Name _____    Date _____

1.  Mr. Lewis arranges all the desks in his classroom into 6 equal groups of 4.  How many desks are in his classroom?  Show a picture and multiplication sentence in your work.

    a.  What does the product in your multiplication sentence represent?

    b.  Fill in the blanks below to complete a related division sentence.

        _____ ÷ 4 = _____

    c.  What does the quotient in Part (b) represent?

2.  a.  Draw an array that shows 9 rows of 2.  Write a multiplication sentence to represent the array, and circle the factor that represents the number of rows.

    b.  Draw another array that shows 2 rows of 9.  Write a different multiplication sentence, and circle the factor that represents the size of the row.

    c.  Explain the relationship between the two arrays using number sentences and words.

3. Ms. Park buys a tray of apples for a class party. There are 5 rows of 4 red apples. There is 1 row of 4 green apples.

   a. The picture below shows Ms. Park's apples. Fill in the blanks to complete the expressions.

   Total apples:

   ____ × 4

   Red apples:

   ____ × 4

   Green apples:

   ____ × 4
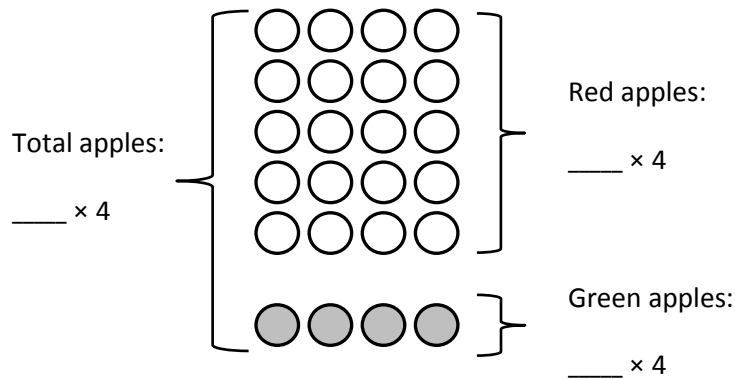
   b. Fill in the unknowns in the equation below to match the picture of the apples in Part (a). Use the break apart and distribute strategy to find the total number of apples Ms. Park bought.

   _____ × 4 = _____ × 4 + _____ × 4

   Ms. Park bought _____ apples.

   c. Lilly brings 8 green apples for the class party. Show Lilly's green apples on the picture in Part (a). Then, fill in the unknowns in the equation below to match the new picture. Solve to find the total number of apples.

   _____ × 4 = _____ × 4 + _____ × 4

   There are _____ apples in all.

4.  Mr. Myer's class plays a game.  The class earns 5 points each time they answer a question correctly.  The class earns 50 points playing the game on Monday.

    a.  How many questions did the class answer correctly?  Show a picture and division sentence in your work.

    b.  Mr. Myer uses the equation 5 × _____ = 50 to find how many questions the class answered correctly.  Is his method correct?  Why or why not?

    c.  The class answered 7 questions correctly on Tuesday.  What is the total number of points the class earned on both days?

5. Complete as many problems as you can in 100 seconds.  Your teacher will time you and tell you when to stop.

| | | | | |
|---|---|---|---|---|
| 4 x 1 = _____ | 3 ÷ 1 = _____ | 10 x _____ = 20 | 2 x 3 = _____ | 10 ÷ 5 = _____ |
| 4 ÷ 2 = _____ | 2 x _____ = 4 | 15 ÷ 5 = _____ | 10 x 3 = _____ | 4 x _____ = 12 |
| 3 x 3 = _____ | 5 x _____ = 15 | 16 ÷ 4 = _____ | 2 x _____ = 8 | 10 x 4 = _____ |
| 2 x 4 = _____ | 12 ÷ 4 = _____ | 4 x _____ = 20 | 5 x 5 = _____ | 50 ÷ 10 = _____ |
| 15 ÷ 3 = _____ | 2 x _____ = 10 | 24 ÷ 4 = _____ | 10 x 6 = _____ | 5 x _____ = 30 |
| 2 x 6 = _____ | 4 x _____ = 24 | 35 ÷ 5 = _____ | 3 x _____ = 21 | 10 x 7 = _____ |
| 4 x 7 = _____ | 14 ÷ 2 = _____ | 3 x _____ = 24 | 5 x 8 = _____ | 80 ÷ 10 = _____ |
| 32 ÷ 4 = _____ | 10 x _____ = 80 | 27 ÷ 3 = _____ | 2 x 9 = _____ | 5 x _____ = 45 |

