Teacher Guide to Clarification

**4.OA.3**

**Use the four operations with whole numbers to solve problems.**

4.OA.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equation with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computations and estimation strategies including rounding.

**Interpreting Remainders and Estimation Strategies**

**Remainder-** the amount left after some calculation.

In problem situations, students must interpret and use remainders with respect to context (4.OA.3) For example, what is the smallest number of buses that can carry 250 students, if each bus holds 36 students? The whole number quotient in this case is 6 and the remainder is 34; the equation 250 = 6 x 36 + 34 expresses this result and corresponds to a picture in which 6 buses are completely filled while a seventh bus carries 34 students. Notice the answer to the stated question (7) differs from the whole number quotient.

On the other hand, suppose 250 pencils were distributed among 36 students, with each student receiving the same number of pencils. What is the largets number of pencils each student could have received? In this case, the answer to the stated question (6) is the same as the whole number quotient. If the problem had said that the teacher got the remaining pencils and asked how many pencils the teacher got, then the remainder would have been the answer to the problem.

Common Core Standards Writing Team. (2013, September 19). *Progressions for the Common
 Core State Standards in Mathematics(draft). K-5 Counting and Cardinality and
 Operations and Algebraic Thinking.* Tucson, AZ: Institute for Mathematics and
 Educations, University of Arizona.

**Rounding**- replacing a value with an approximately equal value.

Estimation skills include identifying when estimation is appropriate, determining the level of accuracy needed, selecting the appropriate method of estimation, and verifying solutions or determining the reasonableness of situations using various estimation strategies. Estimation strategies include, but are not limited to:

• **front-end estimation with adjusting** (using the highest place value and estimating from the front end, making adjustments to the estimate by taking into account the remaining amounts),

• **clustering around an average** (when the values are close together an average value is selected and multiplied by the number of values to determine an estimate),

• **rounding and adjusting** (students round down or round up and then adjust their estimate depending on how much the rounding affected the original values),

• **using friendly or compatible numbers** such as factors (students seek to fit numbers together -e.g., rounding to factors and grouping numbers together that have round sums like 100 or 1000),

• **using benchmark numbers** that are easy to compute (students select close whole numbers for fractions or decimals to determine an estimate).

**Example 1:**

On a vacation, your family travels 267 miles on the first day, 194 miles on the second day and 34 miles on the third day. How many miles did they travel total? Some typical estimation strategies for this problem:

Student 1

I first thought about 267 and 34. I noticed that their sum is about 300. Then I knew that 194 is close to 200. When I put 300 and 200 together, I get 500.

Student 2

I first thought about 194. It is really close to 200. I also have 2 hundreds in 267. That gives me a total of 4 hundreds. Then I have 67 in 267 and the 34. When I put 67 and 34 together that is really close to 100. When I add that hundred to the 4 hundreds that I already had, I end up with 500.

Student 3

I rounded 267 to 300. I rounded 194 to 200. I rounded 34 to 30. When I added 300, 200 and 30, I know my answer will be about 530.

The assessment of estimation strategies should only have one reasonable answer (500 or 530), or a range (between 500 and 550). Problems will be structured so that all acceptable estimation strategies will arrive at a reasonable answer.

**Example 2:**

Your class is collecting bottled water for a service project. The goal is to collect 300 bottles of water. On the first day, Max brings in 3 packs with 6 bottles in each container. Sarah wheels in 6 packs with 6 bottles in each container. About how many bottles of water still need to be collected?

Student 1

First, I multiplied 3 and 6 which equals 18. Then I multiplied 6 and 6 which is 36. I know 18 plus 36 is about 50. I’m trying to get to 300. 50 plus another 50 is 100. Then I need 2 more hundreds. So we still need 250 bottles.

Student 2

First, I multiplied 3 and 6 which equals 18. Then I multiplied 6 and 6 which is 36. I know 18 is about 20 and 36 is about 40. 40+20=60.

300 - 60 = 240, so we need about 240 more bottles.

This standard references interpreting remainders. Remainders should be put into context for interpretation. Ways to address remainders:

• Remain as a left over

• Partitioned into fractions or decimals

• Discarded leaving only the whole number answer

• Increase the whole number answer up one

• Round to the nearest whole number for an approximate result

**Example 3**:

Write different word problems involving **44** ÷ **6 = ?** where the answers are best represented as:

Problem A: 7

Problem B: 7 r 2

Problem C: 8

Problem D: 7 or 8

Problem E: 7 2/6

Possible solutions:

Problem **A: 7.** Mary had 44 pencils. Six pencils fit into each of her pencil pouches. How many pouches did she fill? 44 *÷ 6 = p; p = 7 r 2. Mary can fill 7 pouches completely.*

Problem **B: 7 r 2.** Mary had 44 pencils. Six pencils fit into each of her pencil pouches. How many pouches could she fill and how many pencils would she have left? 44 *÷ 6 = p; p = 7 r 2; Mary* *can fill 7 pouches and have 2 left over.*

Problem **C: 8.** Mary had 44 pencils. Six pencils fit into each of her pencil pouches. What would the fewest number of pouches she would need in order to hold all of her pencils? 44 *÷ 6 = p; p =7 r 2; Mary can needs 8 pouches to hold all of the pencils.*

Problem **D: 7 or 8.** Mary had 44 pencils. She divided them equally among her friends before giving one of the leftovers to each of her friends. How many pencils could her friends have received? 44 *÷ 6 = p; p = 7 r 2; Some of her friends received 7 pencils. Two friends received 8* *pencils.*

Problem **E: 7 2/6.** Mary had 44 pencils and put six pencils in each pouch. What fraction represents the number ofpouches that Mary filled?

