GRADE 3
STUDENT WORKBOOK

New York State Common Core
Mathematics Curriculum

GRADE 3 • MODULE 1
Properties of Multiplication and Division and Solving Problems with Units of 2–5 and 10

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Name ___________________________________________  Date __________________________

1. Fill in the blanks to make true statements.

   a. 3 groups of five = _________
      3 fives = _________
      $3 \times 5 = _________$

   b. $3 + 3 + 3 + 3 + 3 = _________$
      5 groups of three = _________
      $5 \times 3 = _________$

   c. $6 + 6 + 6 + 6 = _________$
      _______ groups of six = _________
      $4 \times ______ = _________$

   d. $4 + _____ + _____ + _____ + _____ + _____ = _________$
      6 groups of _______ = _________
      $6 \times ______ = _________$
2. The picture below shows 2 groups of apples. Does the picture below show $2 \times 3$? Explain why or why not.

![Apples](image)

3. Draw a picture to show $2 \times 3 = 6$.

4. Caroline, Brian and Marta want to share a box of chocolates so that they each get the same amount. Circle the chocolates below to show 3 groups of 4. Then write addition and multiplication sentences to represent the problem.

![Chocolates](image)
1. The picture below shows 4 groups of 2 slices of watermelon. Write repeated addition and multiplication sentences to represent the picture.

\[
2 + ____ + ____ + ____ = __________
\]
\[
4 \times ____ = __________
\]

2. Draw a picture to show \(3 + 3 + 3 = 9\). Then write a multiplication sentence to represent the picture.
Name ________________________________ Date ________________________

1. Fill in the blanks to make true statements.

a. 4 groups of five = _________
   4 fives = _________
   $4 \times 5 = _________$

b. 5 groups of four = _________
   5 fours = _________
   $5 \times 4 = _________$

c. $6 + 6 + 6 = _________$
   _______ groups of six = _________
   $3 \times _______ = _________$

d. $3 + _____ + _____ + _____ + _____ + _____ = _______
   6 groups of _______ = _________
   $6 \times _____ = _________$
2. The picture below shows 3 groups of hot dogs. Does the picture below show $3 \times 3$? Explain why or why not.

![Hot Dogs](image)

3. Draw a picture to show $4 \times 2 = 8$.

4. Circle the markers below to show 3 groups of 6. Write addition and multiplication sentences to represent the problem.

![Markers](image)
Lesson 2: Relate multiplication to the array model.

Date: 5/6/13

Use the arrays below to answer each set of questions.

1. a. How many rows of cars are there? ________
   b. How many cars are there in each row? ________

2. a. What is the number of rows? ________
   b. What is the number of objects in each row? ________

3. a. There are 4 spoons in each row. How many spoons are in 2 rows? ________
   b. Write a multiplication fact to describe the array. ________

4. a. There are 5 rows of triangles. How many triangles are in each row? ________
   b. Write a multiplication fact to describe the total number of triangles. ________
Lesson 2: Relate multiplication to the array model.

Date: 5/6/13

5. The dots below show 2 groups of 5.
   a. Redraw the circles as an array that shows 2 rows of 5.

6. Emma collects rocks. She arranges them in 4 rows of 3. Draw Emma’s array to show how many rocks she has altogether. Then write a multiplication sentence to describe the array.

7. Joshua helps his father organize cans of food in the cupboard. He makes an array with the cans and thinks, “My cans show 5 x 3!” Make a drawing that shows how many cans are in Joshua’s array.
1. Judy collects seashells. She arranges them in 3 rows of 6. Draw Judy’s array to show how many seashells she has all together. Then write a multiplication sentence to describe the array.

2. Judy collects seashells. She arranges them in 3 rows of 6. Draw Judy’s array to show how many seashells she has all together. Then write a multiplication sentence to describe the array.
Lesson 2 Homework

Use the arrays below to answer each set of questions.

1. 
   a. How many rows of erasers are there? _________
   b. How many erasers are there in each row? _________

2. 
   a. What is the number of rows? _________
   b. What is the number of objects in each row? _________

3. 
   a. There are 3 squares in each row. How many squares are in 5 rows? _________
   b. Write a multiplication fact to describe the array. _________

4. 
   a. There are 6 rows of stars. How many stars are in each row? _________
   b. Write a multiplication fact to describe the array. _________
5. The triangles below show 3 groups of 4.

a. Redraw the triangles as an array that shows 3 rows of 4.

b. Compare the drawing to your array. How are they the same? How are they different?

6. Roger has a collection of stamps. He arranges the stamps into 5 rows of 4. Draw an array to represent Roger’s stamps. Then write a multiplication sentence to describe the array.

7. Kimberly arranges her 18 markers in an array. Draw an array that Kimberly might make. Then write a multiplication sentence to match your array.
Lesson 2: Relate multiplication to the array model.

Date: 5/6/13
Lesson 3

Problem Set

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Lesson 3 Problem Set 3.1

Name ________________________________ Date __________________

Solve numbers 1–4 using the pictures provided for each problem.

1. There are 5 flowers in each bunch. How many flowers are in 4 bunches?

   a. Number of groups: _________          Size of each group: ____________
   b. 4 × 5 = __________
   c. There are _________ flowers altogether.

2. There are _______ candies in each box. How many candies are in 6 boxes?

   a. Number of groups: _________          Size of each group: ____________
   b. 6 ×__________ = ___________
   c. There are _________ candies altogether.

3. There are 4 oranges in each row. How many oranges are there in ______ rows?

   a. Number of rows: _________          Size of each row: ____________
   b. ___________ × 4 = __________
   c. There are _________ oranges altogether.

