SQUARE AND TRIANGULAR WAVE GENERATOR
Square Wave Generator

- The non-sinusoidal waveform generators are also called relaxation oscillators. The op-amp relaxation oscillator is a square wave generator. In general, square waves are relatively easy to produce. The comparator uses positive feedback that increases the gain of the amplifier. In a comparator circuit this offer two advantages. First, the high gain causes the op-amp’s output to switch very quickly from one state to another and vice-versa.

  Second, the use of positive feedback gives the circuit hysteresis.
Operational amplifier based triangular wave form generator is simple circuit that is widely used in function generators. The circuit for Triangular wave generator is designed using 741 op amp. We know that the integrator output waveform will be triangular if the input to it is a square wave. It means that a triangular wave generator can be formed by simply cascading an integrator and a square wave generator, as illustrated below.

This circuit uses two operational amplifiers. First op amp functions as a comparator and next op amp as an integrator. Saw tooth waveform can be easily generated by doing little modifications in the triangular wave generator circuit. In this circuit the ‘non inverting’ terminal of second op amp is grounded, to get saw tooth generator we just need a Resistance adjustment.
Circuit Topology
Square wave and Triangular Wave Output
Comparator compares the voltage at Non Inverting point of the first Op Amp continuously with respect to the voltage at the inverting input, which is at ground potential.

When the voltage at Non Inverting terminal goes slightly below zero, the output of comparator will switch to negative saturation.

Consider the output of comparator is $+V_{sat}$, since this voltage is the input of integrator, then its output will be negative going ramp.

Thus one end of the potential divider is at $+V_{sat}$ and other end is at negative going ramp. When the negative going ramp attains a value say $-V_{ramp}$ the effective voltage at P becomes slightly less than 0V. This switches output of comparator to $-V_{sat}$. 
During this time integrator output will be positive going ramp. When the value of positive going ramp attains $+V_{ramp}$, voltage at Non Inverting Terminal of the first Op Amp becomes slightly greater than 0V, thereby switching comparator output to $+V_{sat}$.

This cycle repeats and generates a triangular waveform.

Triangular waveform can also be generated by integrating square wave from an astable multivibrator.
The cycle from the square wave to the next operational amplifier repeats and generates a triangular waveform.

Triangular waveform can also be generated by integrating square wave from an astable multivibrator.

The frequency of the Triangular wave can be calculated using the resistance and the capacitance value calculations.

Thus the Square wave and the Triangular wave is generated using Op Amp 741, and simulated output waveforms are obtained using the Solid thinking Activate tool.