Wonder Workshop

Cue the Olympian

Develop an understanding of ratios and learn the relationship between distance and speed while training an athlete for skating competitions.

wonder workshop

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Names: _____

Coaching Cue Worksheet

Directions: You will coach Cue to compete in both speed skating and figure skating competitions at the winter Olympics! In order to help increase Cue's chances of winning gold, use tables or any other strategy to solve the challenges below. Then program Cue to check your results.

To get a baseline ratio for distance to time, program Cue to move forward 20 centimeters at *x*-speed and time how long it takes Cue to do this. Record these values in the box below.

Baseline ratio: _____ cm / _____ seconds

Challenges 1 and 2: Cue the Speed Skater

Using the ratio you recorded above to solve Challenges 1 and 2.

Challenge #1: According to Cue's skateometer, Cue has skated **120 centimeters** during this morning's practice. How many **seconds** did it take for Cue to cover 120 cm at the rate of _____ **cm /**_____ **seconds**?

Challenge #2: This morning's practice is not over! You ask Cue to skate for another 5 minutes. What is the **distance in cm** that Cue will cover in 5 minutes at the rate of _____ **cm /**_____ **seconds**? (Hint: Begin by converting minutes to seconds.)

Challenges 3 and 4: Cue the Figure Skater

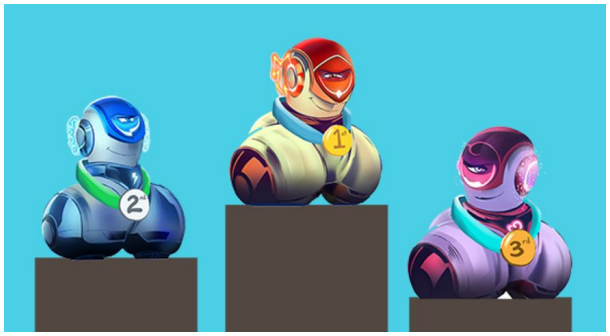
You will program Cue to dance in two figure skating routines. In the challenges below, use the formula **distance = rate x time**.

Challenge #3: Song #1 is 80 seconds long. If Cue travels 20 centimeters per second (cm/s) over the course of an 80-second song, what is the **total distance** that Cue will travel?

Challenge #4: Song #2 is 200 seconds long. Solve for the **rate** that Cue will need to travel in order to cover the same total distance covered in Song #1. State your answer as **cm/s**.

Evaluation Rubric

	Programming	Reflection & Documentation	Collaboration & Communication	Creativity
1 Novice	Completed part of the activity and needed assistance throughout the process.	Use a journal, worksheets, and/or multimedia tools (such as video and images) to document some of the activity results.	Participated little or not at all in classroom discussions. Demonstrated little to no cooperation with group members during the activity.	Demonstrated limited creativity in developing ways to complete the activity.
2 Developing	Used the targeted coding concept(s) to complete the activity with some assistance.	Incorporated some target vocabulary and some thoughtful reflection on the coding process while documenting activity results using journal entries and multimedia tools.	Occasionally participated in classroom discussions and cooperated somewhat with group members.	Developed a few different ways to complete the activity, but the solution was not particularly creative.
3 Proficient	Used the targeted coding concept(s) to complete the activity without assitance.	Incorporated target vocabulary and reflection on the coding process. Clearly documented activity results using journal entries and multimedia tools.	Actively participated in classroom discussions. Answered questions and cooperated with group members during the activity.	Applied the iterative process to develop creative and unexpected solutions for the activity.
4 Exemplary	Used the targeted coding concept(s) to complete the activity without assistance. Enhanced the solution with more efficient (e.g., fewer blocks) and/or advanced features (e.g., lights, sounds) in the code.	Incorporated advanced target vocabulary and in-depth reflection on the coding process. Thoroughly and clearly documented and presented activity results.	Actively participated in classroom discussions and cooperated with group members. Gave constructive feedback to others and effectively incorporated feedback from others.	Went above and beyond to develop, revise, and execute imaginative solutions for the activity.



Ratios: Cue the Olympian
by Wonder Workshop

Description:
Cue is a double-threat athlete at the winter Olympics! In this lesson, students will work in pairs as Olympic coaches for Cue. Students will need to understand ratios in order to explain the relationship between distance and speed while training Cue for a speed and figure skating competitions.

Subject: Coding and Math	Target Grades: 6 - 8
Group Size: 1 - 2 students	Time Required: 50 minutes

Objectives
Students will:

- use ratios to describe the relationship between distance (cm) and speed (seconds).
- determine the time it will take for Cue to skate around a track given the distance.
- determine the distance it will take for Cue to skate around a track given the time in seconds.
- choreograph the same routine for Cue to skate to two songs of different durations.
- determine the rate at which Cue will need to dance to each song in order to cover the same distance.
- use a table to solve ratios comparing distance: time.
- program Cue to test their ratios.

What You'll Need
Cue robot
Coaching Cue Worksheet.pdf
Evaluation Rubric.pdf

Other Supplies
* Cue robot (1 per pair)
* tablet or compatible devices (1 per pair)
* projector or interactive display with mirroring capability

Prior Experience:
Before this lesson, it is recommended that students:

- understand ratios.
- have had practice solving ratios with tables.
- understand that a ratio compares two quantities (e.g., time to distance).
- be able to explain what a ratio represents.
- understand how to solve for rate in centimeters.
- understand how to program distance and time in the Cue app.
- understand how to program the set wheel speeds block.
- understand how to program variables.

Preparation:
Fully charge the tablets and robots.
Install the Wonder Workshop Cue app on each device.

Review:

1. Practice finding the missing values in ratio problems using a table as a strategy.
2. Draw the following table on the board.

