Verification of Kirchhoff's Current and Voltage law using Tinkercad

Date:	7/10/2021	**Name:**	Dhruv Karmokar
Experiment No:	3	**Reg. No:**	21BAI1604

Aim: To verify Kirchhoff's current law and voltage law for a simple resistive circuit using Tinkercad.

Software required: Tinkercad

Theory:

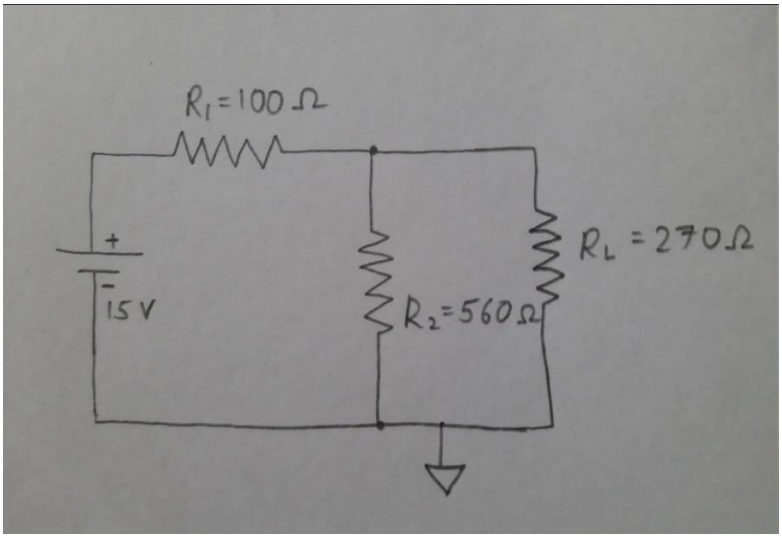
Kirchhoff's current law: Kirchhoff's Current Law states that "The algebraic sum of all currents entering and exiting a node must be equal to zero."

Kirchhoff's voltage law: Kirchhoff's Voltage Law states that "The algebraic sum of all voltages in a loop must equal zero"

Procedure:

1. Sign in to Tinkercad.
2. Click on circuits. Create a new circuit.
3. Add breadboard, power supply, resistors, multimeters and connect wires
4. Negative of breadboard is connected to negative terminal and positive of breadboard is connected to positive terminal. Power supply is set to 15V and resistors 100, 560 and 270. Multimeters (ammeter to measure current is connected in series to the branch wherever value of current is required and voltmeter parallel to the component through which voltage is required.)
5. Simulate it.

Circuit diagram:



Theoretical calculations:

Resistances R_2 & R_3 are in parallel

Equivalent resistance $= \frac{R_2 \times R_3}{R_2 + R_3} = \frac{560 \times 270}{560 + 270} = 182.16\,\Omega$

$R_{eq.1} = 182.16\,\Omega$

R_{eq} & R_1 are in series

Total Equivalent Resistance $= R_{eq.} = R_{eq.1} + R_1$

$= 182.16 + 100$

$= 282.16\,\Omega$

Total Current $= i = \frac{V}{R_{eq}} \Rightarrow i = \frac{15}{282.16} = 0.0531\,A$

$I = 53.1\,mA$

Potential through $100\,\Omega = V_{100\,\Omega} = 53.1\,mA \times 100$

$= 5.3\,V$

Assume current through R_2 be I_2.