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Lesson 3: Interpret the meaning of factors—the size of the group or the number of groups.
5/6/13

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1.A.36

engageNY
4. There are _______ loaves of bread in each row. How many loaves of bread are there in 5 rows?
   
   a. Number of rows: ___________ Size of each row: ___________

   ![Image of loaves of bread]

   b. ___________ × ___________ = ___________

   c. There are ________ loaves of bread altogether.

5. a. Write a multiplication sentence for the array shown below.

   ![Array with 5 rows of 3 loaves]

   X X X
   X X X
   X X X
   X X X
   X X X

   b. Draw a number bond for the array where each part represents the amount in one row.

6. Draw an array using factors 2 and 3. Then show a number bond where each part represents the amount in one row.
Name ______________________________ Date ______________________

Draw an array that shows 5 rows of 3 squares. Then show a number bond where each part represents the amount in one row.
Lesson 3: Interpret the meaning of factors—the size of the group or the number of groups.

Date: 5/6/13

Solve problems 1–4 using the pictures for each problem.

1. There are 5 pineapples in each group. How many pineapples are there in 5 groups?

   a. Number of groups: _____________ Size of each group: ____________
   b. 5 × 5 = ____________
   c. There are ____________ pineapples altogether.

2. There are _______ oranges in each basket. How many oranges are there in 6 baskets?

   a. Number of groups: _____________ Size of each group: ____________
   b. 6 × ____________ = ____________
   c. There are ____________ oranges altogether.
3. There are 4 bananas in each row. How many bananas in ________ rows?

   ![Bananas]

   a. Number of rows: ___________ Size of each row: ___________

   b. ________ × 4 = ___________

   c. There are ___________ bananas altogether.

4. There are ___________ peppers in each row. How many peppers are there in 6 rows?

   ![Peppers]

   a. Number of rows: ___________ Size of each row: ___________

   b. ________ × ___________ = ___________

   c. There are ___________ peppers altogether.

5. Draw an array using factors 4 and 2. Then show a number bond where each part represents the amount in one row.
### Lesson 4 Problem Set

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong></td>
<td><strong>2.</strong></td>
</tr>
<tr>
<td><img src="image1" alt="Flowers" /></td>
<td><img src="image2" alt="Books" /></td>
</tr>
<tr>
<td><strong>Divide 14 flowers into 2 equal groups.</strong></td>
<td><strong>Divide 28 books into 4 equal groups.</strong></td>
</tr>
<tr>
<td>There are _______ flowers in each group.</td>
<td>There are _______ books in each group.</td>
</tr>
</tbody>
</table>

| **3.** | **4.** |
| ![Apples](image3) | ![Cups](image4) |
| **Divide 30 apples into _____ equal groups.** | **Divide _______ cups into _______ equal groups.** |
| There are _______ apples in each group. | There are _______ cups in each group. |

| **5.** | **6.** |
| ![Toys](image5) | ![Cars](image6) |
| **There are _______ toys in each group.** | **9 ÷ 3 = _________** |
| 15 ÷ 3 = _________ | **12 ÷ 2 = _________** |

**Lesson 4:** Understand the meaning of the unknown as the size of the group in division.

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1.B.11
7. Audrina has 24 colored pencils. She puts them in 4 equal groups. How many colored pencils are in each group?

There are ______ colored pencils in each group.

24 ÷ 4 = _______

8. Charlie picks 20 apples. He divides them equally between 5 baskets. Draw the apples in each basket.

There are __________ apples in each basket.

20 ÷ ________ = __________

9. Chelsea collects butterfly stickers. The picture shows how she placed them in her book. Write a division sentence to show how she equally grouped her stickers.

There are ____________ butterflies in each row.

__________ ÷ __________ = __________
Name ____________________________ Date ____________________

1. There are 16 glue sticks for the class. The teacher divides them into 4 equal groups. Draw the number of glue sticks in each group.

There are _________ glue sticks in each group.

16 ÷ _______ = __________

2. Draw a picture to show 15 ÷ 3. Then complete the division sentence.

15 ÷ 3 = __________
Lesson 4 Homework

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Lesson 4: Understand the meaning of the unknown as the size of the group in division.

<table>
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1. Divide 12 chairs into 2 equal groups.
   There are _________ chairs in each group.

2. Divide 21 triangles into 3 equal groups.
   There are _________ triangles in each group.

3. Divide 25 erasers into ______ equal groups.
   There are _________ erasers in each group.

4. Divide _______ chickens into _______ equal groups.
   There are _________ chickens in each group.
   9 ÷ 3 = __________

5. There are _________ buckets in each group.
   12 ÷ 4 = __________

6. 16 ÷ 4 = __________

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1.B.14
7. Andrew has 21 keys. He puts them in 3 equal groups. How many keys are in each group?

There are ______ keys in each group.

21 ÷ 3 = __________

8. Mr. Doyle has 20 pencils. He divides them equally between 4 tables. Draw the pencils on each table.

There are __________ pencils on each table.

20 ÷ ________ = __________

9. Jenna has markers. The picture shows how she placed them on her desk. Write a division sentence to represent how she equally grouped her markers.

There are __________ markers in each row.

__________ ÷ __________ = __________
Lesson 5: Understand the meaning of the unknown as the number of groups in division.