| **End-of-Module Assessment Task** | **Topics A–F** |
|---|---|
| **Standards Addressed** | |

**Represent and solve problems involving multiplication and division.**

**3.OA.1**   Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7.*

**3.OA.2**   Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.*

**3.OA.3**   Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. (See Glossary, Table 2.)

**3.OA.4**   Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = _ ÷ 3, 6 × 6 = ?*

**Understand properties of multiplication and the relationship between multiplication and division.**

**3.OA.5**   Apply properties of operations as strategies to multiply and divide. (Students need not use formal terms for these properties.) *Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)*

**3.OA.6**   Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.*

**Multiply and divide within 100.**

**3.OA.7**   Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

**Solve problems involving the four operations, and identify and explain patterns in arithmetic.**

**3.OA.8**   Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using the mental computation and estimation strategies including rounding. (This standard is limited to problems posed with whole numbers and having whole-number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify a particular order, i.e., Order of Operations.)

## Evaluating Student Learning Outcomes

A Progression Toward Mastery is provided to describe steps that illuminate the gradually increasing understandings that students develop *on their way to proficiency.*  In this chart, this progress is presented from left (Step 1) to right (Step 4) for Problems 1–4.  The learning goal for students is to achieve Step 4 mastery.  These steps are meant to help teachers and students identify and celebrate what the students CAN do now, and what they need to work on next.  Problem 5 is scored differently since it is a timed assessment of fluency.  Students complete as many problems as they can in 2 minutes.  Although this page of the assessment contains 40 questions, answering 30 correct within the time limit is considered passing.

| A Progression Toward Mastery | | | | |
|---|---|---|---|---|
| **Assessment Task Item and Standards Addressed** | **STEP 1** **Little evidence of reasoning without a correct answer.** **(1 Point)** | **STEP 2** **Evidence of some reasoning without a correct answer.** **(2 Points)** | **STEP 3** **Evidence of some reasoning with a correct answer or evidence of solid reasoning with an incorrect answer.** **(3 Points)** | **STEP 4** **Evidence of solid reasoning with a correct answer.** **(4 Points)** |
| **1** **3.OA.1** **3.OA.2** **3.OA.3** **3.OA.4** | Student is unable to answer any question correctly.  The attempt shows the student may not understand the meaning of the questions. | Student answers at least one question correctly.  Mistakes may include those listed in the box to the right, and/or:<br>▪ Finds the incorrect total number of desks.<br>▪ Does not show understanding of the meaning of the product.<br>▪ Places the numbers incorrectly in the division sentence.<br>▪ Does not show understanding of the meaning of the quotient. | Student answers at least two questions correctly.  Mistakes may include the following:<br>▪ Finds the correct total number of desks but does not draw an accurate picture.<br>▪ Incorrectly completes the related division sentence but understands that the quotient represents the number of groups. | Student correctly:<br>▪ Draws a picture, calculates the total number of desks, 24, and writes a multiplication sentence ($6 \times 4 = 24$ or $4 \times 6 = 24$).<br>▪ Explains that the product, 24, represents the total number of desks.<br>▪ Fills in the blanks to complete the related division sentence ($24 \div 4 = 6$).<br>▪ Explains that the quotient, 6, represents the number of groups. |

