

Richmond Public Schools
Department of Curriculum and Instruction
Curriculum Pacing and Resource Guide – Unit Plan



Course Title/ Course #: Physics / 2900

Unit Title/ Marking Period # (MP): Data Analysis, Vectors, Trigonometric Situations / MP1

Start day: 41

Meetings (Length of Unit): 2 weeks

<i>Desired Results ~ What will students be learning?</i>
<u>Standards of Learning/ Standards</u>
PH. 1 a-g PH.2 The student will investigate and understand how to analyze and interpret data. Key concepts include e) situations with vector quantities are analyzed utilizing trigonometric or graphical methods.
<u>Essential Understandings/ Big Ideas</u>
The concepts developed in this standard include the following: <ul style="list-style-type: none">• Not all quantities add arithmetically. Some must be combined using trigonometry. These quantities are known as vectors.
<u>Key Essential Skills and Knowledge</u>
In order to meet this standard, it is expected that students will <ul style="list-style-type: none">• combine vectors into resultants utilizing trigonometric or graphical methods.• resolve vectors into components utilizing trigonometric or graphical methods.

Vocabulary

Vector	Magnitude	Direction	Component	Resultant
Vector Addition	Vector Subtraction	Origin	Pythagorean's Theorem	Sine
Cosine	Tangent	Horizontal	Vertical	Resolve

Assessment Evidence ~ What is evidence of mastery? What did the students master & what are they missing?

Assessment/ Evidence

Use <http://www.problem-attic.com/> to create a multiple choice or free response quiz or test.

Students should be able to demonstrate the following skills with fluency:

- add/subtract vectors in one dimension
- resolve a vector into its horizontal and vertical components
- combine horizontal and vertical vectors into one resultant vector

Given a story, students may represent the motion described in the story using vectors. Alternatively, students may write a story based on a series of motion vectors.

Resolve vector diagrams involving displacement and velocity into their components along perpendicular axes.

Learning Plan ~ What are the strategies and activities you plan to use

Learning Experiences/ Best Practice

Using SMART Board or white board, the teacher can demonstrate for students the various “parts” of a vector and how a vector can be described using its magnitude and direction or using its horizontal and vertical components. Students may copy diagrams on graph paper.

- Many online simulations, such as the [PhET Vector Addition](#) simulation, are powerful visualization tools for students, who can explore these themselves or observe a teacher manipulate them on a SMART Board or projected computer.

Complete “I do, we do, you do” cycles to demonstrate and practice the following concepts:

- Translating vectors on a coordinate plane (to demonstrate that the location of the vector's origin is not related to the essential aspects of the vector itself)
- Adding and subtracting vectors in one dimension

- Adding and subtracting horizontal and vertical vectors using a coordinate plane or grid system
- Using Pythagorean's Theorem to find the resultant of horizontal and vertical component vectors
- Using graph paper to determine the horizontal and vertical components of a vector with an angle
- Using trigonometric functions to find the components of a vector without a coordinate plane.

Students may perform a "Vector Treasure Hunt" in which they are given a set of directions in vector form and directed to add, subtract, or resolve vectors to find the treasure. Google "vector treasure hunt" or "vector treasure map" to find examples of activities online, which may be performed in the school building or outside on a large, marked field.

- As an extension activity, students may hide their own treasures (or play an "I spy" type of game with each other) in which they create their own vector treasure maps.

Technology Integrations

- Students may use scientific or graphing calculators to aid them in complex mathematical calculations during problem solving.
- Online simulations, including [Gizmos](#), [PhET](#), and [Concord Consortium](#)

Resources

General supplies needed

- Rulers or meter sticks
- Protractors
- Scientific Calculators
- Graph paper
- Computers

Gizmos

- [Vectors](#)
- [Adding Vectors](#)

PhET Simulations

- [Vector Addition](#)

[Physics Lab Online: Vectors](#)

The Physics Classroom

- [Tutorial: Vectors – Motion and Forces in Two Dimensions](#)
- [Interactives: Vectors and Projectiles](#)
- [Problem Set: Vectors and Projectiles](#)
- [Problem Set: Vectors and Forces in 2D](#)

[Khan Academy: Two-Dimensional Motion](#) (1st video)

Cross Curricular Connection

- Vectors and trigonometric functions are mathematical (geometry) tools used to model physics concepts.
- Fluency with vectors may help students analyze maps and coordinate planes more easily.