Week 6 Questions

Lecture 28

1. Sender and receiver must have shared knowledge, like an agreed upon encoding scheme.
2. It is important to know how much information is transmitted. So you can possibly speed up the interpretation.
3. So that the receiver knows how to interpret the message the sender is sending.
4. The less the data, the faster the receiver can interpret the data.
5. 1 bit. If you already know the answer, then you can just use the bit to verify the sender's integrity.

Lecture 29

1. N bits, 4 bits, 7 bits
2. If the sender and receiver agreed that there would only be two different answers ("attack at dawn" and "attack at dusk"), then there only needs two bits to discern which one it is. However, if the receiver does not know what answers the sender is going to send, then it may need to read all the bits and see which answer it matches with.
3. 4 bits. Each time a bit is sent it splits the available answers in half. It would take 4 bits to get to exactly one answer.
4. 256 bits.
5. Like in the example, you don't know if there will be just two answers (dawn and dusk), or multiple answers (anytime during the day). Many circumstances can have multiple answers so that is why so few are ideal.

Lecture 30

1. The first definition is a shortened name for binary digit; it is a discrete number (0 or 1). The second is talking about the quantity of information.
2. 000, 001, 010, 100, 110, 101, 011, 111
3. Message 10 will happen 99.5% of the time, so message 10 has been uniquely encoded with just 1 bit. The other messages have 5 bits. So if you do it 1000 times, 995 errors would be message 10 and the other 5would be messages with 5 bits. There for 995 bits for message 10 and 5 bits for each of the other 5 messages.
4. If you know that a particular message is more likely to occur, you can encode that one uniquely so that it would take less bits to transmit the information.
5. 0, 1, 01, 11
6. It is the best possible encoding for this language.

Lecture 31

1. 24684286
2. 0, 10, 110, 1110, 11110, 11111
3. It is important to be uniquely decodable so the receiver may decode the sender's message unambiguously
4. We don't lose any information from the transmission.
5. It's not uniquely decodable. You don't know if 3 dots is 3 Es or an S.

Lecture 32

1. H = -(log(1/8)) ~ 0.903
2. H = -(4/5log(4/5) + 1/5log(1/5)) ~ 0.217
3. It gives a lower limit on the encoding efficiency. You know if you can do better or not.

Lecture 33

1. Each coin flip is independent of each other. So to find the probability, you just multiple them together.
2. It is the number of bits of encoding multiplied by the number of times it is likely to occur.
3. 000, 001, 010, 011, 100, 110
4. H = -(12/20log(6/20) + 6/20log(3/20) + 2/20log(1/20)) ~ 1.591
5. 0, 10 ,110, 1110, 11110, 11111