

PLTW GTT ME MATH Frameworks

PLTW Course GTT Magic of Electrons

Math Strand being addressed Algebra

Math Standard being addressed 7.2.1.1

Overview:

Math Standard and Benchmarks 7.2.1; Understand the concept of proportionality in real-world and mathematical situations, and distinguish between proportional and other relationships.

- 7.2.1.1; Understand that a relationship between two variables, x and y , is proportional if it can be expressed in the form

Correlation to Common Core Math Standards: MN 7.2.1.1 \approx CCSS 7.RP.2

Essential Understandings/Big Ideas:

Measure voltage, current, and resistance using a multimeter and mathematically calculate voltage, current, and resistance using Ohm's law.

Essential Questions

Why is the mathematical relationship expressed through Ohm's Law so important for designing and evaluating electrical circuits?

What should students know and be able to do [at a mastery level] related to these benchmarks?

- They should be able to set up an algebraic equation.
- Be able to understand the relationship between the variable and be able to manipulate them in a way to solve the problem.
- Students should be able explain:
 - Ohm's Law explains the mathematical relationship between voltage, current, and resistance. They will use this relationship to understand the concept of proportionality in real-world and mathematical situations, and distinguish between proportional and other relationships.
 - Understand that a relationship between two variables, x and y , is proportional if it can be expressed in the form $I = V/R$ or $V = IR$. Distinguish proportional relationships from other relationships, including inversely proportional relationships.

Misconceptions:

Student Misconceptions:

That electronic is math

Solving Ohms Law is related to Algebra

That math is very relevant in any device that needs electricity.

Teacher Resources:

Teacher Notes

The student struggle the most is in is making the correlations to what it is they are measuring to an Algebraic equation. Having the students work in pairs with one student measuring the components with a multimeter and the other student writing down the math, and have the student switch roles after each problem. Then have the student share their findings.

New Vocabulary

Capacitor	An electrical device used to store electrical charge.
Circuit Diagram	A drawing that traces the path that electron flow will take in an electronic circuit.
Diode	A device that permits current to flow through it in only one direction.
Electronic Circuit	A group of electronic components that work together to perform a specific function.
Fixed Resistor	Resistors that have a value that cannot be changed.
Light Emitting Diode (LED)	A diode that will produce light when current flows through it.
Ohm (Ω)	The unit of measure of electrical resistance.
Parallel Circuit	A circuit that contains more than one path for current flow.
Resistor	A device used to introduce some amount of resistance into a circuit.
Schematic	A map of an electronic circuit. It uses symbols to represent electrical components along the pathway.
Series Circuit	A circuit that contains only one path for current flow.
Switch	A mechanical device used to connect or disconnect a component or circuit.
Thermistor	A resistor that changes its resistance with a change of temperature.

Transistor	A small electronic device used in a circuit as an amplifier or switch.
Variable Resistor	A resistor whose value can be varied between its minimum and maximum values.
Volt (V)	A unit for measuring voltage.

Vignette:

This is a step-by-step description of the experience students might have in applying this math standard/benchmark in the PLTW class.(dialog)

Student teams will work on the activity in pairs, complete the relevant portions of their Circuit Diagrams Chart while the teacher assists students utilizing classroom procedures to keep the students on task.

The students will follow along with the teacher led presentation creating the proper circuit configuration using a learning tool called snap circuits. During each configuration of components student will try and calculate the missing component then measure that component to see if their math was done correctly. Each student will be take turns document their finding and measuring the circuits using a digital multimeter.

Additional Instructional Resources The following website includes Ohm’s Law practice problems that students can complete.

http://www.wisc-online.com/objects/index_tj.asp?objID=AMT3105

Assessment:

Assessment:

Mathematically calculate voltage, current, and resistance using Ohm’s law.
 How do you calculate the total resistance in a series circuit with more than one resistor?
 How do you calculate the total voltage in a series circuit with more than one component?
 Give and explain two good reasons why the answers you calculated might be a little different than the values that were measured.

Differentiation:

Gifted and Talented:

You could set up additional problems for the students that are more challenging, like an actual circuit from an electronic device, or have them bring in a simple electronic device (a lawn solar light) that no longer works and see if they can diagnose the problem.

Special Education:

These students could be place in groups with students that have a better understanding of the material.

English Language Learners

Parents and Administration:

Administrative/Peer Classroom Observation

Students Are: (descriptive list)	Teachers Are: (descriptive list)
Investigating	Facilitating
Testing	Guiding
Problem solving	Advising
Collaborative groups	Questioning
Using problem solving skill	Monitoring
	Listening
	Redirecting

Professional Learning Communities:

Reflection – Critical Questions regarding the teaching and learning of these benchmarks

Materials – suggest articles and books for book study with PLC

Parent Resources: The following website includes Ohm's Law practice problems that students can complete.

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References:

Project Lead the Way curriculum
Minnesota State Math Standards
SciMath Minnesota