1. The first piece of the puzzle is to understand the cardiac conduction cycle. We will break the conduction cycle into six main steps (A-F in the figure at right). These steps may be different than what is usually taught but understanding these six steps is necessary to understand all the deflections on an ECG. (A-F in the figure at right).

A. Depolarization of the Atria
B. Repolarization of the Atria
C. Septal Depolarization
D. Apical Depolarization
E. Late Left Ventricular Depolarization
F. Repolarization of the Ventricle

2. The second piece of the puzzle is to understand the system of leads. The main leads of the ECG are lined up in what is called Einthoven’s Triangle. The basis of the 12 lead system is to view voltage changes from several angles, technically six lead axes that will visualize voltage changes on the frontal plane (I, II, III, aVR, aVL, and aVF) as well as six “precordial” electrodes (V1, V2, V3, V4, V5, V6) which wrap towards the armpit to view voltage changes in the transverse plane (while we are only looking at the frontal leads here, the same principles apply to precordial leads).

3. The third piece of the puzzle is how do the leads pick up the voltages.

1. ECG machines measure the sum of all voltage changes (not individual voltage changes).
2. ECG leads only pick up that part of a voltage change that is parallel to the lead.
3. If the voltage change is in the same direction as the lead, the deflection is positive (up). If the voltage change is opposite the lead, the deflection is negative (down.)

Sources: www.bem.fi and Investigative Electrocardiography in Epidemiological Studies and Clinical Trials.