

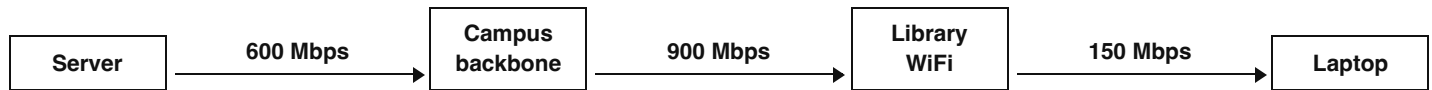
Name: _____

GWID: _____

Every answer is a single number — the units are given in the question. Use the box under each question for your work.

Q1 Throughput and the Bottleneck Link

A student in the library downloads a large file from a course server:



The server uplink and the library WiFi are this student's alone. The **campus backbone is shared evenly** among everyone downloading at that moment.

1.1 At 2 p.m., **10 students** are downloading. What is this student's end-to-end throughput, in Mbps?

Throughput: _____ Mbps

1.2 At 3 a.m., only **3 students** are downloading, everything else unchanged. What is the throughput now, in Mbps?

Throughput: _____ Mbps

Work

Q2 HTTP Response Time

A browser loads a page made of a **base HTML file plus 5 embedded objects** referenced inside it. **RTT = 10 ms**. Every object is small, so **ignore transmission time** — only round trips count.

Under **non-persistent HTTP**, fetching one object costs **2 RTT**: one round trip to open the TCP connection, one to send the request and get the first bytes back.

2.1 The browser fetches everything **sequentially**, opening and closing a connection for each object. How long does the page take to load, in ms?

Load time: _____ ms

2.2 The browser now opens up to **2 parallel connections**, still non-persistent. How long does the page take to load, in ms?

Load time: _____ ms

Work