<table>
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</tr>
</tbody>
</table>

### 1.
Divide 6 tomatoes into groups of 3.

There are ______ groups of 3 tomatoes.

\[ 6 \div 3 = 2 \]

### 2.
Divide 8 lollipops into groups of 2.

There are ______ groups.

\[ 8 \div 2 = ______ \]

### 3.
Divide 10 stars into groups of 5.

\[ 10 \div 5 = ______ \]

### 4.
Divide the shells to show \( 12 \div 3 = \) ________ where the unknown represents the number of groups.

How many groups are there? ________
5. Rachel has 9 crackers. She puts 3 crackers in each bag. Circle the crackers to show Rachel’s bags.

   ![Crackers Diagram]

   a. Write a division sentence where the answer represents the number of Rachel’s bags.

   b. Draw a number bond to show Rachel’s crackers.

6. Jameisha has 16 wheels to make toy cars. She uses 4 wheels for 1 car.

   a. Use a count-by to find the number of cars Jameisha can build. Make a drawing to match your counting.

   b. Write a division sentence to represent the problem.
1. Divide 12 triangles into groups of 6.

\[ 12 \div 6 = \underline{2} \]

2. Spencer buys 20 strawberries to make smoothies. Each smoothie needs 5 strawberries. Use a count-by to find the number of smoothies Spencer can make. Make a drawing to match your counting.
Lesson 5 Homework

1. Divide 4 triangles into groups of 2.

There are _______ groups of 2 triangles.

\[ 4 \div 2 = 2 \]

2. Divide 9 eggs into groups of 3.

There are _______ groups.

\[ 9 \div 3 = \_____ \]

3. Divide 12 buckets of paint into groups of 3.

\[ 12 \div 3 = \_____ \]

4. Group the squares to show \(15 \div 5 = \_____\) where the unknown represents the number of groups.

How many groups are there? \( \_____ \)
5. Daniel has 12 apples. He puts 6 apples in each bag. Circle the apples to find the number of bags Daniel makes.

- a. Write a division sentence where the answer represents the number of Daniel's bags.

- b. Draw a number bond to show Daniel's apples.

6. Jacob is drawing cats. He draws 4 legs on each cat, and a total of 24 legs.
   - a. Use a count-by to find the number of cats Jacob draws. Make a drawing to match your counting.

   - b. Write a division sentence to represent the problem.
Lesson 6 Problem Set

Name ___________________________________________ Date _________________

1. Rick puts 15 tennis balls into cans. Each can holds 3 balls. Circle groups of 3 to show the balls in each can.

   ![Cans with tennis balls]

   Rick needs _______ cans. ______ × 3 = 15

   15 ÷ 3 = ______

2. Rick uses 15 tennis balls to make 5 equal groups. Draw to show how many tennis balls are in each group.

   ![Groups of tennis balls]

   There are _______ tennis balls in each group. 5 × ______ = 15

   15 ÷ 5 = ______

3. Use an array to model Problem 1.

   ![Array with numbers]

   a) ______ × 3 = 15

   15 ÷ 3 = ______

   The number in the blanks represents: _________________________________.

   b) 5 × ______ = 15

   15 ÷ 5 = ______

   The number in the blanks represents: ________________________________.
4. Deena makes 21 jars of tomato sauce on her farm. She puts 7 jars in each box to sell at the supermarket. How many boxes does Deena need?

\[21 \div 7 = \_\_\_\_\_\_\_\_\_\_\_

\[\_\_\_\_\_\_\_\_\_\_ \times 7 = 21\]

What is the meaning of the unknown factor and quotient? ________________________________

5. The teacher gives the problem 4 \times ____ = 12. Charlie finds the answer by writing and solving 12 \div 4 = _____. Explain why Charlie’s method works.

6. The blanks in Problem 5 represent the size of the groups. Draw an array to represent the number sentences.
1. Cesar arranges 12 notecards into rows of 6 for his presentation. Draw an array to represent the problem.

\[
12 \div 6 = \underline{} \quad \underline{} \times 6 = 12
\]

What do the unknown factor and quotient represent? ________________________________
Name _______________________________ Date __________________

1. Mr. Hannigan puts 12 pencils into boxes. Each box holds 4 pencils. Circle groups of 4 to show the pencils in each box.

   Mr. Hannigan needs _______ boxes.
   ______ × 4 = 12
   12 ÷ 4 = ______

2. Mr. Hannigan places 12 pencils into 3 equal groups. Draw to show how many pencils are in each group.

   There are _______ pencils in each group.
   3 × ______ = 12
   12 ÷ 3 = ______

3. Use an array to model Problem 1.

   a) ______ × 4 = 12
      12 ÷ 4 = ______
      The number in the blanks represents: ____________________________.

   b) 3 × ______ = 12
      12 ÷ 3 = ______
      The number in the blanks represents: ____________________________.
4. Judy washes 24 dishes. She then dries and stacks the dishes equally into 4 piles. How many dishes are in each pile?

\[ 24 \div 4 = \square \]

\[ 4 \times \square = 24 \]

What is the meaning of the unknown factor and quotient? ________________________________

5. Nate solves the problem \( \square \times 5 = 15 \) by writing and solving \( 15 \div 5 = \square \). Explain why Nate’s method works.

6. The blanks in Problem 5 represent the number of groups. Draw an array to represent the number sentences.
Lesson 7

Demonstrate the commutativity of multiplication and practice related facts by skip-counting objects in array models.

Name _____________________________________________ Date __________________________

1. a. Count by 2 six times.
   _____, _____, _____, _____, _____, _____
   b. Draw an array that matches your count-by.
   c. Write a multiplication sentence that represents the total number of objects in your array.
      _____ × _____ = _____

2. a. Count by 6 two times.
   _____, _____
   b. Draw an array that matches your count-by.
   c. Write a multiplication sentence that represents the total number of objects in your array.
      _____ × _____ = _____

3. a. Compare your work in Problems 1 and 2. Turn your paper as you study the arrays to look at them in different ways.
   b. Why are the factors in your multiplication sentences in a different order?

