Name _____   Date _____

1. Aunt Korina and her 3 friends decide to share a cab and go to the mall. If they each spent $6, how much did the cab ride cost altogether? Write an equation using a letter to represent the unknown. Solve.

2. Aunt Korina's 3 friends each order pasta and a lemonade for lunch. Aunt Korina orders only chicken salad.

Lunch Menu	
Pasta	$7
Chicken Salad	$9
Lemonade	$2

   a. Use the menu to find how much they spend altogether. Write equations using letters to represent the unknown. Solve.

   b. Aunt Korina mentally checks the total using $9 × 4. Explain her strategy.

3. After lunch the friends notice a sale. Compare the crossed out prices to the new sale prices. If all sale prices are calculated in the same way, what would the sale price be on an item that originally cost $24? Use words and equations to explain how you know.

   $12 $4 $21 $7 $27 $9 $3 $1

4.
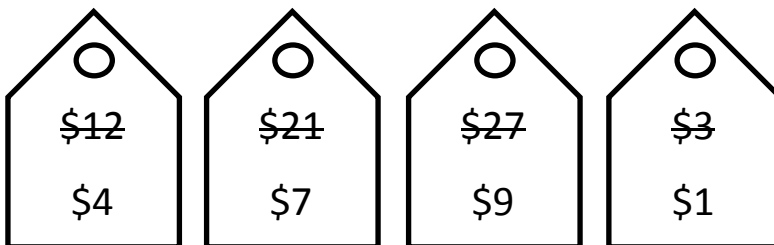
a. A shopkeeper in the bookstore arranges the boxed sets of books as shown to the right. If each box contains 9 books, how many books are there?

- Write equations and solve using a letter to represent the unknown.
- Explain how you know your answer is reasonable.
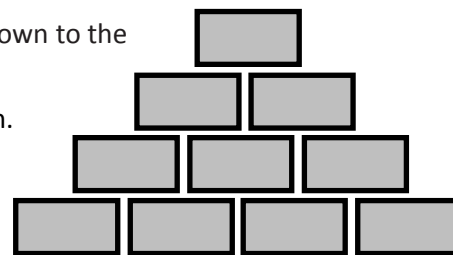
b. Aunt Korina figures out how many books are in the arrangement. Her work is shown below. Explain Aunt Korina's strategy.

$$10 \times 10 - 10 = 90$$

c. In the book store, Aunt Korina buys 3 boxes of pens. Each box contains 2 bundles of 10 gray pens. Her friend buys 6 packs of pens. Each pack contains 10 black pens. Explain how the equation below shows how Aunt Korina and her friend buy the same number of pens.

$$6 \times 10 = 3 \times 2 \times 10$$
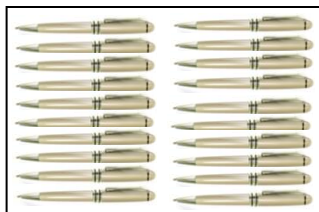
Box of gray pens   Pack of black pens

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

$2 \times 1 =$ _____	$4 \div 2 =$ _____	_____ $= 10 \div 5$	$3 \times 3 =$ _____	$2 \times$ _____ $= 4$
_____ $\times 6 = 12$	$21 \div 7 =$ _____	$8 \times$ _____ $= 24$	_____ $= 9 \times 3$	_____ $= 30 \div 10$
$5 \times 3 =$ _____	$8 \div 2 =$ _____	_____ $\times 3 = 12$	_____ $= 16 \div 4$	$6 \times 4 =$ _____
$9 \times 4 =$ _____	$7 \times$ _____ $= 35$	$40 \div 8 =$ _____	_____ $= 3 \times 5$	_____ $\times 4 = 20$
$7 \times$ _____ $= 35$	_____ $= 54 \div 9$	_____ $\times 6 = 36$	$8 \times 6 =$ _____	$24 \div 4 =$ _____
$9 \times 6 =$ _____	_____ $= 49 \div 7$	$8 \times$ _____ $= 56$	_____ $= 6 \times 7$	$21 \div 3 =$ _____
$7 \times 7 =$ _____	_____ $\times 9 = 63$	_____ $= 64 \div 8$	$6 \times$ _____ $= 48$	_____ $= 4 \times 8$
$24 \div 3 =$ _____	$81 \div 9 =$ _____	$63 \div 7 =$ _____	$8 \times 9 =$ _____	$9 \times$ _____ $= 81$

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

Represent and solve problems involving multiplication and division.

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.)*

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 × 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 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.)

3.OA.9   Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.*

Use place value understanding and properties of operations to perform multi-digit arithmetic. (A range of algorithms may be used.)

