1. What is *congestion control* and why do we use it in the Internet?

2. Flows in the Internet commonly use TCP (Transmission Control Protocol). TCP uses window-based flow control, in which a maximum number of packets, W, are allowed to be outstanding (i.e. transmitted but not yet acknowledged) at any one time. How many packets should a transmitter hold onto, just in case they need to be retransmitted?

3. To control congestion, TCP does not use a fixed value for W. Instead, W varies over time, depending on the current congestion in the network. Specifically, TCP follows two rules to control congestion:
   a. When a packet is successfully acknowledged: $W \rightarrow W + 1$.
   b. When a packet is dropped: $W \rightarrow \dfrac{W}{2}$.

   Sketch the evolution of W as a function of time, assuming that exactly one packet is dropped every time W reaches $\hat{W}$.

4. Based on your sketch in (3), derive an approximate expression for the throughput of a TCP flow as function of p (the loss probability) and RTT (the round-trip-time, which we will assume is constant).