## A Progression Toward Mastery

| | | | | |
|---|---|---|---|---|
| **2**<br><br>**3.OA.3**<br>**3.OA.5** | Student is unable to answer any question correctly.  The attempt shows the student may not understand the meaning of the questions. | Student answers at least one question correctly.  Mistakes may include those listed in the box to the right, and/or:<br>■ Draws incorrect arrays in Part (a) and/or in Part (b).<br>■ Writes an incorrect multiplication sentence in either Part (a) or Part (b). Inaccurately explains the relationship between the two arrays. | Student answers at least two questions correctly.  Mistakes may include the following:<br>■ Incorrectly circles 2 in Part (a) or Part (b).<br>■ Explanation of the relationship between the two arrays includes some inaccuracies. | Student correctly:<br>■ Draws an array with 9 rows of 2, writes a multiplication sentence ($9 × 2 = 18$ or $2 × 9 = 18$), and circles 9.<br>■ Draws an array with 2 rows of 9, writes a different multiplication sentence ($2 × 9 = 18$ or $9 × 2 = 18$), and circles 9.<br>■ Provides an accurate explanation of the commutative property in Part (c). |
| **3**<br><br>**3.OA.3**<br>**3.OA.5** | Student is unable to answer any question correctly.  The attempt shows the student may not understand the meaning of the questions. | Student answers at least one question correctly.  Mistakes may include those listed in the box to the right, and/or:<br>■ Incorrectly fills in the blanks in the expressions in Part (a).<br>■ Incorrectly fills in the unknowns in Part (b) and/or in Part (c).<br>■ Inaccurately shows Lilly's 8 apples in the picture in Part (a). | Student answers at least two questions correctly.  Mistakes may include the following:<br>■ Incorrectly fills in the blank for the total apples in Part (a).<br>■ Correctly fills in the unknowns in Part (b) and/or Part (c) but incorrectly calculates the total number of apples.<br>■ Correctly calculates the total number of apples in Part (b) but does not use the distributive property. | Student correctly:<br>■ Fills in the blanks to complete the expressions in Part (a).  (Total apples: $6 × 4$, red apples:  $5 × 4$, and green apples:  $1 × 4$.)<br>■ Fills in the unknowns in the equation (6, 5, 1) and uses the distributive property to calculate the total number of apples as 24.<br>■ Draws two more rows of green apples in the array in Part (a), fills in the unknowns (8, 5, 3), and calculates the total number of apples as 32. |

## A Progression Toward Mastery

| 4  3.OA.3 3.OA.6 3.OA.8 | Student is unable to answer any question correctly.  The attempt shows the student may not understand the meaning of the questions. | Student answers at least one question correctly. Mistakes may include those listed in the box to the right, and/or: <br>■ Draws an inaccurate picture. <br>■ Writes an incorrect division sentence. <br>■ Identifies that Mr. Myer's method is correct but explanation includes inaccuracies.  Incorrectly calculates the total number of points earned on both days in Part (c). | Student answers at least two questions correctly.  Mistakes may include the following: <br>■ Explanation for Part (b) includes some limitations but no inaccuracies. <br>■ Correctly calculates the number of points earned on Tuesday but does not find the total for both days. | Student correctly: <br>■ Draws a picture, and writes a division sentence and calculates the number of questions (50 ÷ 5 = 10). <br>■ Explains division as an unknown factor problem in Part (b). <br>■ Calculates the total number of points the class earned on both days in Part (c) as 85. |
|---|---|---|---|---|
| 5  3.OA.7 | Use the attached sample work to correct students' answers on the fluency page of the assessment. <br><br>Students who answer 30 or more questions correctly within the allotted time pass this portion of the assessment.  They are ready to move on to the more complicated fluency page given with the Module 2 End-of-Module Assessment.  For students who do not pass, you may choose to re-administer this fluency page with each subsequent End-of-Module Assessment until they are successful. <br><br>Analyze the mistakes students make on this assessment to further guide your fluency instruction.  Possible questions to ask as you analyze are: <br>    ■    Did this student struggle with multiplication, division, or both? <br>    ■    Did this student struggle with a particular factor? <br>    ■    Did this student consistently miss problems with the unknown in a particular position? | | | |