3.NBT.3   Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties 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 each student is to achieve Step 4 mastery. These steps are meant to help teachers and students identify and celebrate what the student 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 two minutes. Although this page of the assessment contains 40 questions, answering 30 correct within the time limit is considered passing.

COMMON CORE   **Module 3:**   Multiplication and Division with Units of 0, 1, 6–9, and Multiples of 10
Date: 3/28/14

engage^{ny}   **3.S.12**

| A Progression Toward Mastery				
Assessment Task Item and Standards Assessed	**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.3** **3.OA.4**	Student is unable to write and solve an equation.	Student writes a multiplication equation using the incorrect factors and without a letter to represent the unknown.	Student writes a multiplication equation using a letter to represent the unknown but calculates an incorrect answer (e.g., $4 \times \$6 = n$; n = wrong answer).	The student correctly: ▪ Writes and solves $4 \times \$6 = n$; $n = \$24$.
2 **3.OA.3** **3.OA.4** **3.OA.8**	Student is unable to answer either question correctly.	Student attempts to solve Part (a) but does not use letters to represent the unknown.	Student writes correct equations and solves for the unknown in Part (a) (e.g., F = the amount in dollars spent by Aunt Korina's friends, K = the amount in dollars spent by Aunt Korina; F + K = $27 + \$9 = \$36$), but provides inaccurate explanation in Part (b).	The student correctly: ▪ Writes equations using letters to represent the unknown. (e.g., F = the amount in dollars spent by Aunt Korina's friends, K = the amount in dollars spent by Aunt Korina; F + K = $27 + \$9 = \$36$). ▪ Finds the total, $36, in Part (a). ▪ Provides accurate explanation of strategy in Part (b).
3 **3.OA.9**	Student is unable to explain the pattern.	Students attempts to find and explain the pattern.	Student understands how the sale prices are calculated but incorrectly finds the sale price of $24 (e.g., $24 \div 3$ = wrong answer).	The student clearly: ▪ Explains the sale prices are calculated by dividing the original price by 3. ▪ Writes $24 \div 3 = \$8$.

A Progression Toward Mastery				
4 **3.OA.3** **3.OA.4** **3.OA.5** **3.OA.8** **3.OA.9** **3.NBT.3**	Student is unable to answer any question correctly.	Student answers one question correctly.	Student answers two questions correctly. Mistakes may include: ▪ Providing inaccurate explanations in Parts (a) or (b). ▪ Inability to explain why the equations are equal in Part (c).	The student clearly: ▪ Writes $10 \times 9 = n$; In = 90. ▪ Provides accurate explanation of the equation in Part (a). ▪ Provides accurate explanation of the $10 = 9 - 1$ pattern in Part (b). ▪ Provides accurate explanation of the associative property of multiplication in Part (c) to find 60 pens altogether.
5 **3.OA.7**	Use the attached sample work to correct students' answers on the fluency page of the assessment. Students who answer 30 or more questions correctly within the allotted time pass this portion of the 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. Analyze the mistakes students make on this assessment to further guide your fluency instruction. Below are possible questions to ask as you analyze: ▪ Did this student struggle with multiplication, division, or both? ▪ Did this student struggle with a particular factor? ▪ Did the student consistently miss problems with the unknown in a particular position?			

Name __Gina_____ Date _____

1. Aunt Korina and her 3 friends decide to share a cab and go to the mall. If they each spent $6, how much did the cab ride cost altogether? Write an equation using a letter to represent the unknown. Solve.

$4 \times \$6 = n$ $n =$ total cost of the cab ride
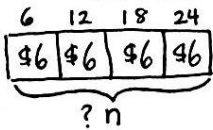
$n = \$24$

The cab ride cost $24.

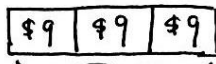| 6	12	18	24
$6	$6	$6	$6

? n

2. Aunt Korina's 3 friends each order pasta and a lemonade for lunch. Aunt Korina only orders chicken salad.

   a. Use the menu to find how much they spend altogether. Write equations using letters to represent the unknown. Solve.

Lunch Menu	
Pasta	$7
Chicken Salad	$9
Lemonade	$2

$7 + $2 = $9

F = the amount spent by Aunt Korina's friends (in $)

K = the amount spent by Aunt Korina (in $)

F:
$9	$9	$9

? F = $27

K: | $9 |

$F + K = \$27 + \$9$
$= \$36$

They spend $36 altogether.

   b. Aunt Korina mentally checks the total using $9 × 4. Explain her strategy.

   3 friends each spent $9. Aunt Korina also spent $9. So, they spend 4 × $9 altogether. The tape diagram above also shows 4 units of $9.

