Find ¼ Starting from 1, Assessment Variation

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

GRADE LEVEL Third

IN THE STANDARDS 3.NF.A.2

WHAT WE LIKE ABOUT THIS TASK

Mathematically:

- Helps students understand fractions in relation to whole numbers (3.NF.A.2a)
- Requires students to understand that the fraction $\frac{1}{4}$ is formed by partitioning the whole (1) into 4 equal parts (3.NF.A.1)
- Uses a number line to demonstrate students' understanding of fractions as numbers
- Encourages students to think carefully about the placement of the unit fraction ($\frac{1}{4}$) as 0 and 1 are arbitrarily placed on the number line

In the classroom:

- Can lead into related discussions such as, "Find x starting from y", where x and y are fractions
- Allows students to demonstrate conceptual understanding through a brief conceptual problem with low computational difficulty
- Provides an example of how students might encounter such a task in a computer-based environment

MAKING THE SHIFTS[1]

Focus	Belongs to the major work[2] of third grade
Coherence	Integrates fractions with whole numbers, and lays groundwork for grade 4 fraction expectations; Expands understanding of whole numbers on the number line from previous grades
Rigor[3]	Conceptual Understanding: primary in this task
	Procedural Skill and Fluency: not targeted in this task
	Application: not targeted in this task

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

ADDITIONAL THOUGHTS

As noted in the Commentary above, this task is the first in a set of three tasks. The other tasks in the set can be found here: Find 7/4 Starting from 1 and Find 1 Starting from 5/3.

3.NF.A.2 calls for students to understand fractions as a number on the number line and to represent fractions on a number line diagram. This is part of the standards' progression toward the rational number system (6–8, NS).

For more information on fractions on the number line, read page 3 of the progression document, 3–5, Number and Operations – Fractions, 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.

Illustrative Mathematics

3.NF Find 1/4 Starting from 1, Assessment Version

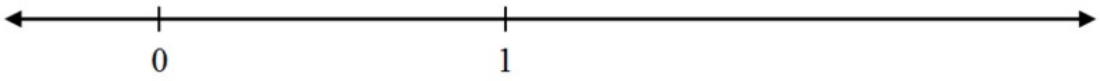
Alignments to Content Standards

- Alignment: 3.NF.A.2

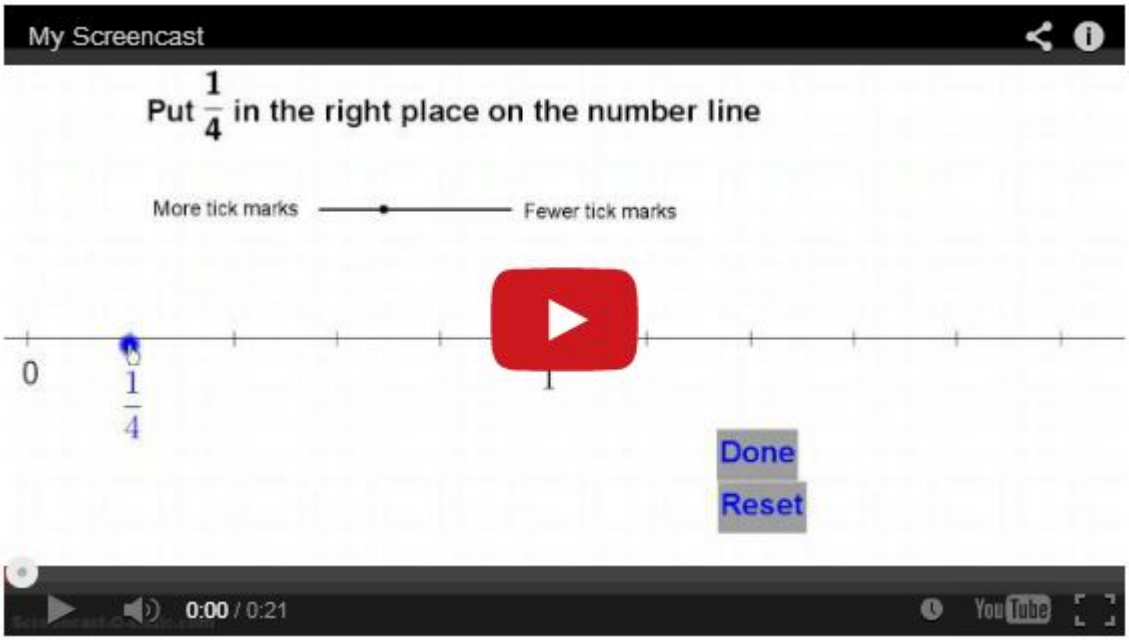
Tags

Tags: summative assessment, SAP

The number line below shows two numbers, 0 and 1.



Where is $\frac{1}{4}$ on this number line?



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 is the first of three summative assessment tasks for 3.NF.2 that progress in difficulty. Each requires that students "understand a fraction as a number on the number line" and "represent fractions on a number line diagram." Part (a) of the standard is about representing unit fractions and part (b) is about representing fractions in terms of unit fractions. The first task involves (a); the second two involve both (a) and (b) at different levels of complexity. The tasks require attention to the whole when thinking about fractions; on a number line, the whole is the interval from 0 to 1.

Cognitive Complexity

Mathematical Content

The three tasks increase in complexity:

- 3.NF Find 1/4 starting from 1 asks students to construct a unit fraction on the number line given the unit interval.
- 3.NF Find 7/4 starting from 1 asks students to construct a fraction greater than 1 on the number line given the unit interval.
- 3.NF Find 1 starting from 5/3 asks students to work backwards from a given fraction to reconstruct the location of 1.

Mathematical Practices

Proficiency with the number line is an important component of students' ability to reason abstractly and quantitatively (MP 2).

While the number line is an important tool, these tasks do not ask for strategic use of tools (MP 5) because the number line is provided. An item calling for MP 5 might be one that is easy if the student uses a number line, but difficult if not.

These tasks give students an opportunity to look for and make use of structure (MP 7), namely, the partitioning of the unit interval.

Linguistic Demand

The linguistic demand is low.

Stimulus Material

The stimulus material is not complex, consisting of only a short written prompt and a number line.

Response Mode

The response mode might be unfamiliar to students. However, they can mess around without penalty and there is a reset option. The spacing on the selector for the tick marks should be wide enough so that students can easily pick the refinement they want. The point has a fairly large radius relative to the scale of the number line.

Additional Notes

- All of these can be turned into multiple choice tasks, as in, for example, 3.NF Find 1 starting from 5/3. However, the multiple choice variation is less complex because the technology enhanced version asks students to construct a number line rather than select one.
- An instructional extension would be a task asking students to "Find 2/3 starting from 1/4." This would be more complex because it requires juggling two partitions of the unit interval, into fourths and then thirds.

Solutions

This is a one point task; the correct answer is shown in the video. Students will get full credit as long as the point touches the correct tick mark at all.

Solutions

Solution: 1

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