4. Count by the unit (the number in word form) the number of times indicated. Write the multiplication sentence that matches your count by. The first one is done for you.
   a. 6 twos: 6 × 2 = 12
d. 2 sevens: ______
   b. 2 sixes: ______
e. 9 twos: ______
g. 11 twos: ______
c. 7 twos: ______
f. 2 nines: ________
h. 2 twelves: ________
5. Write and solve a different multiplication sentence to describe each array.

6. Ms. Nenadal writes $2 \times 7 = 7 \times 2$ on the board. Do you agree or disagree? Draw arrays to help explain your thinking.

7. Find the missing factor to make each number sentence true.

8. Jada gets 2 new packs of erasers. Each pack has 6 erasers in it.
   a. Draw an array to show how many erasers Jada has altogether.
   b. Write and solve a multiplication sentence to describe the array.
   c. Use the commutative property to write and solve a different multiplication sentence for the array.
Do you agree or disagree with the statement in the box? Draw arrays and use skip-counting to explain your thinking.

2 × 5 = 5 × 2
1. a. Count by 2 seven times.
   _____, _____, _____, _____, _____, _____, _____
   b. Draw an array that matches your count-by.
   c. Write a multiplication sentence that represents the total number of objects in your array.
   _____ × _____ = ______

2. a. Count by 7 two times.
   _____, _____
   b. Draw an array that matches your count-by.
   c. Write a multiplication sentence that represents the total number of objects in your array.
   _____ × _____ = ______

3. a. Compare your work in Problems 1 and 2. Turn your paper as you study the arrays to look at them in different ways.
   b. Why are the factors in your multiplication sentences in a different order?

4. Count by the unit (the number in word form) the number of times indicated. Write the multiplication sentence that matches your count-by. The first one is done for you.
   a. 2 twos: 2 × 2 = 4
   b. 3 twos: ______
   c. 2 threes: ______
   d. 2 fours: ______
   e. 4 twos: ______
   f. 5 twos: ______
   g. 2 fives: ______
   h. 2 sixes: ______
5. Write and solve a different multiplication sentence to describe each array.

   
   

6. Angel writes $2 \times 8 = 8 \times 2$ in his notebook. Do you agree or disagree? Draw arrays to help explain your thinking.

7. Find the missing factor to make each number sentence true.

   
   

8. Tamia buys 2 bags of candy. Each bag has 7 pieces of candy in it.
   
   a. Draw an array to show how many pieces of candy Tamia has altogether.

   b. Write and solve a multiplication sentence to describe the array.

   c. Use the commutative property to write and solve a different multiplication sentence for the array.
Lesson 7: Demonstrate the commutativity of multiplication and practice related facts by skip-counting objects in array models.

Date: 5/6/13
Lesson 8

Lesson 8 Problem Set

Name ________________________________ Date __________________

1. a. Count by 3 five times.


b. Draw an array that matches your count-by.

2. a. Count by 5 three times.


b. Draw an array that matches your count-by.

3. Write multiplication expressions below to represent your arrays in Problems 1 and 2. Use the commutative property to make the equation true.


Problem 1

Problem 2

4. Count by the unit (the number in word form) the number of times indicated. Write the multiplication sentence that matches your count by. The first one is done for you.

a. 2 threes: \(2 \times 3 = 6\)

b. 3 twos: \_

c. 3 fours: \_

d. 4 threes: \_

e. 3 sevens: \_

f. 7 threes: \_

g. 3 nines: \_

h. 9 threes: \_

i. 10 threes: \_

5. Find the unknowns that make the number sentences true. Then draw a line to match facts that are related.

a. \(3 + 3 + 3 + 3 + 3 = \_

b. \(3 \times 9 = \_

c. 7 threes + 1 three = \_

d. \(3 \times 8 = \_

e. \_ = 5 \times 3\)

f. \(27 = 9 \times \_

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Lesson 8: Demonstrate the commutativity of multiplication and practice related facts by skip-counting objects in array models.

Date: 5/6/13
6. Isaac picks 3 tangerines from his tree every day for 7 days.
   a. Use circles to draw an array that represents the tangerines Isaac picks.
   b. How many tangerines does Isaac pick in 7 days? Write and solve a multiplication sentence.
   c. Isaac decides to pick 3 tangerines every day for 3 more days. Draw ‘x’s to show the new tangerines on the array in part A.
   d. Write and solve a multiplication sentence to find the total number of tangerines Isaac picks.

   a. How much money does Sarah spend if she buys 3 bottles of soap?

      \[
      \text{\underline{\hspace{2cm}}} \times \text{\underline{\hspace{2cm}}} = \$\text{\underline{\hspace{1cm}}}
      \]

   b. How much money does she spend if she buys 6 bottles of soap?

      \[
      \text{\underline{\hspace{2cm}}} \times \text{\underline{\hspace{2cm}}} = \$\text{\underline{\hspace{1cm}}}
      \]
Name __________________________________________ Date __________________

1. Mary Beth organizes stickers on a page in her sticker book. She arranges them in 3 rows and 4 columns. Draw an array to show Mary Beth’s stickers.

   a. Use your array to write a multiplication sentence to find Mary Beth’s total number of stickers.

   b. Label your array to show how you skip-count to solve your multiplication sentence.

   c. Use what you know about the commutative property to write a different multiplication sentence for your array.
Name ____________________________ Date ________________

1. a. Count by 3 six times.  
   _______ _______ _______ _______ _______ _______  
   b. Draw an array that matches your count-by. 

