

Guide for Probe: Choosing Expressions to Represent Situations

I. Understandings and Successful Approaches

Correct Answers: 1) c 2) d 3) b 4) d

Students who choose each of these correct answers and have explanations that support their choices are applying one or more successful strategies including:

- Making sense of the actions within a problem context to determine which of the addition, subtraction, multiplication, or division expressions will result in a correct response to the situation.
- Modeling the situation with a number sentence or expression
- Explaining why the given expression matches or does not match the situation

II. Potential Common Misconceptions and Difficulties to Look For

A mixture of correct and incorrect choices may reveal a misunderstanding related to modeling a problem situation with a numeric expression. Note that students with misconceptions may get the correct answer for incorrect reasons.

1. "Overgeneralize about Key Words" Misconception

Answer Pattern: 1) c 3) a

Students with this misconception overgeneralize about key words by assuming that these words always indicate the need for a specific operation. These students choose the operation based on a key word rather than trying to make sense of the full problem situation/context to determine the operation.

1) A pitcher had $3\frac{1}{2}$ cups of orange juice. Sue drank $\frac{1}{4}$ of the juice in the pitcher. How much juice did she drink?

Which number sentence can be used to find the answer? Circle it.

- a) $3\frac{1}{2} + \frac{1}{4}$ b) $3\frac{1}{2} - \frac{1}{4}$ c) $3\frac{1}{2} \times \frac{1}{4}$ d) $3\frac{1}{2} \div \frac{1}{4}$

Explain your thinking.

$\frac{1}{4}$ of $3\frac{1}{2} = 3\frac{1}{2} \times \frac{1}{4}$
because "of" always is multiply

3) Pete is running in a $3\frac{1}{2}$ mile race. If he has run $\frac{1}{4}$ of a mile so far, how many more miles does he need to run in order to finish the race?

- a) $3\frac{1}{2} + \frac{1}{4}$ b) $3\frac{1}{2} - \frac{1}{4}$ c) $3\frac{1}{2} \times \frac{1}{4}$ d) $3\frac{1}{2} \div \frac{1}{4}$

Explain your thinking.

HOW MANY MORE tells me to add

2. "Modeling the Situation with an Incorrect Expression" Difficulty

Answer Patterns vary

Students with this difficulty incorrectly choose an expression based on overgeneralizing that a key action within the problem situation indicates a particular operation, such as assuming that problems that involve eating, drinking, or cutting need to be solved with subtraction because the amount will get smaller. Students may also have difficulty representing their solution process with an expression.

In this example, the student seems to incorrectly interpret the action -- "drank $\frac{1}{4}$ of the juice" with subtraction since the remaining amount would be less than the starting amount.

1) A pitcher had $3\frac{1}{2}$ cups of orange juice. Sue drank $\frac{1}{4}$ of the juice in the pitcher. How much juice did she drink?
Which number sentence can be used to find the answer? Circle it.

a) $3\frac{1}{2} + \frac{1}{4}$ **b) $3\frac{1}{2} - \frac{1}{4}$** c) $3\frac{1}{2} \times \frac{1}{4}$ d) $3\frac{1}{2} \div \frac{1}{4}$

Explain your thinking.

Since she drank some that equals take away because there will be less

In this example, the student approaches a division problem by using repeated subtraction. However, he incorrectly thinks that this process of repeated subtraction can be represented by $3\frac{1}{2} - \frac{1}{4}$.

4) How many $\frac{1}{4}$ pound bags can be made from a $3\frac{1}{2}$ pound bag of peanuts?

a) $3\frac{1}{2} + \frac{1}{4}$ **b) $3\frac{1}{2} - \frac{1}{4}$** c) $3\frac{1}{2} \times \frac{1}{4}$ d) $3\frac{1}{2} \div \frac{1}{4}$

Explain your thinking.

$3\frac{1}{2}$
 $-\frac{1}{4}$
 $-\frac{1}{4}$
 $-\frac{1}{4}$

Just keep subtracting and then count.