1) Write your name and your Andrew ID.
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2) Explain the difference between Channel Aftertouch (aka Channel Pressure) and Polyphonic Aftertouch (aka Key Pressure) messages in terms of semantics (what they mean) as opposed to syntax (what are the bits)
Channel Aftertouch senses the pressure of all keys pressed to create a set of data to determine how hard the key is pressed. Polyphonic pressure on the other hand senses each individual key but creates a lot more data.

3) Describe the format of a MIDI controller change message (including the status byte). Account for every bit.
The first byte's first nibblet includes a number for Note-On Command and the second nibblet represents the Channel.
The second byte ranges from 00-7F for the controller.
The third byte ranges from 01-7F for the value.

4) Suppose you want to play different instruments at once using a single MIDI connection to a synthesizer. For example, you want to select piano, violin, viola, cello, bass, flute, clarinet, oboe, bassoon, etc. How many different instruments can you play at once? (This is not a trick question, if you include drums, count "drums" of all types to be one instrument.)
16 instruments

5.) How long does it take to send one 3-byte MIDI message?
320 microsecond / byte * 3 bytes = 960 microseconds

How long does it take to play a 5-note chord in each of the following two cases?
5A.) Assume each note is encoded using s 3-byte NoteOn message. What is the transmission time?
320 microsecond / byte * 5 notes = 4800 microseconds

5B.) Assume the first note is encoded using a 3-byte NoteOn message, and the remaining notes are encoded using "running status." What is the transmission time?
960 microseconds + 4 * (320 microseconds * 2 bytes) = 3520 microseconds

6A.) Suppose we build a microcontroller to capture pressure from a sensor and send the pressure as MIDI to our laptop using Channel Aftertouch messages. How many messages can we send per second?
320 microsecond / byte -> 1/3200 = 0.003125 = (3125 bytes / second) / (2 bytes / 1 message) = 1562.5 messages / second

6B.) How many bits of data can we send per message? I.e. how many bits can we use to encode pressure samples?

8 bits

6C) 6C.) Suppose we now want to capture multiple pressure sensors. We need to sample each sensor 300 times per second. Assuming the only limitation is MIDI bandwidth, and we limit ourselves to one standard MIDI cable connection, how many pressure sensors can we have, with each sensor sending 300 Channel Aftertouch messages per second on the same MIDI cable?

(1562.5 messages / second) / (300 messages/sensor) = 5.208 pressure sensors (5 sensors)

7.) Write 8 bytes in hexadecimal that will
• Select an oboe sound using General MIDI on Channel 3 (where channels are numbered 1 to 16)
C2 44
• Play an F# above middle C with a velocity of 110
92 66 6E
• Stop playing the F# above middle C (using a NoteOn status byte, not NoteOff)
92 66 00
• You could encode this sequence in only 7 bytes. How?
The status byte of 92 from the first message is still in effect, and did not have to be resent.