3. After lunch the friends notice a sale. Compare the crossed out prices to the new sale prices. If all sale prices are calculated in the same way, what would the sale price be on an item that originally cost $24? Use words, and equations to explain how you know.

÷3 ($12
$4

÷3 ($21
$7

÷3 ($27
$9

÷3 ($3
$1
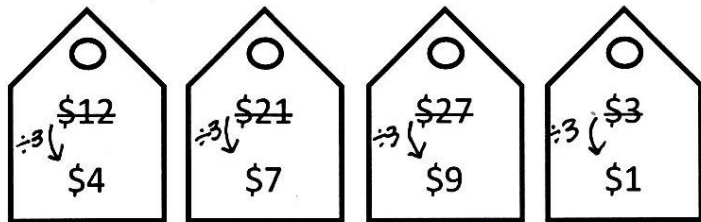
The sale price is found by dividing the original price by 3. To find the sale price of $24 you divide it by 3.
$24 ÷ 3 = $8
The sale price is $8.

4a. A shopkeeper in the bookstore arranges the boxed sets of books as shown below. If each box contains 9 books, how many books are there?

- Write equations and solve using a letter to represent the unknown.
- Explain how you know your answer is reasonable.

$$10 \times 9 = n \quad n = \text{total number of books}$$
$$n = 90$$
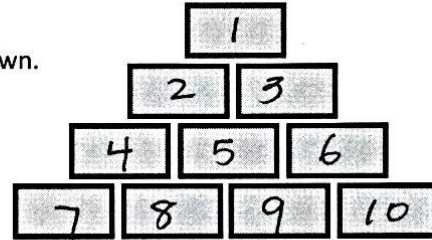
Since there are 10 boxed sets of books and 9 books in each set, we need to multiply to find the total number of books, 90 books.
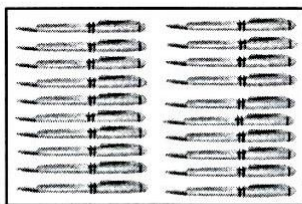

b. Aunt Korina figures out how many books are in the arrangement. Her work is shown below. Explain Aunt Korina's strategy.
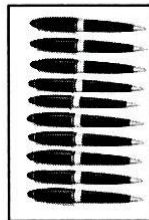
$$10 \times 10 - 10 = 90$$

Aunt Korina found 10 tens, and then subtracted 1 ten to get 9 tens. 9 tens is just 9×10. That's the same as 10×9.

c. In the book store, Aunt Korina buys 3 boxes of pens. Each box contains 2 bundles of 10 gray pens. Her friend buys 6 packs of pens. Each pack contains 10 black pens. Explain how the equation below shows how Aunt Korina and her friend buy the same number of pens.

Black pens → $6 \times 10 = (3 \times 2) \times 10$ ← gray pens

$3 \times 2 \times 10$ represents Korina's total gray pens. 6×10 represents her friend's total pens. We know they buy the same number of pens because $3 \times 2 = 6$ and 6×10 is the same as the other side of the equal sign. They both equal 60 pens altogether.

Box of gray pens   Pack of black pens

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

$2 \times 1 = \underline{2}$ $4 \div 2 = \underline{2}$ $\underline{2} = 10 \div 5$ $3 \times 3 = \underline{9}$ $2 \times \underline{2} = 4$

$\underline{2} \times 6 = 12$ $21 \div 7 = \underline{3}$ $8 \times \underline{3} = 24$ $\underline{27} = 9 \times 3$ $\underline{3} = 30 \div 10$

$5 \times 3 = \underline{15}$ $8 \div 2 = \underline{4}$ $\underline{4} \times 3 = 12$ $\underline{4} = 16 \div 4$ $6 \times 4 = \underline{24}$

$9 \times 4 = \underline{36}$ $7 \times \underline{5} = 35$ $40 \div 8 = \underline{5}$ $\underline{15} = 3 \times 5$ $\underline{5} \times 4 = 20$

$7 \times \underline{5} = 35$ $\underline{6} = 54 \div 9$ $\underline{6} \times 6 = 36$ $8 \times 6 = \underline{48}$ $24 \div 4 = \underline{6}$

$9 \times 6 = \underline{54}$ $\underline{7} = 49 \div 7$ $8 \times \underline{7} = 56$ $\underline{42} = 6 \times 7$ $21 \div 3 = \underline{7}$

$7 \times 7 = \underline{49}$ $\underline{7} \times 9 = 63$ $\underline{8} = 64 \div 8$ $6 \times \underline{8} = 48$ $\underline{32} = 4 \times 8$

$24 \div 3 = \underline{8}$ $81 \div 9 = \underline{9}$ $63 \div 7 = \underline{9}$ $8 \times 9 = \underline{72}$ $9 \times \underline{9} = 81$