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Grade 11 Physics Curriculum

In this course, students learn basic concepts of physics. In this course, students learn basic concepts of physics. In this course, students learn basic concepts of physics. In this course, students learn basic concepts of physics. In this course, students learn basic concepts of physics. In this course, students learn basic concepts of physics. In this course, students learn basic concepts of physics. In this course, students learn basic concepts of physics.

- Unit 1: One-Dimensional Motion
- Unit 2: Two-Dimensional Motion
- Unit 3: Forces
- Unit 4: Universal Gravitation
- Unit 5: Circular Motion

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Unit 1: **One-Dimensional Motion**

Suggested Pacing

Standards	Show +
Key Concepts	Show +
Key Terms	Show +
Common Student Misconceptions	Show +

MODULE 1

Suggested Pacing

Topics

> Using Numbers to Describe Reality

> Distance and Displacement

> Motion: Speed and Velocity

Activities

> Math Skills

> Measuring Walking Speed (Berated activity)

> A constant speed activity which leads to graphing motion data

Threshold Equations

$$slope = \frac{\Delta x}{\Delta y} = \frac{rise}{run}$$

$$x = vt$$

$$x = \left(\frac{v_i + v_f}{2} \right) t$$

Threshold Problems

Conceptual

Holt p.68 #1-6

Computational

Holt p.28 #11b, d, g

Holt p.44 #5, 6

Differentiation for PSP

Holt p.69 #11

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> Graphs of Motion

> Acceleration

> Freefall

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Holt p.59 #5

Holt p.70 #21, 23, 30

Holt p.881 #44

Holt p.64 #2b

Differentiation for PSP

Holt p.71 #37, 40

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Unit 1: **One-Dimensional Motion**

Suggested Pacing

Standards Show +

Key Concepts Show +

Key Terms Show +

Common Student Misconceptions Show +

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Make a Note

Unit 1: One-

This will give some information about the role of the standards section in the curriculum.

Suggested Pacing

Standards Show +

Key Concepts Show +

Key Terms Show +

Common Student Misconceptions Show +

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Unit 1: **One-Dimensional Motion**

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Standards

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S11.A.1.1.5

Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).

S11.A.1.3.1

Use appropriate quantitative data to describe or interpret change in systems (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).

S11.A.3.2.1

Compare the accuracy of predictions represented in a model to actual observations and behavior.

S11.A.3.3.3

Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves).

S11.C.3.1.3

Describe the motion of an object using variables (i.e., acceleration, velocity, displacement).

View all Standards Addressed by Physics 11 Course

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Show +

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- Time and displacement are fundamental quantities in physics.
- Some quantities (vectors such as displacement, velocity, and acceleration) must be assigned a specified direction to be fully described.
  (direction is qualitative in Unit 1, quantitative in Unit 2 through the use of vectors)
- The rate of change (for example speed) is the change in some quantity per time, where time is typically in 1 second intervals.
- Constant motion is moving equal distance intervals in equal time intervals.
- Accelerated motion is moving unequal distance intervals in equal time intervals.
- Freefall is the primary of example of accelerated motion.

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Unit 1: One Dimensional Motion:

Topic: Using Numbers to Describe Reality

Goals

Knowledge

1. Recognize the importance of units when making measurements
2. Know the SI units for measuring time (seconds, minutes, hours)
3. Know the SI units for measuring distance and describing position
4. Know some of the basic conversion factors within the SI system and between the SI system and the English system
5. Recognize rates as an amount over time in multiple contexts – distance covered/time, water flow/time, money earned/time, and so on.

Skills

1. Convert units from one to another, given a conversion factor
2. Express numbers in scientific notation
3. Use numbers written in scientific notation in calculations

Teaching Resources

- Here's an item in a list of resources. It might be online with a link.
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- Here's an item in a list of resources. It might be online with a link.
- Here's an item in a list of resources. It might be online with a link.
- *And you could click here to add another.*

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Unit 1: One Dimensional Motion

Activity: Math Skills

Rationale

Need to assess students' math skills, which are often lower that would be expected given the courses on students' transcripts. Basic algebra is the key in this course, with the use (but not manipulation) of certain trigonometric identities.

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Unit 1: One Dimensional Motion

Activity: Measuring Walking Speed

Rationale

As the first lab experiences in the physics classroom, this activity is used to establish behavioral and academic expectations as well as set the tone for the types of investigations during the year. The physics content is an important foundation for all that comes later.

Students should emerge at the end of the activity recognizing that motion can be numerically quantified and that easily measured numbers (time, distance) can be used to generate more descriptive numbers (speed) which can be used to make predictions. Because the ubiquity of rates in introductory physics, this activity can also draw out some of the salient features of rates, providing a useful touchstone for the class when confronted with new rates (acceleration, power, and so on).

Prior Knowledge and Skills

- units for distance and conversions (can be done prior to English-SI conversions)
- units for time and conversions
- the definition of a rate
- experience calculating rates and quantities (can be done prior to time calculations)

Goals

5. Recognize rates as an amount over time in multiple contexts – distance covered/time, water flow/time, money earned/time, and so on.

✦ speed is a type of rate – one where the quantity involved is distance, or change in position

✦ a rate is a ratio between quantities, so the magnitudes of the 2 quantities involved may be very different, yet yield the same rate

✦ a full description of motion requires direction as part of the vector quantities of displacement and velocity

✦ constant speed is the ratio of equal distances over equal times which results in a linear equation typically written as distance as a function of time, the slope of which is the constant speed (constant velocity requires the additional qualification of in the same direction)

✦ looking forward to graphing in Unit 1 Module 2, constant speed motion results in a straight line graph where the slope is found by taking the ratio of the distance to the time

people usually walk with a velocity of about 1 or 2 m/s.

11. Measure distance accurately in SI units

✦ a change in position can be measured with simple tools, like meter sticks or rulers

✦ how to use a meter stick to make distance measurements in SI units

how long a meter is, with respect to objects in their everyday experience

13. Measure time accurately in SI units

✦ a change in time can be measured with simple tools like a clock, stopwatch, or metronome

how to use a stopwatch to make time measurements in SI units

15. Define speed as a particular rate – the rate at which position changes

16. Measure the speed of an object, using appropriate tools

17. Use the definition of average speed to calculate speed, distance covered or elapsed time

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Unit 1: One Dimensional Motion

Activity: Constant Speed Activity

Rationale

Graphs are excellent ways to visualize data. Students need to experience the process of gathering individual data points and then extrapolating patterns based on the visual cues provided by graphing the data. There are numerous ways to gather motion data, including photogates, sonic rangers, ticker-tape timers, stopwatches and meter sticks, simulations, and so on. Depending on your materials, students should be presented with a constant velocity motion which has easily measurable distance and time characteristics. From this, students should be able to generate data tables, then graphs of position vs. time (or displacement vs. time).

Some of the patterns that must be easily discernable are that an object with a constant speed will have a linear x(t) graph and that the slope of the x(t) graph corresponds to the speed of the object. There are, obviously, many other important lessons that can be brought out in the execution of the activity, including fitting theoretical models to experimental data, the reliability of data and a review of graphing techniques. The focus here is on accurate data collection, with graphing being the transition into Module 2 which actually contains the graphing CE's and PE's for Unit 1.

Detailed Activity Documentation