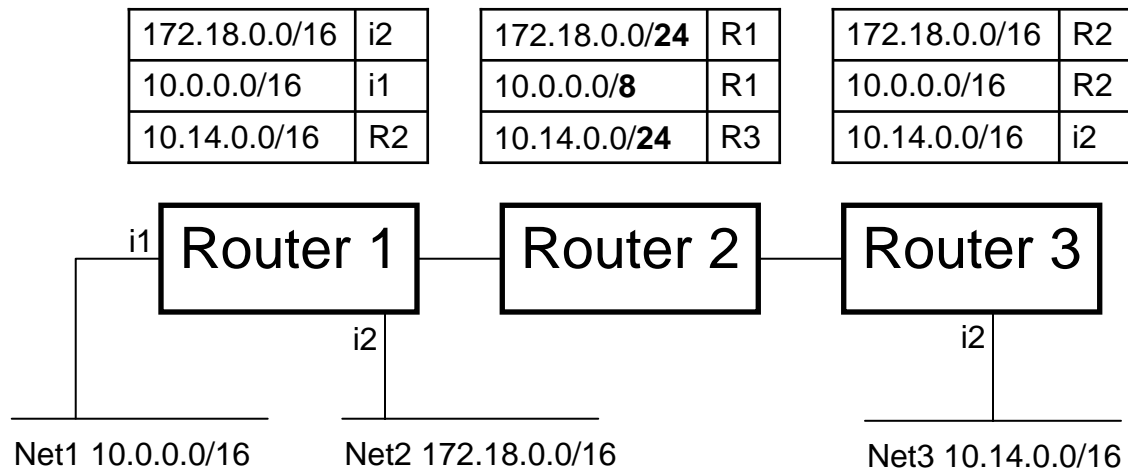


## Quiz 2

Write your name on the exam. Write something for every question. Students who do not write something for everything lose out over students who write down wild guesses. You will get some points if you attempt a solution but nothing for a blank sheet of paper. Write something down, even wild guesses. Problems take long to read but can be answered concisely.

Question	Maximum	Score
1	12	
2	8	
Total	20	

## Question 1 – IP forwarding



The network in the figure above has three routers and the figure also shows the routers' forwarding tables. A junior network administrator changes by mistake the prefix lengths for the entries in router2's forwarding table from 16 to 24 for the first and third entry, and from 16 to 8 for the second one. What is the path through the network for the following 3 packets?

a) A packet sent from computer A on Net1 to computer B on Net3 (IP 10.14.64.0)

*Router1->Router2->Router1... The packet will loop between Router1 and Router2 until its TTL reaches 0.*

b) A packet sent from computer B on Net3 to computer A on Net2 (IP 172.18.18.13)

*Router3->Router2 Router2 will drop the packet because it matches none of the routes in its forwarding table.*

c) A packet sent from computer B on Net3 to computer C on Net1 (IP 10.0.0.13)

*Router3->Router2->Router1->C The packet is delivered correctly.*

## Question 2 – End-host implementation

a) Explain the difference between using programmed I/O and direct memory access to transfer frames to and from the network adaptor.

*With programmed I/O every word of data is moved through the processor's registers. For incoming packets words are read from the card and written to memory, for outgoing packets words are read from memory and written to the card. With DMA, the network card "steals" the bus from the CPU and transfers data to/from memory directly. DMA is more efficient because the processor can execute instructions while the DMA transfer is in progress and the processor's cache is not "polluted" unnecessarily with the frame content.*

b) Give two reasons why we need to have memory to store a small number of frames on the Ethernet network adaptor.

*When the adaptor sends the frame, it needs to transmit the bits in the frame at a constant rate which is different from the rate at which data is read from memory, so it is simpler to buffer the data in the adaptor's local memory. When a frame causes a collision, the adaptor needs to store it until it can retransmit. A few incoming frames need to be buffered in the adaptor because the operating system might not be able to react immediately to an interrupt from the network adaptor announcing the arrival of new data.*