2. a. Count by 6 three times.  
   _______ _______ _______ _______ _______ _______  
   b. Draw an array that matches your count-by. 

2. Write multiplication expressions below to represent your arrays in Problems 1 and 2. Use the commutative property to make the equation true.  
   _______ × _______ = _______ × _______  
   Problem 1  Problem 2

3. Count by the unit (the number in word form) the number of times indicated. Write the multiplication sentence that matches your count by. The first one is done for you.  
   a. 5 threes: 5 × 3 = 15  
   b. 3 fives: _________  
   c. 6 threes: _________  
   d. 3 sixes: _________  
   e. 7 threes: _________  
   f. 3 sevens: _________  
   g. 8 threes: _________  
   h. 3 nines: _________  
   i. 10 threes: _________

4. Find the unknowns that make the number sentences true. Then draw a line between related facts.  
   a. 3 + 3 + 3 + 3 + 3 = _________  
   b. 3 × 5 = _________  
   c. 8 threes + 1 three = _________  
   d. 3 × 9 = _________  
   e. _________ = 6 × 3  
   f. 15 = 5 × _________
5. Fernando puts 3 pictures on each page of his photo album. He puts pictures on 8 pages.
   a. Use circles to draw an array that represents the total number of pictures in Fernando’s photo album.

   b. Use your array to write and solve a multiplication sentence to find Fernando’s total number of pictures.

   c. Fernando adds 2 more pages to his book. He puts 3 pictures on each new page. Draw x’s to show the new pictures on the array in Part A.

   d. Write and solve a multiplication sentence to find the new total number of pictures in Fernando’s album.

6. Ivania recycles. She gets 3 cents for every can she recycles.
   a. How much money does Ivania make if she recycles 4 cans?

      \[ \text{________} \times \text{________} = \text{_______} \text{ cents} \]

   b. How much money does she make if she recycles 7 cans?

      \[ \text{________} \times \text{________} = \text{_______} \text{ cents} \]
Lesson 9: Find related multiplication facts by adding and subtracting equal groups in array models.

Date: 5/6/13

1. The team organizes soccer balls into 2 rows of 5. The coach adds 3 rows of 5 soccer balls. Complete the number sentences to describe the total array.

   a. \((5 + 5) + (5 + 5 + 5) = \) ___________
   
b. 2 fives + _____ fives = ___________ fives
   
c. ________ × 5 = __________

2. \(7 \times 2 = \) ________

3. \(9 \times 2 = \) ________

   10 + 4 = __________
   
   ________ × 2 = 14
Lesson 9: Find related multiplication facts by adding and subtracting equal groups in array models.

Date: 5/6/13

   a. Draw an array that represents Matthew’s cards using an x to show each card.

   b. Solve the multiplication sentence to find Matthew’s total number of cards.  
   \[ 4 \times 3 = \_\_\_\_ \]

5. Matthew adds 2 more rows. Use circles to show his new cards on the array in part 4a.
   a. Write and solve a multiplication sentence to represent the circles you added to the array.

   \[ \_\_\_\_\_ \times 3 = \_\_\_\_ \]

   b. Add the totals from the multiplication facts in 4b and 5a to find Matthew’s total cards.

   \[ \_\_\_\_\_ + \_\_\_\_\_ = 18 \]

   c. Write the multiplication sentence that shows Matthew’s total number of cards.

   \[ \_\_\_\_\_ \times \_\_\_\_\_ = 18 \]
1. Mrs. Stern roasts cloves of garlic. She places 10 rows of two cloves on a baking sheet.

Write a multiplication sentence to describe the number of cloves Mrs. Stern bakes.

\[ \text{________ } \times \text{________ } = \text{_______} \]

2. When the garlic is roasted, Mrs. Stern uses some for a recipe, leaving 2 rows of two garlic cloves on the pan.

a. Complete the number sentence below to show how many garlic cloves she uses.

\[ \text{_______ twos } - \text{_______ twos } = \text{_______ twos} \]

b. \[ 20 - \text{_______ } = 16 \]

c. Write a multiplication sentence to describe the number of garlic cloves she uses.

\[ \text{_______ } \times 2 = \text{_______} \]
1. Dan organizes his star stickers into 3 rows of 4. Irene adds 2 more rows of stickers. Complete the number sentences to describe the total number of stickers in the array.

![Array of stars]

a. \((4 + 4 + 4) + (4 + 4) = \) ___________

b. 3 fours + _____ fours = ___________ fours

c. ________ \times 5 = ___________

2. 7 \times 2 = _____

![Array of circles]

6 \times 2 = ___

1 \times 2 = ___

12 + 2 = ___________

_______ \times 2 = 14

3. 9 \times 3 = _____

![Array of boxes]

10 \times 3 = ___

1 \times 3 = ___

30 – _______ = 27

_______ \times 3 = 27
4. Franklin collects stickers. He organizes his stickers in 5 rows of 4 on his table.

Draw an array that represents Franklin’s stickers using an x to show each sticker.

\[ 5 \times 4 = \underline{\quad} \]

5. Franklin adds 2 more rows. Use circles to show his new stickers on the array in part 3a.

a. Write and solve a multiplication sentence to represent the circles you added to the array.

\[ \underline{\quad} \times 4 = \underline{\quad} \]

b. Complete the addition sentence to show how you added the totals of 2 multiplication facts to find Franklin’s total number of stickers.

\[ \underline{\quad} + \underline{\quad} = 28 \]

c. Complete the unknown to show Franklin’s total number of stickers.

\[ \underline{\quad} \times 4 = 28 \]
Lesson 9: Find related multiplication facts by adding and subtracting equal groups in array models.

