CMSC3180: Data Communication and Networking
Assignment 4 Due on Monday (10/21) in class

Policies:

1. Discussions on these questions are welcomed and encouraged. However, you should NOT ask any other person to write solution for you or copy solutions from any other person directly. You should write the names of the persons from whom you received help and cite the references used if any.
2. Late turn in will cause a 10% deduction on your grade for each late day.

Question 1. (15 points) Host A and B are communicating over a TCP connection, and Host B has already received from A all bytes up through byte 546. In this TCP connection, A's port # is 64231 and B's port # is 80. Suppose Host A then sends two segments to Host B back-to-back. The first and second segments contain 60 and 30 bytes of data, respectively

a. What is the sequence # in the first segment of the two back-to-back segments from A to B?

- *First Sequence = 547*

b. In the second segment sent from Host A to B, what are the sequence number, source port number, and destination port number?

- *Sequence #: 547 + 60 bytes = 607*
- *Source Port: A is source= 64231*
- *Destination Port: B is destination = 80*

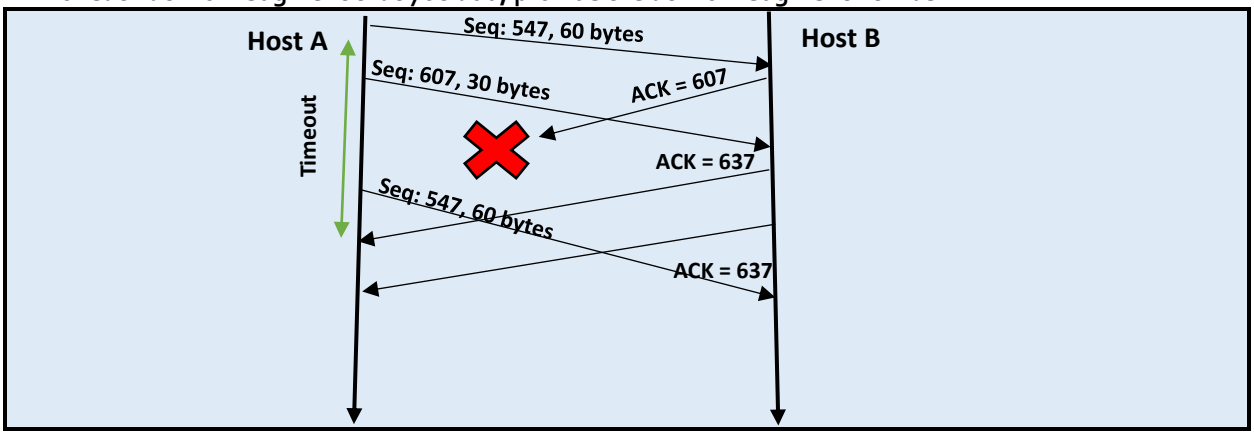
c. If the first segment arrives before the second segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number, the source port number, and the destination port number?

- If the first segment arrives before the second segment, the acknowledgement of the first arriving segment is 607, the source port number is 80, and destination port is 64231.

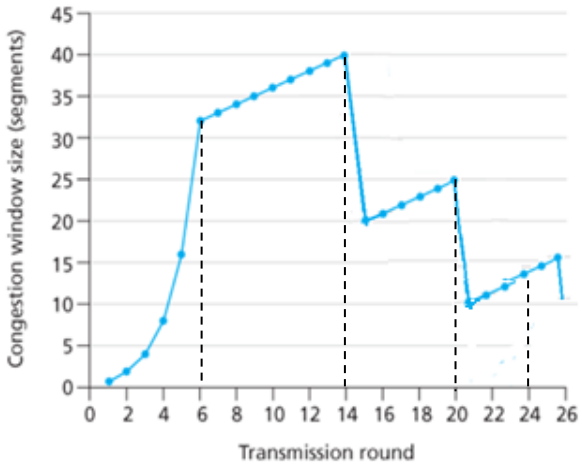
d. If the second segment arrives before the first segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number?

- If the second segment arrives before the first, in the acknowledgment of the first arriving segment, the acknowledgment number would be 547(the first sequence #). This shows that is still waiting for the first bytes and those past it.

e. Suppose the two segments sent by A arrive in order at B. The first acknowledgment is lost and the second acknowledgment arrives after the first timeout interval. Draw a timing diagram, showing these segments and all other segments and acknowledgments sent. (Assume there is no additional packet loss.) For each segment in your figure, provide the sequence number and the number of bytes of data; for each acknowledgment that you add, provide the acknowledgment number.



Question 2. (**15 points**) Play with the Applet of TCP congestion control https://media.pearsoncmg.com/ph/esm/ecs_kurose_compnetwork_8/cw/content/interactiveanimations/tcp-congestion/index.html. Assuming TCP Reno is the protocol experiencing the behavior shown in the image attached, answer the following questions.



a. Identify the interval of time (expressed in transmission round) when TCP slow start is operating
   - *The interval of time for slow start: 1-6 transmission rounds*

b. Identify the interval**(s)** of time when TCP additive increase is operating
   - *Interval of Additive Increase: 7 – 14 transmission rounds*

c. What is the value of ssthresh value before the 12th transmission round?
   - *No loss yet, don't need formula: ssthresh = cwnd/2*
   - *38 = value of ssthresh*

d. At what transmission round(s) does the sender detect packet loss?
   - *The sender detects packet loss at rounds 15, 21, 27. The window size is then reset/adjusted correspondingly.*

e. What is the value of ssthresh on the 24th transmission round?
   - ~~*CWND at 24th transmission round = 13,*~~
   - ~~*13/2 = 6.5 value of ssthresh*~~
   - *Last Loss on round 21*
   - *Use 25 cwnd and transmission round 20, since just before loss event*
   - *25/2 = 12.5*