Grade 4: Odd Fraction Out

4.NF.A.1 - Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

There are four expressions. Three of the expressions are equal to each other—but one expression is not equal to any of the other three.

Which expression is not equal to any of the others?

A) $\frac{4}{3} - 1$

B) $\frac{3 \times 3}{33}$

C) $\frac{7}{3 \times 7}$

D) $4 \times \frac{1}{12}$

Answer: Expression [ ] is not equal to any of the others.

Solution

Correct if student writes the letter B.

Probably the easiest expressions to work with are A, C, and D:

- Expression A: $4/3 - 1 = 4/3 - 3/3 = 1/3$
- Expression C: $7/(3 \times 7) = 7/21 = 1/3$
- Expression D: $4 \times 1/12 = 4/12 = 1/3$

Expressions A, C, and D are all equal to $1/3$, so they are all equal to each other. Therefore, the correct answer is B.

Expression B is equal to $9/33$. Since $9/33$ doesn't equal $1/3$—in fact, $9/33$ is less than $1/3$—expression B is not equal to any of the others. Here are some ways to see that $9/33$ is less than $1/3$:

- $9/33$ is less than $10/33$, which is less than $10/30$, which equals $1/3$.
- $11/33$ is equal to $1/3$, and $9/33$ is less than $11/33$.
- $(3 \times 3)/33$ is $(3 \times 3)/(3 \times 11)$, which is $3/11$, which is less than $3/9$, which equals $1/3$.

If students are having trouble, you might try some or all of the following hints:

- If expression B is giving them trouble, have them skip it to consider expressions A, C, and D.
- Rewrite expression B as $9/33$
- Rewrite expression C as $7/21$
- In expression A, rewrite the 1 as $3/3$
- Ask students, "Can you write the answer to $4 \times 1/12$ as a fraction?"
- For the fractions $7/21$, and/or $4/12$, ask the student, "Can you rewrite the fraction with a denominator of 3?"
- To analyze $9/33$ in relation to $1/3$, ask students, "What if it were $10/33$? In that case would it be more or less than $1/3$?" (Or try this with $9/30$ or $11/33$ in place of $10/33$.)

Elaboration on Alignment

This task combines elements of fraction arithmetic with fraction equivalence. The hardest expression to deal with is B, but the task is constructed so that a student can avoid expression B altogether and still get the right answer. (In wanting to make sure that B is correct, a longer conversation about B might ensue.)

In grade 4, students learn the general principle of fraction equivalence, $a/b = (n \times a)/(n \times b)$, in which the numerator and denominator are both in the form of products. Likewise, the numerator of expression B, and the denominator of expression C, are not just single-numeral symbols but binary expressions. In this sense, the task prompts "chunking" in the same way it happens in later grades in algebra.

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Name: _____

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