Date: 5/6/13
Lesson 10: Model the distributive property with arrays to decompose units as a strategy to multiply.

1. \(7 \times 3 = (5 \times 3) + (2 \times 3) = \underline{\quad} \)

\[
\begin{array}{c}
\includegraphics[width=0.5\textwidth]{array1} \\
(5 \times 3) = 15 \\
\includegraphics[width=0.5\textwidth]{array2} \\
(2 \times 3) = \underline{\quad} \\
(5 \times 3) + (2 \times 3) = 15 + \underline{\quad}
\end{array}
\]

15 + _____ = _________

2. \(8 \times 3 = (4 \times 3) + (4 \times 3) = \underline{\quad} \)

\[
\begin{array}{c}
\includegraphics[width=0.5\textwidth]{array3} \\
(4 \times 3) = \underline{\quad} \\
\includegraphics[width=0.5\textwidth]{array4} \\
(4 \times 3) = \underline{\quad}
\end{array}
\]

(4 \times 3) + (4 \times 3) = _______ + _______

_______ \times 3 = _______
3. Ruby is making a photo album. She puts 3 pictures in each row.

   a. Use the multiplication sentences on the left. Draw arrays to show the photos on the upper and lower parts of Ruby’s album page.

   \[
   \begin{array}{c}
   \framebox{5} \\
   \times 3 = 6 \\
   \framebox{3} \\
   \times 3 = 9 \\
   \end{array}
   \]

   b. Ruby calculates the total number of pictures as shown below. Use the array you drew to help explain her calculation.

   \[
   5 \times 3 = 6 + 9 = 15
   \]
Lesson 10: Model the distributive property with arrays to decompose units as a strategy to multiply.

1. \(6 \times 3 = \quad\)
   \[
   \begin{array}{c}
   \hline
   \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   \hline
   \end{array}
   \]
   \[
   (4 \times 3) = \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   (2 \times 3) = \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   (4 \times 3) + (2 \times 3) = \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   6 \times 3 = \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   \quad \times 3 = \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   \]

2. \(7 \times 3 = \quad\)
   \[
   \begin{array}{c}
   \hline
   \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   \hline
   \end{array}
   \]
   \[
   (\quad \times 3) = \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   (\quad \times 3) = \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   (5 \times 3) + (2 \times 3) = \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   7 \times 3 = \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   \quad \times 3 = \quad \quad \quad \quad \quad \quad \quad \quad \quad \\
   \]
Lesson 10 Homework

Name ___________________________________________ Date _______________________

1. \(6 \times 3 = \) _______

\[
\begin{align*}
(4 \times 3) &= 12 \\
(2 \times 3) &= \underline{6} \\
12 + \underline{6} &= \underline{18} \\
6 \times 3 &= \underline{18}
\end{align*}
\]

2. \(8 \times 2 = \) _______

\[
\begin{align*}
(\underline{4} \times 2) &= \underline{8} \\
(\underline{3} \times 2) &= \underline{6} \\
(\underline{4} \times 2) + (\underline{4} \times 2) &= \underline{8} + \underline{8} \\
\underline{4} \times 2 &= \underline{8}
\end{align*}
\]
3. Adriana is organizing her books on shelves. She puts 3 books in each row.
   a. Use the multiplication sentences on the right to draw arrays to show the books on Adriana’s top and bottom shelves.

   \[
   \begin{align*}
   6 \times 3 &= 15 \\
   \underline{ \quad } \times 3 &= 3
   \end{align*}
   \]

   b. Adriana calculates the total number of books as shown below. Use the array you drew to help explain her calculation.

   \[
   6 \times 3 = 15 + 3 = 18
   \]
1. Mrs. Prescott has 12 oranges. She puts 2 oranges in each bag. How many bags does she have?
   
a. Draw an array where each column shows a bag of oranges.
   
   \[ ____ \div 2 = _____ \]

b. Redraw the oranges in each bag as a unit in the tape diagram. The first unit is done for you. As you draw, label the diagram with known and unknown information from the problem.

   ![Tape Diagram]

2. Mrs. Prescott arranges 18 plums into 6 bags. How many plums are in each bag? Model the problem with both an array and a labeled tape diagram. Show each column as the number of plums in each bag.

   There are _______ plums in each bag.
3. Fourteen shopping baskets are stacked equally in 7 piles. How many baskets are in each pile? Model the problem with both an array and a labeled tape diagram. Show each column as the number of baskets in each pile.

4. In the back of the store, Mr. Prescott packs 24 bell peppers equally into 8 bags. How many bell peppers are in each bag? Model the problem with both an array and a labeled tape diagram. Show each column as the number of bell peppers in each bag.

5. Olga saves $2 a week to buy a toy car. The car costs $16. How many weeks will it take her to save enough to buy the toy?
Ms. McCarty has 18 stickers. She puts 2 stickers on each homework paper. How many homework papers does she have? Model the problem with both an array and a labeled tape diagram.
Lesson 11: Model division as the unknown factor in multiplication using arrays and tape diagrams.

1. Fred has 10 pears. He puts 2 pears in each basket.

   a. Draw an array where each column represents a basket of pears.

      \[ \_\_\_\_\_\_\_ \div 2 = \_\_\_\_\_\_\_ \]

   b. Redraw the pears in each basket as a unit in the tape diagram. Label the diagram with known and unknown information from the problem.