$I_2 = \frac{I \times R_1}{R_1 + R_2}$

$= \frac{53.1\,mA \times 270}{560 + 270} = \frac{14,337}{830}$

$I_2 = 17.27\,mA$

$I_3 = I - I_2$

$= 53.1 - 17.27$

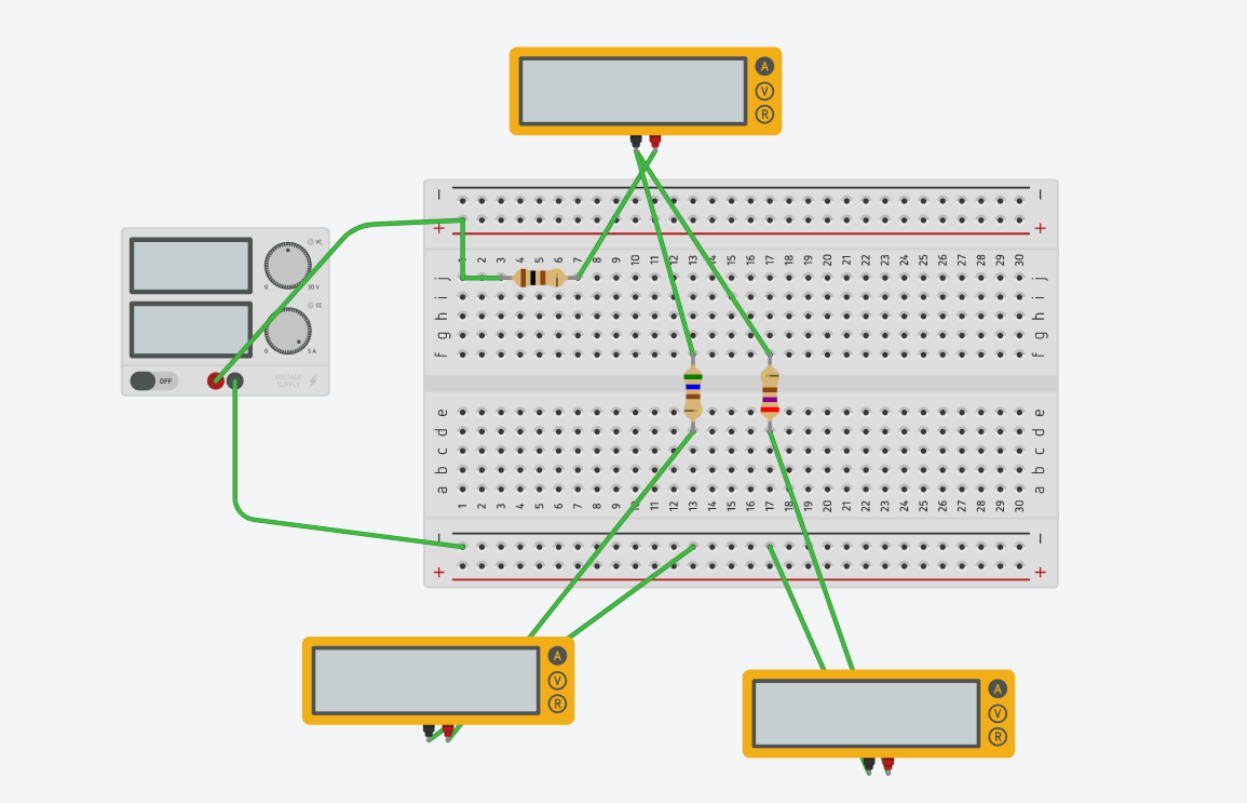
$I_3 = 35.83\,mA$

$V_2 = V_{560\,\Omega} = V_{270} = 15 - V_{100\,\Omega}$