Name _Gina_                    Date _____

1. Mr. Lewis arranges all the desks in his classroom into 6 equal groups of 4. How many desks are in his classroom? Show a picture and multiplication sentence in your work.
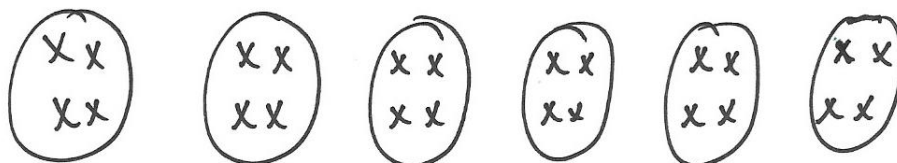


6 × 4 = 24      There are 24 desks in his classroom.

a. What does the product in your multiplication sentence represent?

The product is 24 and it represents the total number of desks.

b. Fill in the blanks below to complete a related division sentence.

_24_ ÷ 4 = _6_

c. What does the quotient in part (b) represent?

The quotient is 6 and it represents the number of equal groups of desks.

2.

a.  Draw an array that shows 9 rows of 2.  Write a multiplication sentence to represent the array, and circle the factor that represents the number of rows.

$$\textcircled{9} \times 2 = 18$$

b.  Draw another array that shows 2 rows of 9.  Write a different multiplication sentence and circle the factor that represents the size of the row.
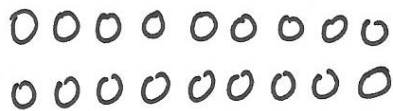
$$2 \times \textcircled{9} = 18$$

c.  Explain the relationship between the two arrays using number sentences and words.

The arrays have the same totals, 18 and they have the same factors, 2 and 9. The factors switch places. In 9x2=18, the 9 is the number of rows, but in 2x9=18, the 9 is the size of the row. It's the commutative property!

3. Ms. Park buys a tray of apples for a class party. There are 5 rows of 4 red apples. There is 1 row of 4 green apples.

a. The picture below shows Ms. Park's apples. Fill in the blanks to complete the expressions.

Total apples:

__6__ × 4

Red apples:

__5__ × 4

Green apples:

__1__ × 4

> Lilly's apples
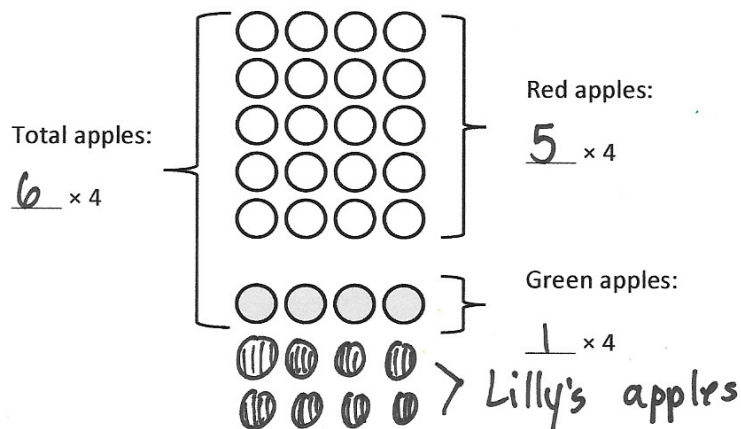
b. Fill in the unknowns in the equation below to match the picture of the apples in part (a). Use the break apart and distribute strategy to find the total number of apples Ms. Park bought.

