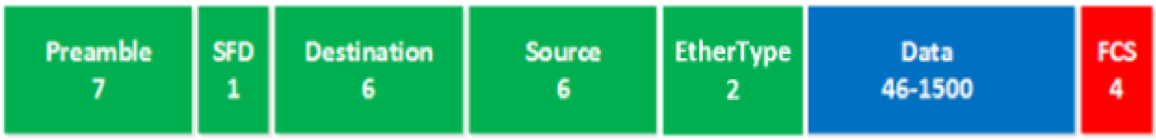
Additional information Exercise 4 (Worksheet 4) :

A 1500-byte frame is made up of the Ethernet header, which is 26 bytes long, so each IP packet has a size of 1500-26=1474 bytes.

Why the header of the frame is considered 26 Bytes in this exercise:

In this exercise, the format of the frame is considered as depicted below:



7 + 1 + 6 + 6 + 2+ 4 = 26 Bytes

An Ethernet frame is preceded by a preamble and start frame delimiter (SFD), which are both part of the Ethernet packet at the physical layer.

- **Preamble** – informs the receiving system that a frame is starting and enables synchronization.
- **SFD (Start Frame Delimiter)** – signifies that the Destination MAC Address field begins with the next byte.

Each Ethernet frame starts with an Ethernet header, which contains destination and source MAC addresses as its first two fields. The middle section of the frame is payload data including any headers for other protocols (for example, Internet Protocol) carried in the frame. The frame ends with a frame check sequence (FCS), which is used to detect any in-transit corruption of data.

So, in this exercise, the preamble and start frame delimiter (SFD) have been included when the header size is calculated that's why the result was 26 Bytes.

The router B will receive the frame of 1500 bytes (from network 10) and perform the fragmentation process before forwarding it to network 30. However, before passing it to the network layer to perform the fragmentation, the data link layer of the router should remove the header of the data link (1500 – 26 = 1474 bytes).

Exercise 13 (Worksheet 2):

A

	Dest	Next H	Cost
C	B	--	2
	C	@B @E	6 6
	D	@B @E	5 5
C	E	--	2
	F	@B @E	9 3
	G	@B @E	6 4
	H	@B @E	7 5

B

	Dest	Next H	Cost
C	A	--	2
	C	@A @D	8 4
C	D	--	3
	E	@A @D	4 6
	F	@A @D	5 7
	G	@A @D	6 4
	H	@A @D	7 5

C

	Dest	Next H	Cost
	A	@D @H	6 9
	B	@D @H	4 11
C	D	--	1
	E	@D @H	4 7
	F	@D @H	5 8
	G	@D @H	2 5
C	H	--	4

D

	Dest	Next H	Cost
	A	@B @C @G	3 10 5
C	B	--	3
C	C	--	1
	E	@B @C @G	7 8 3
	F	@B @C @G	8 9 4
C	G	--	1
	H	@B @C @G	12 5 2

E

	Dest	Next H	Cost
C	A	--	2
	B	@A @F @G	4 10 6
	C	@A @F @G	8 8 4
	D	@A @F @G	7 7 3
C	F	--	1
C	G	--	2
	H	@A @F @G	9 5 3

F

	Dest	Next H	Cost
	A	@E @H	3 9
	B	@E @H	5 9
	C	@E @H	5 8
	D	@E @H	4 6
C	E	--	1
	G	@E @H	3 5
C	H	--	4

G				H			
	Dest	Next H	Cost		Dest	Next H	Cost
	A	@D	6		A	@C	10
		@E	4			@F	7
		@H	8			@G	5
	B	@D	4		B	@C	8
		@E	6			@F	9
		@H	9			@G	5
	C	@D	2	C	C	--	4
		@E	10				
		@H	5				
C	D	--	1		D	@C	5
						@F	8
						@G	2
C	E	--	2		E	@C	8
						@F	5
						@G	3
	F	@D	9	C	F	--	4
		@E	3				
		@H	5				
C	H	--	1	C	G	--	1

All routing tables
We suppose that the minimum cost is taking into account each time we find multiple routes with the same next hop output.

Exercise 14:

The routing tables of the router R1 are indicated in the next tables, depending on the criterion chosen to perform the aggregations.

Routes with equivalent addressing space

	Destination/Prefix	Next hop	Cost
C	213.205.24.24/30	213.205.24.25	0
C	130.192.3.188/30	130.192.3.190	0
C	130.192.3.184/30	130.192.3.185	0
S	0.0.0.0/0	213.205.24.26	1
S	130.192.2.0/24	130.192.3.189	1
S	130.192.3.0/25	130.192.3.189	1
S	130.192.3.160/27	130.192.3.189	1
S	130.192.3.192/29	130.192.3.189	1
S	130.192.0.0/23	130.192.3.186	3
S	130.192.3.128/27	130.192.3.186	3

Please note that the route 130.192.3.160/27 includes also the address ranges 130.192.3.184/30 and 130.192.3.188/30 that are reachable through another next hop. However, the above routes are more specific, hence can be aggregated in a larger address range. Notice that in this case the studied topology is connected to the Internet and thus it is consented to use a default route even in the case of an equivalent addressing space. Actually, one must assume that all the addresses not present in the studied topology are present in the Internet; the default route will thus be a route to these destinations.

Routes with maximal aggregation

	Destination/Prefix	**Next hop**	**Cost**
C	213.205.24.24/30	213.205.24.25	0
C	130.192.3.188/30	130.192.3.190	0
C	130.192.3.184/30	130.192.3.185	0
S	0.0.0.0/0	213.205.24.26	1
S	130.192.2.0/23	130.192.3.189	1
S	130.192.0.0/23	130.192.3.186	3
S	130.192.3.128/27	130.192.3.186	3

Notice that, the studied topology being connected to the Internet, the default route is basically used to reach these destinations and cannot be used to aggregate the internal networks