1.

* Speed(Hz) and typical Intel or AMD
* Millions of transistors
* First commercial CPU was Intel 4004 4bit (16 value) 746 kHz
* Machine code language, compiler turns our code into machine code (1 & 0)
* 1 bit = 2 values, 2 bit = 4 values, 32 bit = 4.29 billion values, 64 bit = 9.2 quintillion
* 32 bit can address 4 gb ram, 64 bit can address 16 billion gb of ram
* iPhone 6 and above have 64bit
* the bits isn’t as important as the architecture (coffee lake, sky lake, ivy bridge, haswell)
* Ferrari vs Camry. Both understand when pedal is pushed but Ferrari engine architecture design lets it accelerate faster

2.

* Overclocking
  + Boosting clock speed. Cant make a calculator as fast as a gaming pc
  + Device becomes unstable as speed turns up. Can compensate by turning up voltage( boosts power consumption and heat output.
  + Making a computer run faster than what it was designed for
  + Gives more performance and is very common

3.

* Multi core “Eating”
  + Can only do as much as one mouth
  + If you can add more mouths you can process more
  + Due to costs its not always possible to take this approach (Intel I8 6 core)
  + Increases power consumption and heat output
* Hyperthreading
  + Using two hands to eat with one mouth
  + Not wasting anytime
  + Scheduling
  + Cant do much for single threaded work loads because one thing at a time
  + Multi threaded is adding more hands and more mouths
  + Multi threading is good with video editing, 3d rendering, and heavy multitasking
  + One frame of video can processed while the next is qued up
  + Increases power consumption and heat output
  + Hyper threading is better than no hyper threading but isn’t as good as just adding more processors

4.

* In 2011 U of Illinois built supercomputer called blue water. It used 15MW. Which is enough to power 15,000 homes. It would take nearly 53,000 solar panels.

5.

* Qubit can be a spin in a magnetic field or a photon with horizontal or vertical polarization
* Superposition, can be both 1 and 0. Once looked at it has to decide if its 1 or 0
* 4 classical bits can be in 16 combinations. 4 qubits can be in all of those 16 at once
* Entanglement is a close connection that makes each of the qubits react to a change in the others state instantaneously matter how far apart.
* Quantum gate manipulates an input of superpositions rotates probabilities and produces another superposition.
* Quantum computer sets up qubits applies quantum gates to entangle them and manipulate probabilities and then measures the actual o’s and 1’s. Which means you get all the possible calculations all done at the same time.
* You can only measure one of the results and it might not be the one you want.
* But by exploiting superposition and entanglement this can be exponentially more efficient on a normal computer.