__6__ × 4 = __5__ × 4 + __1__ × 4

$6 \times 4 = 20 + 4$

$6 \times 4 = 24$

Ms. Park bought __24__ apples.

c. Lilly brings 8 green apples for the class party. Show Lilly's green apples on the picture in part (a). Then, fill in the unknowns in the equation below to match the new picture. Solve to find the total number of apples.
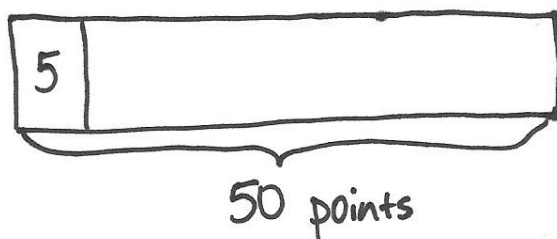
__8__ × 4 = __5__ × 4 + __3__ × 4

$8 \times 4 = 20 + 12$

$8 \times 4 = 32$

There are __32__ apples in all.

4.  Mr. Myer's class plays a game. The class earns 5 points each time they answer a question correctly. The class earns 50 points playing the game on Monday.

   a.  How many questions did the class answer correctly? Show a picture and division sentence in your work.

   5

   50 points

   $50 \div 5 = 10$

   The class answered 10 questions correctly.

   b.  Mr. Myer uses the equation 5 × _____ = 50 to find how many questions the class answered correctly. Is his method correct? Why or why not?

   Yes, his method is correct. I solved using division, but he is solving using multiplication. The blank shows he is looking for a factor. 5 × 10 = 50, so he gets the same answer as 50 ÷ 5 = 10. Both show the class answered 10 questions correctly.

   c.  The class answered 7 questions correctly Tuesday. What is the total number of points the class earned on both days?

   5  5  ?  5  5  5  5  5

   $7 \times 5 = 35$

   | 35 | 50 |

   ?
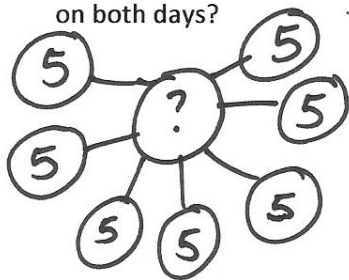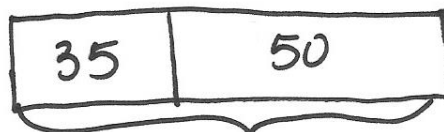
   $35 + 50 = 85$

   The class earned 85 points on both days.

5. Complete as many problems as you can in 100 seconds. Your teacher will time you and tell you when to stop.

$4 \times 1 = \underline{4}$     $3 \div 1 = \underline{3}$     $10 \times \underline{2} = 20$     $2 \times 3 = \underline{6}$     $10 \div 5 = \underline{2}$

$4 \div 2 = \underline{2}$     $2 \times \underline{2} = 4$     $15 \div 5 = \underline{3}$     $10 \times 3 = \underline{30}$     $4 \times \underline{3} = 12$

$3 \times 3 = \underline{9}$     $5 \times \underline{3} = 15$     $16 \div 4 = \underline{4}$     $2 \times \underline{4} = 8$     $10 \times 4 = \underline{40}$

$2 \times 4 = \underline{8}$     $12 \div 4 = \underline{3}$     $4 \times \underline{5} = 20$     $5 \times 5 = \underline{25}$     $50 \div 10 = \underline{5}$

$15 \div 3 = \underline{5}$     $2 \times \underline{5} = 10$     $24 \div 4 = \underline{6}$     $10 \times 6 = \underline{60}$     $5 \times \underline{6} = 30$

$2 \times 6 = \underline{12}$     $4 \times \underline{6} = 24$     $35 \div 5 = \underline{7}$     $3 \times \underline{7} = 21$     $10 \times 7 = \underline{70}$

$4 \times 7 = \underline{28}$     $14 \div 2 = \underline{7}$     $3 \times \underline{8} = 24$     $5 \times 8 = \underline{40}$     $80 \div 10 = \underline{8}$

$32 \div 4 = \underline{8}$     $10 \times \underline{8} = 80$     $27 \div 3 = \underline{9}$     $2 \times 9 = \underline{18}$     $5 \times \underline{9} = 45$