2. Ms. Meyer organizes 15 clipboards equally into 3 boxes. How many clipboards are in each box? Model the problem with both an array and a labeled tape diagram. Show each column as the number of clipboards in each box.

   There are \_\_\_\_\_\_\_ clipboards in each box.
3. Sixteen action figures are arranged equally on 2 shelves. How many action figures are on each shelf? Model the problem with both an array and a labeled tape diagram. Show each column as the number of action figures on each shelf.

4. Jasmine puts 18 hats away. She puts an equal number of hats on 3 shelves. How many hats are on each shelf? Model the problem with both an array and a labeled tape diagram. Show each column as the number of hats on each shelf.

5. Corey checks out 2 books a week from the library. How many weeks will it take him to check out a total of 14 books?
1. There are 8 birds at the pet store. 2 birds are in each cage. Circle to show how many cages there are.

\[ 8 \div 2 = \boxed{4} \]

There are ______ cages of birds.

2. The pet store sells 10 fish. They equally divide the fish into 5 bowls. Draw fish to find the number in each bowl.

\[ \boxed{2} \times 5 = 10 \]

There are ______ fish in each bowl.

3. Match.

- \[ 10 \div 2 = \boxed{5} \]
- \[ 16 \div 2 = \boxed{8} \]
- \[ 18 \div 2 = \boxed{9} \]
- \[ 14 \div 2 = \boxed{7} \]
- \[ 12 \div 2 = \boxed{6} \]
4. Laina buys 14 meters of ribbon. She cuts her ribbon into 2 equal pieces. How many meters long is each piece? Label the tape diagram to represent the problem, including the unknown.

Each piece is __________ meters long.

5. Roy eats 2 cereal bars every morning. Each box has a total of 12 bars. How many days will it take Roy to finish 1 box?

6. Sarah and Esther equally share the cost of a present. The present costs $18. How much does Sarah pay?
There are 14 mints in 1 box. Cecilia eats 2 mints each day. How many days does it take Cecilia to eat 1 box of mints? Draw and label a tape diagram to solve.

It takes Cecilia ________ days to eat 1 box of mints.
Lesson 12 Homework

Name _____________________________ Date __________________

1. 10 people wait in line for the roller coaster. 2 people sit in each car. Find the total number of cars needed.

10 ÷ 2 = __________

There are _______ cars needed.

2. Mr. Ramirez divides 12 frogs equally into 6 groups for students to study. How many frogs are in each group? Label known and unknown information on the tape diagram to help you solve.

There are________ frogs in each group.

3. Match.

Match the following expressions with the correct number of frogs:

- \(10 ÷ 2\)
- \(16 ÷ 2\)
- \(18 ÷ 2\)
- \(14 ÷ 2\)

Match the following fractions with the correct number of parts:

- \(\frac{8}{8}\)
- \(\frac{7}{7}\)
- \(\frac{5}{5}\)
- \(\frac{9}{9}\)
4. Betsy pours 16 cups of water to equally fill 2 bottles. How many cups of water are in each bottle? Label the tape diagram to represent the problem, including the unknown.

There are _________ cups of water in each bottle.

5. An earthworm tunnels 2 cm into the ground each day. The earthworm tunnels at about the same pace every day. How many days will it take the earthworm to tunnel 14 cm?

6. Sebastian and Teshawn go to the movies. The tickets cost $16 in total. The boys share the cost equally. How much does Teshawn pay?
1. Complete the related expressions.

2. Mr. Lawton picks tomatoes from his garden. He divides the tomatoes into bags of 3.
   a. Circle to show how many bags he packs. Then skip-count to show the total number of tomatoes.
   b. Draw and label a tape diagram to represent the problem.

Mr. Lawton packs _______ bags of tomatoes.
3. Camille buys a sheet of stamps that measures 15 centimeters long. Each stamp is 3 centimeters long. How many stamps does Camille buy? Draw and label a tape diagram to solve.

Camille buys _________ stamps.

4. Thirty third-graders go on a field trip. They are equally divided into 3 vans. How many students are in each van?

5. Some friends spend $24 altogether on frozen yogurt. Each person pays $3. How many people buy frozen yogurt?
1. Andrea has 21 apple slices. She uses 3 apple slices to decorate 1 pie. How many pies does Andrea make? Draw and label a tape diagram to solve.

2. There are 24 soccer players on the field. They form 3 equal teams. How many players are on each team?
1. Complete the related expressions.

\[
\begin{align*}
2 \times 3 &= 6 \\
6 \div 3 &= \_\_\_ \\
1 \times 3 &= \_\_\_ \\
3 \div 3 &= \_\_\_ \\
7 \times 3 &= \_\_\_ \\
\_\_\_ \div 3 &= 7 \\
9 \times 3 &= \_\_\_ \\
\_\_\_ \div 3 &= 9
\end{align*}
\]

2. Ms. Jones’ pet fish are shown below. She keeps 3 fish in each tank.

a. Circle to show how many fish tanks she has. Then skip-count to find the total number of fish.

b. Draw and label a tape diagram to represent the problem.

\[
\_\_\_\_\_ \div 3 = \_\_\_\_\_ \]

Ms. Jones has _____ fish tanks.
3. Juan buys 18 meters of wire. He cuts the wire into pieces that are each 3 meters long. How many pieces of wire does he cut?

4. A teacher has 24 pencils. They are divided equally among 3 students. How many pencils does each student get?

5. There are 27 third graders working in groups of 3. How many groups of third graders are there?
Lesson 14: Skip-count by fours. Match the answers to the appropriate multiplication problem.

