Lesson Plan

Description

In this lesson, students use knowledge of multiplication rules to determine the force required to move an object. Once students have determined the force required, they will determine the path with least work required to move the object. Students will then code the path of least work, using provided statements and phrases.

Learning Outcomes

- By the end of this lesson students will be able to apply knowledge of multiplication to solve problems including Work (W=F x D) and Force (F= M x A)
- By the end of this lesson students will be able to determine the path of least work as well as code this path
- By the end of this lesson students will apply knowledge of code writing to create own code script

Specific Expectations

Strand A: STEM Skills

A2.1 write and execute code in investigations and when modelling concepts

Strand C: Matter and Energy

C2.4 identify ways in which forces are used in their daily lives

Math

B2.1 use the properties of operations, and the relationships between multiplication and division, to solve problems and check calculations

Introduction

This lesson requires students to have prior knowledge of multiplication rules and algorithms, as well as related science terms like work, force, and distance. This lesson also requires students to have prior knowledge of coding and related terms, if your students are weaker in coding that portion of the lesson can be modified or removed.

To code is to create a sequence of instructions, or a list of step-by-step instructions. In this activity students will problem solve to determine the path of least work for their robot, they will then code the path the robot needs to take. They are creating the step-by-step instructions for the robot to be able to reach its storage closet. If they are not exact steps, the robot will not make it to the closet. Coding phrases have been provided in the activity.

To introduce this lesson, ask students if they were ever tasked with doing something and once completed, they realized there was a way to complete the task doing way less work? Did they wish they would have known how much work was required first? For example, Joe always

uses his manual pushing lawn mower and it takes him 3 hours to mow his lawn. His friend suggests he uses an electric lawn mower, and it only takes Joe 1 hour, saving Joe lots of work.

The robot in this lesson needs help finding out how she can move her time capsule to her secret storage closet, while doing the least amount of work. Have your students work through the problems and get the robot to the closet!

To review multiplication algorithms before the lesson begins, try the following example with students:
Joe mows his lawn at a rate of 2m/s, his lawn mower weighs 10lbs, how much force is required to move the lawn mower?
Force = Weight x Speed (Mass x Acceleration)
F = 10 x 2
F= 20

Joes' lawn is 15m long, how much work does it take to mow one strip of his lawn?
Work = Force x Distance
W= 20 x 15
W= 300

To practice writing algorithms, you can use the example of Joe mowing the lawn to demonstrate how it can be broken into steps.

Sample Code:
Push the lawn mower forward 15m,
Turn 90 degrees to the left
Move 1m forward
Turn 90 degrees to the left
Push the lawn mower forward 15m
Turn 90 degrees to the right
Move 1m forward
Turn 90 degrees to the right
Repeat until the lawn is cut

Action

Have students complete the attached handouts individually or in groups, depending on your preference. The handouts take students through the steps to find the path of least work and have them code the path for their robot.

This lesson can be set up in multiple ways such as group work, individual, whole class or pairs and can be completed in one lesson or multiple.

It is suggested to circulate the room while students are completing the worksheets to assist where needed and monitor students.

Consolidation/Extension

To complete the lesson, have students share the code they wrote with the class, if all students can agree on the same code write it on the board or chart paper as a final class task.

A suggested extension activity is to have students create a visual art poster of the items they would keep in their time capsule.

This can also be extended to have students act out the two different paths, and physically see the difference in work required for the paths (use obstacles and other items in the classroom to create two different pathways) to reach a destination.

Accommodations/Modifications

This lesson can be modified for students needs in many ways including changing the distances and weights to smaller values, providing the students with the least work path, and creating code as a class.

Assessment

There is an answer sheet attached for assessment of the worksheets. This lesson would be suggested to use as Assessment Of Learning, as students should have the prior knowledge required to complete the tasks involved in the lesson.