Solutions

2.1

- ACK 61 – cumulative: $1 + 60$ bytes expected next ✓.

2.2

- SYN; SYN-ACK; ACK ✓.

2.3

- Flow control protects the receiver's buffer; congestion control protects the network ✓.

3.1

- 40 bytes: seq 1, ACK 41 ✓.
- 80 bytes: seq 41, ACK 121 ✓.
- Lost 25 at seq 121: ACK stalls at 121 ✓.
- Retransmitted 25: ACK 146; final 10 bytes: seq 146, ACK 156 ✓.
- Total delivered: $40 + 80 + 25 + 10 = 155$ bytes ✓.
- The receiver never delivers data above the gap to the application – it buffers it until the gap fills ✓.

3.2

- DNS lookup: UDP – one request-sized packet; loss means re-ask ✓.
- File download: TCP – ordered, complete delivery ✓.
- Live audio call: UDP – delay is worse than loss ✓.
- Chat message: UDP with application-level ACK/retry is acceptable ✓.
- The download needs the retransmission ledger (order + completeness) ✓.
- The call needs no retransmission: a late frame is worthless ✓.
- On UDP the chat must add its own acknowledgement and retry logic ✓.