Video: https://www.youtube.com/watch?v=ZBaXPY_0TNI

Review: classical bits are either 0 or 1.
They can be manipulated through logic gates (ie not changes a 0 bit to a 1 bit)

Qbits are similar: they still do inform that a bit is a 0 or a 1. Using an 'X' gate can convert a 0 to a 1 and vice versa.

There are reset gates, which make a qubit 0. But qubits can do more than this.

A hadamard gate can either make a gate a 0 or a 1. There is a 50/50 chance of each occurring. It could seem like the h gate is just randomizing the qubit. But putting two h gates in a row will always reset the value to whatever value it was beforehand. This a key step to understanding that a qubit is more than just having a 0 or a 1.

In between h gates, you could say that it knows that it's in between the 0 and 1 states. Being in between a 0 and a 1 is known as being in a superposition.

When using an h gate and reporting several different measurements, they will all agree, suggesting that we're not just reporting something random each time (so not everything will be like a coinflip)

The measurement gate works by randomly selecting a state and making that the *only* possible state. This is known as collapsing a superposition.

Measuring a qubit is destructive - it destroys some of the information it carries upon measuring such a qubit. As an example: start with a qubit at 0, put an h-gate, a measurement, an h-gate, and another measurement. Earlier, the second measurement would always be 0. But with this measurement added in between the h gates, it now has a chance to be a 1.

To represent the state of a qubit, we use a bloch sphere. If 0 was an arrow pointing directly up, and 1 was pointing directly down, an arrow leaning in the direction of 0 has a greater chance of being a 0 than a 1, and vice versa.

An x gate could be like a half rotation, which is more descriptive in telling where a qubit will end up when it is not a 0 or a 1. Y and Z gates do the same thing on their respective axis. Rx, Ry, and Rz gates can rotate a specified amount. We could say that a y gate rotates by a half a radian, and an Rx gate can be rotated by 3 radians.

On this rotation topic, the H-gate does half rotations on an axis in between the x and z axis.