SCIENCE NORTH SCIENCE NORD
SUDBURY, ONTARIO, CANADA

Position-Time Graphs for Constant Velocity — Grade 11 Physics – Kinematics

Lesson

Cross Curricular	Computational Thinking
Safety Notes	When cart is running, keep fingers off the track. Practice proper posture when using a computer.

Big Ideas

- Investigate, in qualitative and quantitative terms, uniform and non-uniform linear motion, and solve related problems;

Learning Goals

- Students will learn about scalar and vector quantities
- Students will learn about position-time graphs
- Students will learn about computational thinking.
- Students will code a program to test knowledge and understanding of position-time graphs

Specific Expectations

- use appropriate terminology related to kinematics, including, but not limited to: time, distance, position, displacement, speed, velocity, and acceleration
- analyse and interpret position–time graphs of motion in one dimension

Description

Students will review about scalar and vector quantities, learn about position-time graphs, and create a coded program to test knowledge and understanding of position-time graphs.

Materials

- *Position-Time Graphs for Velocity* handout
- *Position-Time Graphs for Velocity PowerPoint.*
- Micro:bit
- Internet
- Internet Accessible Devices such as Chromebooks, Computers, or Ipads
- Example Micro:bit Code: https://makecode.microbit.org/74901-03448-03219-78983
- Physics Position-Time Graph for Velocity in One-Dimension: https://makecode.microbit.org/_23Fa0ViPVMDT

Accommodations/Modifications

Students have the opportunity to type, verbally record with speech-to-text software, and draw their answers.

Introduction

- Educators should have groups of 2 or 3 students determined prior to the beginning of class. Students do not need to be placed into groups until Micro:bit coding section.
- Introduction: Review scalar and vector quantities video from start until 2:00: https://www.youtube.com/watch?v=Pj8Zh0A-uLU

Action

- Facilitate collaborative elbow-partner discussion on Slide 3 in the *Position-Time Graphs for Velocity PowerPoint* and the **Matching** section of *Position-Time Graphs for Velocity* handout.
- Educators are encouraged to discuss the answers, located on Slide 4 in the *Position-Time Graphs for Velocity PowerPoint.*
- Students will complete drawings and fill-in-the-blanks in the **Vector Quantity: Velocity** section of *Position-Time Graphs for Velocity* handout with Slides 5-6 in the *Position-Time Graphs for Velocity PowerPoint.*
- Educators will play the Velocity Video, https://www.youtube.com/watch?v=apewLkLAR-U, pausing the video for Video Tasks at 5:33 to facilitate a discussion between elbow-partners, continuing the video and pausing again at 5:55 to facilitate a class discussion.
- Students will complete the Video Tasks in the *Position-Time Graphs for Velocity* handout during the allotted discussion times.
- Students will then split into the pre-determined groups of 2 or 3 and complete the **Collaborative Problem-Solving** section of the *Position-Time Graphs for Velocity* handout.
- Educators are encouraged to review the process to answering the questions in the **Collaborative Problem-Solving** section in the *Position-Time Graphs for Velocity* handout with Slides 9-10 *Position-Time Graphs for Velocity PowerPoint.*
- Students will continue in their groups of 2/3 to complete the **Position-Time Graphs** section of the *Position-Time Graphs for Velocity* handout.
- Educators are encouraged to review the **Position-Time Graphs** section in the *Position-Time Graphs for Velocity* handout with Slide 12 in the *Position-Time Graphs for Velocity PowerPoint.*
- Educators will show the Example Micro:bit Code, https://makecode.microbit.org/74901-03448-03219-78983, located on Slide 13 of the *Position-Time Graphs for Velocity PowerPoint* and pose the question "What type of velocity is being described in the Position-Time Graph?"
- Students will use Makecode.Microbit.org and **Micro:bit Brainstorming** section of the *Position-Time Graphs for Velocity* handout to expand on the Example Micro:bit code and demonstrate an object that has no velocity and an object that has negative velocity. An optional challenge is also

available for students to modify the code to allow for the demonstration of updating constant velocity.

- Individually, students will create and write down 2 different constant velocity scenarios and the answers to quiz their partners, who will then answer using their coded Micro:bit.
- Educators will then facilitate a class discussion on the created scenarios, the process for answering these scenarios, and the various codes that were utilized to help answer these scenarios.

Consolidation/Extension

- To consolidate the lesson, the educator will direct students, in their groups, to complete the **Additional Questions #3 and 4** section *Position-Time Graphs for Velocity* handout.
- Educators will conduct a class discussion with the students on the Additional Questions #3 and 4 with Slides 16-18 in the *Linear Motion in One Dimension PowerPoint.*