Students	Robots
3	2
6	?
?	6
12	?
?	?

3. Ask, “If the ratio of students to Cue robots is 3 to 2 and you know there are 10 robots, what is the number of students?”

Solution:

Students	Robots
3	2
6	4
9	6
12	8
15	10

4. [Optional] Review other ratio strategies including cross multiplication, division, and graphing.

Introduction:
Assemble students as a whole group and explain the goal of the lesson.

Say, “During this lesson, you will work in small groups to act as Cue's Olympic coach. You will program Cue to speed skate and then figure skate through four practice sessions. You will need to understand the relationship between ratios to be able to solve for missing values such as time, distance, and rate of speed.”

Guided Practice:

1. Project the **Coaching Cue** worksheet and review the four challenges students will be working on with their partners and Cue.
2. Share the goal: “Solve each scenario using a selected ratio strategy (e.g., creating a table) and check your results by programming Cue for time, distance, or rate per the stated ratio.”
    - Note that there is more than one way to program each challenge from the **Coaching Cue** worksheet.
3. Before getting started, draw a table on the board and substitute different values in the table for practice. See example below:
    - Ask, "If Cue can skate 30 centimeters per 3 seconds, how many seconds will it take for Cue to skate a distance of 50 centimeters?"
    - Call students to the board to identify and insert the missing values in the table, comparing distance (centimeters) to time (seconds). State the solution as a ratio. "Cue will skate 50 centimeters at a rate of 50 cm / 15 seconds.”

Centimeters	Seconds
10	3
20	
30	
40	
50	

Solution:

Centimeters	Seconds
10	3
20	6
30	9
40	12
50	15

4. Project your device screen and open the *Cue* app.
    - Navigate to the **Code with Block and JavaScript®** section.
5. Say, “In this lesson, you will act as an Olympic skating coach, coding Cue to run four skating programs. What are some blocks from the **Actions** menu that could help you achieve this?” (Sample response: "**Move distance**, **set wheel speed**, and **turn angle** blocks.”)
6. Ask, “In your program, what blocks could be used to reflect the increasing values in a table?”
    - Sample response: “**Variable** blocks.”
7. Tell students, "Once you and your partners have completed a practice program successfully, Cue will be thrilled! Show the fans how elated Cue is feeling by programming a victory exclamation like, ‘Go for the gold!’ or ‘America, I salute you!’ You may include lights, face patterns, or animations in Cues victory dance."

- Ask, "Which blocks can be used to add pizzazz to Cue's figure skating programs? (Sample responses: “**Set light**, **set face pattern**, **custom sound**, and **animate** blocks.”)

Sample Solutions

Solutions based on a baseline ratio of 20 cm / 2 sec. Your students' baseline ratios may vary. Note: Times will be approximate.

Challenge #1: Solve for distance.

Answer: 120 cm / 12 sec

Challenge #2: Solve for time.

Answer: 300 cm / 30 seconds

Sample Program

Challenge #3: Solve for distance.

Song # 1 is 80s long.

Cue travels 20 cm/s for 40s.

20 cm/s x 40s = 800 cm

This will be the target distance for Song #2, as well.

Answer: Cue will travel 20 cm/s over 800 cm.

Sample Program

Challenge #4: Solve for rate. Use the same distance to solve for the rate as used in Song #1.

Song #2 is 100s long.

Cue travels ? cm/s for 100s

d = r x t (distance = rate x time)

800 = r x 100s (Solve for rate. Divide each side by 100.)

Answer: Cue will travel 8 cm/s for 800 cm

Quick Check

- What are the objectives of this assignment? (Sample response: “Solve the challenges on the worksheet for time and distance. Test your results by coding each practice problem in the *Cue* app and running the program with Cue.”)

Independent Practice:
Divide students into pairs.
Distribute robots, devices, rulers, and Coaching Cue worksheets.
Circulate to assist and assess as students work together.

Wrap Up:
After students are finished, have each group share their solutions and programs with the class.

Follow-Up Questions/Discussion
What challenges did you encounter? How did you overcome them?
If you could do this challenge over again, what would you do differently?

Assessment
Use the Evaluation Rubric to review students' work and presentations.

Extension Activities
Instruct students to think of other situations where ratios come into play and enact them by programming Cue to demonstrate.
Suggestions: amusement parks, baseball stadiums, aquariums.
Have students write their own word problems involving ratios for their peers to program and solve using Cue.

Educational Standards:

Common Core

- CCSS.MATH.CONTENT.6.RP.A.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A recieved, candidate C received nearly three votes."
- CCSS.MATH.CONTENT.6.RP.A.3: Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
- CCSS.MATH.CONTENT.6.RP.A.3.B: Solve unit rate problems including those involving unit pricing and constant speed. For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?

NGSS

- MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution,
- MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

CSTA

- 1B-AP-10: Create programs that include sequences, events, loops, and conditionals.
- 1B-AP-15: Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended.
- 1B-AP-16: Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development.
- 1B-AP-17: Describe choices made during program development using code comments, presentations, and demonstrations.
- 2-AP-13: Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.
- 2-AP-15: Seek and incorporate feedback from team members and users to refine a solution that meets user needs.
- 2-AP-17: Systematically test and refine programs using a range of test cases.

ISTE

- 1A: Articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes.
- 1B: Build networks and customize their learning environments in ways that support the learning process.
- 1C: Use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways.
- 4D: Exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
- 5A: Formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.
- 5C: Break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
- 6C: Communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.
- 6D: Students publish or present content that customizes the message and medium for their intended audiences.
- 7A: Use collaborative technologies to work with others, including peers, experts or community members, to examine issues and problems from multiple viewpoints.
- 7C: Contribute constructively to project teams, assuming various roles and responses.