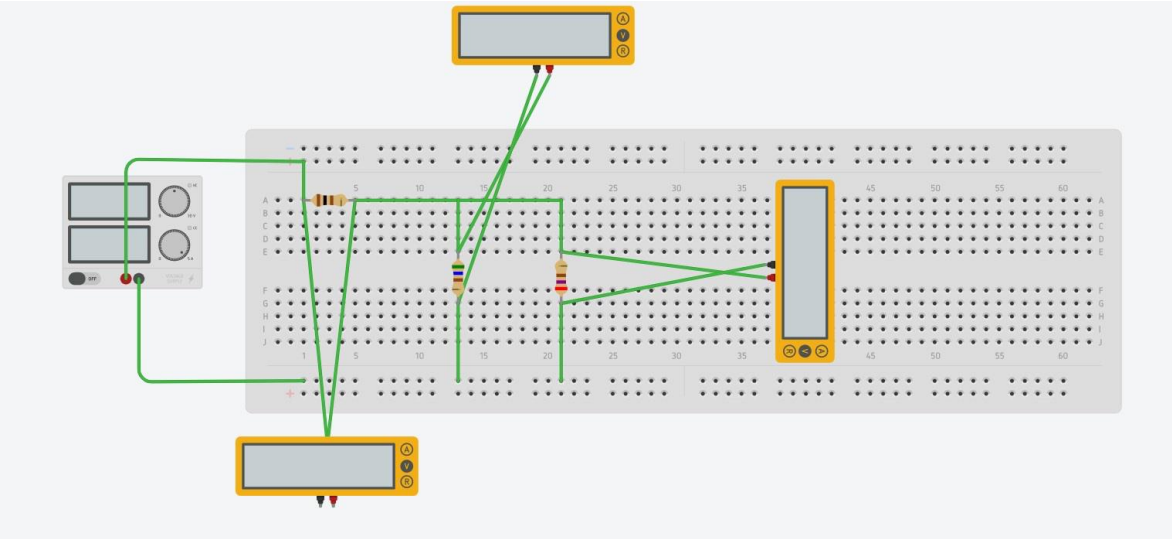
$= 15 - 5.3$

Voltage drop across R_3 & R_2 $= 9.7\,V$

Circuit for KCL – Tinkercad (snapshot):

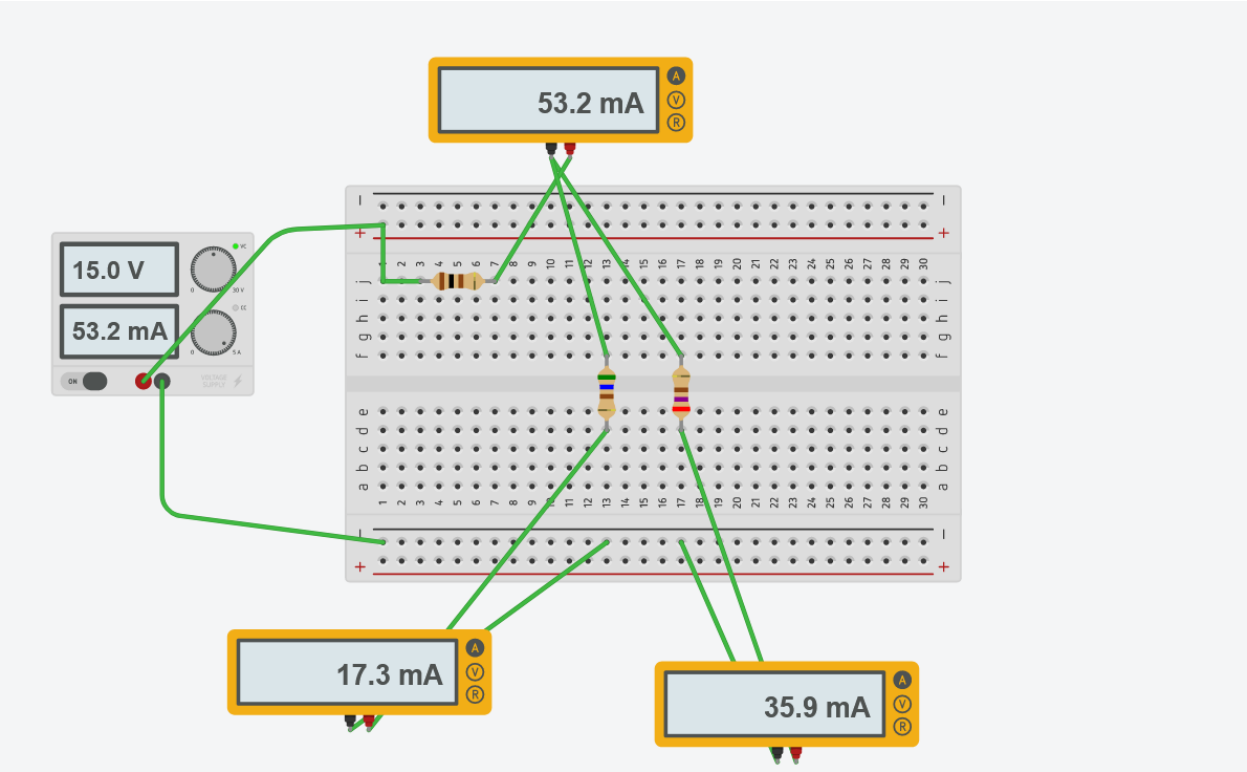


Circuit for KVL – Tinkercad (snapshot):



Results:

KCL



KVL