The Escalator, Assessment Variation

Sample task from achievethecore.org
By Illustrative Mathematics and Student Achievement Partners

GRADE LEVEL Sixth

IN THE STANDARDS 6.RP.A.1, 6.RP.A.2

WHAT WE LIKE ABOUT THIS TASK

Mathematically:

- Provides a simply stated, yet mathematically rich task.
- Requires students to understand the concept of a ratio (6.RP.A.1) and a rate (6.RP.A.2).
- Builds understanding of ratios through the use of precise mathematical language (e.g., every, per) (MP6).

In the classroom:

- Enables students to consider multiple correct descriptions of the same ratio by using "Choose all that apply."
- Orders answer choices intentionally, placing a similar – but incorrect – choice (c) after a correct one (a).
- Gives students the opportunity to thoughtfully select the method they will use to solve the task (e.g., table of equivalent ratios, plotting points in the coordinate plane, double number line diagrams, equations) (MP5).

This task was designed to include specific features that support access for all students and align to best practice for English Language Learner (ELL) instruction. Go here to learn more about the research behind these supports. This lesson aligns to ELL best practice in the following ways:

- Provides opportunities for students to practice and refine their use of mathematical language.
- Allows for whole class, small group, and paired discussion for the purpose of practicing with mathematical concepts and language.
- Includes a mathematical routine that reflects best practices to supporting ELLs in accessing mathematical concepts.
- Provides opportunities to support students in connecting mathematical language with mathematical representations.
- Prompts teachers to write essential ideas/concepts/language on the board as a reference for students.

MAKING THE SHIFTS[1]

Focus	Belongs to the Major Work[2] of grade 6	
Coherence	Provides foundational work for learning about proportional relationships in grade 7 (see Molly's Run)	
Rigor[3]	Conceptual Understanding: primary in this task	
	Procedural Skill and Fluency: secondary in this task	
	Application: secondary in this task	

[1]For more information read Shifts for Mathematics.
[2]For more information, see Focus in Grade Six.
[3]Tasks will often target only one aspect of Rigor.

The steps in this routine are adapted from the Principles for the Design of Mathematics Curricula: Promoting Language and Content Development.

Engage students in the Collect and Display Mathematical Language Routine as a way to capture the language they use when thinking about this task. This will provide a stable, collective reference for students to refer to, build on, or make connections to while working on future tasks. This collection can be used as a model and then revised and updated as more content is learned.

As students are working to find the correct statements in this task, circulate and listen to students talk. Record important words and phrases used along with diagrams. Add these to a visual display to use during the whole-class discussion of the task. As this recording is shared, students can clarify how and why they used these words or diagrams. Ask "Which of these help our communication to be more precise?" Listen for words directly relating to the standards: ratio, relationship between quantities, for every ___ there was ____, unit rate a/b, and ratio a:b with b=0.

LANGUAGE DEVELOPMENT

Ensure students have ample opportunities in instruction to read, write, speak, listen, and understand the mathematical concepts that are represented by the following terms and concepts:

- Ratio
- Unit Rate

Students should engage with these terms and concepts in the context of mathematical learning, not as a separate vocabulary study. Students should have access to multi-modal representations of these terms and concepts, including: pictures, diagrams, written explanations, gestures, and sharing of non-examples. These representations will encourage precise language, while prioritizing students' articulation of concepts. These terms and concepts should be reinforced in teacher instruction, classroom discussion, and student work

ELLs may need support with the following vocabulary words during the classroom discussion:

- Per
- Escalator
- Meters
- Rode
- Statement
- Traveled
- Apply
- Select
- Every

ADDITIONAL THOUGHTS

As noted in the Commentary below, this task is the first in a set of three tasks. It's interesting to view the two grade six tasks side-by-side, as this task focuses primarily on conceptual understanding of ratios and rates, while Riding at a Constant Speed focuses primarily on application of ratio and rate reasoning to solve problems. The third task in this set, Molly's Run, illuminates the heightened expectations of this domain for grade 7 (i.e., students work with ratios specified by rational numbers).

For more insight into the expectations for ratio and rate reasoning in grade six, read pages 5–7 of the progression document, *6–7, Ratios and Proportional Relationships*, available at www.achievethecore.org/progressions.

For more analysis on this task from an assessment perspective, please read the Cognitive Complexity section on the Illustrative Mathematics site.

6.RP The Escalator, Assessment Variation

Task

Ty took the escalator to the second floor. The escalator is 12 meters long, and he rode the escalator for 30 seconds. Which statements are true? Select all that apply.

a. He traveled 2 meters every 5 seconds.

b. Every 10 seconds he traveled 4 meters.

c. He traveled 2.5 meters per second.

d. He traveled 0.4 meters per second.

e. Every 25 seconds, he traveled 7 meters.

Solutions

Solution: 1

This is a one-point item.

(a), (b) and (d) are all correct.

Commentary

This task is part of a joint project between Student Achievement Partners and Illustrative Mathematics to develop prototype machine-scorable assessment items that test a range of mathematical knowledge and skills described in the CCSSM and begin to signal the focus and coherence of the standards.

Task Purpose

This task is part of a set of three assessment tasks that address various aspects of 6.RP domain and help distinguish between 6th and 7th grade expectations.

While simply constructed, 6.RP The Escalator addresses aspects of both 6.RP.1 "Understand the concept of a ratio" and 6.RP.2 "Understand the concept of a unit rate a/b associated with a ratio a:b with b≠0, and use rate language in the context of a ratio relationship." The simple extension of a traditional multiple choice item to a "choose all that apply" allows us to ask questions about the same context from the different perspectives afforded by the different RP standards in 6th grade.

6.RP Riding at a Constant Speed addresses aspects of 6.RP.2 "Understand the concept of a unit rate a/b associated with a ratio a:b" and 6.RP.3 "Use ratio and rate reasoning to solve real-world and mathematical problems." The numbers are chosen so that it would be easy to implement this task as a fill-in-the-blank item.

On the other hand, 7.RP Molly's Run is meant to contrast directly with "6.RP Riding at a Constant Speed" as it is the natural extension of the work that students do related to 6.RP.2. In sixth grade, the standards are clear that ratios need to have whole numbers for a and b. With the introduction of rational number arithmetic in 7.NS, the standards place an emphasis on ratios that have fractions within a given ratio; 7.RP.1 requires students to "compute unit rates associated with ratios of fractions."

Cognitive Complexity

Mathematical Content

The mathematics in "6.RP The Escalator" is more complex than it appears. The distractors are placed in a particular order. Students might choose (c) after (correctly) choosing (a) because they look similar. The three correct answers are purposefully interrupted by an incorrect choice, and (e) is included for students who subtract rather than divide.

"6.RP Riding at a Constant Speed" requires students to attend to both ratios (20:150) and (150:20) and both associated unit rates $\frac{20}{150}$ and $\frac{150}{20}$ that are implicit in the given context. Thus, this task is complex for 6th grade.

"7.RP Molly's Run" is a straight-forward extension of the work that students do in 6th grade. The only difference is that students now work with ratios defined by fractions rather than just whole numbers. Thus, this task is not mathematically complex except for students who are still struggling with fractions.

Mathematical Practice

Especially in 6th grade, the cognitive load associated with making sense of units in proportional relationships is heavy; the first two tasks in this set engage MP6, Attend to precision.

The third task does not engage any of the MPs any more than they are present in the day-to-day mathematical work of students.

Linguistic Demand

The linguistic demand for all three tasks is low.

Stimulus Material

The stimulus material for all three tasks is not complex.

Response Mode

The response mode for all three tasks is not complex.