This is a resource from CPALMS (www.cpalms.org) where all educators go for bright ideas!
Resource ID#: 60552

Primary Type: Formative Assessment

Justify the Process - 2

Students are asked to justify each step in the process of solving an equation.

General Information

Subject(s): Mathematics
Grade Level(s): 9, 10, 11, 12
Intended Audience: Educators

Freely Available: Yes

Keywords: MFAS, properties of equality, Distributive Property, justification, linear equations, solving

Instructional Component Type(s): Formative Assessment

Resource Collection: MFAS Formative Assessments

Attachment

MFAS_JustifyTheProcess-2_Worksheet.docx

Formative Assessment Task

Instructions for Implementing the Task
This task can be implemented individually, with small groups, or with the whole class.

1. The teacher asks the student to complete the problem on the *Justify the Process - 2* worksheet.
2. The teacher asks follow-up questions, as needed.

TASK RUBRIC

Getting Started

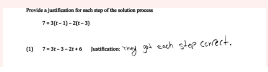
Misconception/Error

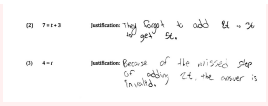
The student is unable to provide justifications for the steps of the solution process.

Examples of Student Work at this Level

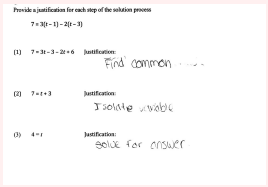
The student:

- Evaluates rather than justifies the steps.


Provide a justification for each step of the solution process
7 = 3(t − 1) − 2(t − 3)
(1) 7 = 3t − 3 − 2t + 6 Justification: I say yes each step correct.



- Attempts to give a description of how to solve the equation.



Questions Eliciting Thinking

What does it mean to justify?

What is the Distributive Property? Was it used in any of these steps?

What are the properties of equality? How can they be used to solve equations?

What value of *x* makes the first equation true? The second equation? What does that tell you?

Instructional Implications

Review the properties of equality and the properties of operations. Explain the reasoning process used in solving linear equations and that each step follows from the equality asserted in the previous step. Emphasize that appropriate application of the properties of equality enables one to rewrite an equation in an equivalent form. Provide the student with the steps of the solution of an equation and ask the student to justify each step using properties of equality and operations.

If needed, review the application of the properties of equality and the properties of operations to the process of solving an equation. Provide a variety of equations for the student to solve. Begin with simple one-step equations, then two-step equations, and finally, equations with rational expressions. Ask the student to justify each step of the process of solving and provide feedback as needed.

Making Progress

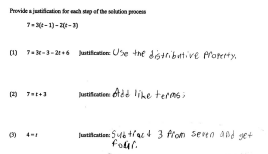
Misconception/Error

The student is unable to use properties of equality as justifications.

Examples of Student Work at this Level

The student justifies the first step with the Distributive Property and the second step with "combining like terms." Rather than justifying the last step with the Subtraction Property of Equality, the student:

- Describes the subtraction of three from seven.



- Says, "They isolate(d) the variable."

Questions Eliciting Thinking

How do you know that three can be subtracted from seven? What happened to the three on the right side of the equation?

Can you explain what it means to "isolate the variable"? What property justifies this?

Instructional Implications

Review the properties of equality. Explain the reasoning process used in solving linear equations and that each step follows from the equality asserted in the previous step. Emphasize that appropriate application of the properties of equality enables one to rewrite an equation in an equivalent form. Provide the student with the steps of the solution of several two-step equations such as $-3x + 7 = 12$ and $\frac{x}{4} + 9 = -2$ and ask the student to justify each step using properties of equality.

Got It

Misconception/Error

The student provides complete and correct responses to all components of the task.

Examples of Student Work at this Level

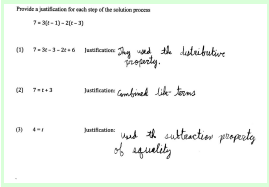
The student provides justification as follows from the equality of numbers.

$7 = 3(t-1) - 2(t-3)$

(1) $7 = 3t - 3 - 2t + 6$ Justification: Distributive Property

(2) $7 = t + 3$ Justification: Combine like terms

(3) $4 = t$ Justification: Subtraction Property of Equality



Questions Eliciting Thinking

Do you have to use the Distributive Property and combine like terms before using an equality property?

What does it mean to combine like terms? How can you justify combining like terms?

Instructional Implications

Ask the student to justify the process of combining like terms. For example, provide the student with the following example and ask the student to justify each step: $5x + 2x = (5 + 2)x = 7x$. Then challenge the student with a more complex example such as: $(9x + 5) + 4x = (5 + 9x) + 4x = 5 + (9x + 4x) = 5 + (9 + 4)x = 5 + 13x = 13x + 5$. Again, ask the student to justify each step. For an even greater challenge, ask the student to justify that $3t - 3 - 2t + 6 = t + 3$ by providing and justifying the steps that lead from $3t - 3 - 2t + 6$ to $t + 3$.

Accommodations & Recommendations

Special Materials Needed:

- *Justify the Process - 2* worksheet

Source and Access Information

Contributed by:
Name of Author/Source: MFAS FCRSTEM
Is this Resource freely Available? Yes
Access Privileges: Public
License: CPALMS License - no distribution - non commercial

Aligned Standards

Name	Description
MAFS.912.A-REI.1.1:	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.