44 *÷ 6 = p; p =* **7 2/6**



Kansas Association of Teachers of Mathematics (KATM) Flipbooks. Questions or to send feedback: melisa@ksu.edu. Retrieved from: <http://katm.org/wp/wp-content/uploads/flipbooks/4FlipBookedited.pdf>

**Coherence and Connections: Need to Know**

To compute and interpret remainders in word problems (**4.OA.3**), students must reason abstractly and quantitatively (MP.2), make sense of problems (MP.1), and look for and express regularity in repeated reasoning (MP.8) as they search for the structure (MP.7) in problems with similar interpretations of remainders.

*PARCC Model Content Frameworks: Mathematics Grades 3-11 (version 3)*. (2012, November
 1). Retrieved June 3, 2014, from <http://parcconline.org/sites/parcc/files/PARCCMCFMathematicsNovember2012V3_FINAL_0.pdf>

PARCC PBA and EOY

|  |  |  |  |
| --- | --- | --- | --- |
| **Evidence****Statement Key** | **Evidence Statement Text** | **Clarifications** | **MP** |
| 4.OA.3-2PBA & EOY | Solve multi-step word problems posed with whole numbers and having whole-number answers using the four operations, in which remainders must be interpreted. | i) Assessing reasonableness of answer is not assessed here.ii) Tasks involve interpreting remainders.iii) See page 30 of the Progression for Operations and Algebraic Thinking | 1,2,7,4 |
| 4.C.5-1PBA | Distinguish correct explanation/reasoning from that which is flawed, and – if there is a flaw in the argument – present corrected reasoning. (For example, some flawed “student” reasoning is presented and the task is to correct and improve it.) Content Scope: Knowledge and skills articulated in 4.OA.3 | i) Reasoning in these tasks centers on interpretation of remainders. | 2,3,6,1,7 |
| 4.C.6-1PBA | Present solutions to multi-step problems in the form of valid chains of reasoning, using symbols such as equals signs appropriately (for example, rubrics award less than full credit for the presence of nonsense statements such as 1+4=5+7=12 even if the final answer is correct), or identify or describe errors in solutions to multi-step problems and present corrected solutions. Content Scope: Knowledge and skills articulated in 4.OA.3 | i) Tasks involve interpreting remainders. | 3,5,6,1,2,7 |
| 4.OA.3-1EOY | Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations. | i) Assessing reasonableness of answer is not assessed here. ii) Tasks do not involve interpreting remainders | 1,2,7 |
| 4.Int.5EOY | Solve multi-step word problems posed with whole numbers and involving computations best performed by applying conceptual understanding of place value, perhaps involving rounding. See 4.OA.3, 4.NBT | None | 1,2,7 |

*PARCC Mathematics Evidence Tables. (*2013, April). Retrieved from:
<http://www.parcconline.org/assessment-blueprints-test-specs>

**4.OA.3** is connected to 4.OA.1 Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 x 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements if multiplicative comparisons as multiplication equations.

|  |  |  |
| --- | --- | --- |
| Grade Below | Grade-Level | Grade Above |
| 3.OA.8 | 4.NBT.34.NBT.64.MD.2**4.OA.3** |  |

**Classroom Resources**

Powerpoint

Virtual Manipulatives to help solve real-world problems: <http://www.mathplayground.com/thinkingblocks.html>

**HOT Questions**

1. The school math club is selling cans of soda at a football game to raise money. They need 400 cans of soda. If James bring 2 12-packs and Sara brings 3 12-packs how many cans does the math club need? If cans are only sold in 12-packs, how many 12-packs does the club still need?

 

1. During a jump rope competition Sally jumped 356 times, Dave jumped 278 times and Adrian jumped 161 times. How many total jumps were there between Sally, Dave and Adrian?



1. Erik and Kristen each solved problem #2, but they have different answers. Who is closer to the right answer? How do you know?

Erik said, “I rounded 356 to 350 and rounded 161 to 150. I added those together to get 500. I then rounded 278 to 300 and added it to the 500 for a total of 800.” Kristen said, “I rounded 356 to 400 and 278 to 300. I added those together to get 700. I then rounded 161 to 200 and added it to 700 for a total of 900 jumps.”

**Additional Resources**

<https://www.illustrativemathematics.org/illustrations/876>

<https://www.illustrativemathematics.org/illustrations/1289>

<http://www.k-5mathteachingresources.com/support-files/4oa3multistepwordproblems.pdf>

<http://www.learnnc.org/lp/pages/3757?ref=search>

<https://grade4commoncoremath.wikispaces.hcpss.org/file/view/4.OA.3_Addition%20and%20Subtraction%20Word%20Problems_3Lesson%20Series.pdf/457082172/4.OA.3_Addition%20and%20Subtraction%20Word%20Problems_3Lesson%20Series.pdf>

<http://www.mathplayground.com/wp_videos.html>

<https://grade4commoncoremath.wikispaces.hcpss.org/file/view/4.OA.3_4.NBT.3_NBT.4_NiceNumbers.pdf/457300994/4.OA.3_4.NBT.3_NBT.4_NiceNumbers.pdf>

<https://grade4commoncoremath.wikispaces.hcpss.org/file/view/4.OA.3_EstimationasaCheck.pdf/457301070/4.OA.3_EstimationasaCheck.pdf>

<https://grade4commoncoremath.wikispaces.hcpss.org/file/view/4.OA.3_Multi-StepMultiplication.pdf/457301088/4.OA.3_Multi-StepMultiplication.pdf>

<https://grade4commoncoremath.wikispaces.hcpss.org/file/view/4.OA.3_SensibleRounding.pdf/457301114/4.OA.3_SensibleRounding.pdf>

<http://cc.betterlesson.com/lesson/586386/sharing-field-trip-money>