Name _______________________________ Date __________________

1. Skip-count by fours. Match the answers to the appropriate multiplication problem.

4 x 4
4 x 8
4 x 6
4 x 5
4 x 10

4 x 2
4 x 3
4 x 7
4 x 9

4 8
2. Mr. Schmidt replaces each of the 4 wheels on 7 cars. How many wheels does he replace? Draw and label a tape diagram to solve.

Mr. Schmidt replaces _________ wheels altogether.

3. Trina makes 4 bracelets. Each bracelet has 6 beads. Draw and label a tape diagram to show the total number of beads Trina uses.

4. Find the total number of sides on 5 rectangles.
Name ____________________________ Date ________________

Arthur has 4 boxes of chocolates. Each box has 6 chocolates inside. How many chocolates does Arthur have altogether? Draw and label a tape diagram to solve.
1. Skip-count by fours. Match the answers to the appropriate multiplication problem.

- 9 × 4
- 7 × 4
- 6 × 4
- 8 × 4
- 10 × 4
- 5 × 4
- 1 × 4

Name ____________________________ Date ________________________
2. Lisa places 5 rows of 4 juice boxes in the refrigerator. Draw an array and skip-count to find the total number of juice boxes.

\[ \underline{\quad} \times 4 = \underline{\quad} \]

There are \underline{\quad} juice boxes in total.

2. 6 folders are placed on each table. How many folders are there on 4 tables? Draw and label a tape diagram to solve.

3. Find the total number of corners on 8 squares.
Lesson 14: Skip-Count objects in models to build fluency with multiplication facts using units of 4.

Date: 5/6/13
Lesson 15

Objective: Relate arrays to tape diagrams to model the commutative property of multiplication.

Suggested Lesson Structure

- Fluency Practice (11 minutes)
- Application Problem (5 minutes)
- Concept Development (34 minutes)
- Student Debrief (10 minutes)
- Total Time (60 minutes)

Fluency Practice (11 minutes)

- Multiply by 4 3.OA.7 (8 minutes)
- Group Counting 3.OA.1 (3 minutes)

Sprint: Multiply by 4 (8 minutes)

Materials: (S) Multiply by 4 Sprint Set (1–5)

Note: This activity builds fluency with multiplication facts using units of 4. It works toward the goal of students knowing from memory all products of two one-digit numbers. See Directions for Administration of Multiply by in Lesson 9.

T: (Write 4 x 5 = ____.) Let’s skip-count by fours to find the answer. (Count with fingers to five as students count.)

S: 4, 8, 12, 16, 20.

T: (Circle 20 and write 4 x 5 = 20 above it. Write 4 x 4 = ____.) Let’s skip-count up by fours again. (Count with fingers to four as students count.)

S: 4, 8, 12, 16.

T: Let’s see how we can skip-count down to find the answer to 4 x 4. Start at 20. (Count down with your fingers as students say numbers.)

S: 20, 16.

Repeat process for 4 x 3.

T: Let’s practice multiplying by 4. Be sure to work left to right across the page. (Distribute Multiply by 4 Sprint)
Group Counting (3 minutes)

Note: Group counting reviews interpreting multiplication as repeated addition. Counting by twos and threes in this activity reviews multiplication with units of 2 and 3 from Topics C and D.

Count by threes to 30 forward and backward.
Count by twos to 20 forward and backward.

Application Problem (5 minutes)

A cell phone is about 4 inches long. About how long are 9 cell phones laid end to end?

Note: This problem reviews multiplication using units of four from Lesson 14. It provides an opportunity to review using tape diagrams as tools for solving multiplication problems, which students further explore in today’s lesson.

Concept Development (34 minutes)

Materials: (S) Personal white boards, blank paper with \( \frac{1}{3} \) folded (shown at right)

Pictorial: Relate arrays with tape diagrams.

Each student starts with 1 piece of blank, folded paper (shown at right).

T: Draw an array with 2 rows and 4 columns above the fold on your paper. Use the array to remind your partner about what the commutative property is. Turn it if you need to.

S: (Students may rotate array 90 degrees.) The factors switch places but the total stays the same.

T: Use the commutative property to write two multiplication equations for the array. Write them on the left side of the paper below the fold, one above the other.

NOTES ON REVIEWING THE COMMUTATIVE PROPERTY:
Keep the review of the commutative property quick. Students will have just revisited the concept in Lesson 14’s Debrief.
1. Label the tape diagrams and complete the equations. Then draw an array to represent the problems.

   a. 
   
   4
   
   2
   
   2 × 4 = 
   
   4 × 2 = 
   
   b. 
   
   
   
   
   
   _____ × 4 = 
   
   4 × _____ = 
   
   c. 
   
   
   
   
   
   _____ × _____ = 28
   
   _____ × _____ = 28
2. Draw and label 2 tape diagrams to model how the statement in the box is true. \[4 \times 6 = 6 \times 4\]

3. Grace picks 4 flowers from her garden. Each flower has 8 petals. Draw and label a tape diagram to show how many petals there are in total.

4. Michael counts 8 chairs in his dining room. Each chair has 4 legs. How many chair legs are there altogether?
Draw and label 2 tape diagrams to show that $4 \times 3 = 3 \times 4$. Use your diagrams to explain how you know.
1. Label the tape diagrams and complete the equations. Then draw an array to represent the problems.

a.

\[ 3 \times 4 = _____ \]

\[ 4 \times 3 = _____ \]

b.

\[ 4 \times _____ = _____ \]

\[ _____ \times 4 = _____ \]
Lesson 15: Relate arrays to tape diagrams to model the commutative property of multiplication.

Date: 5/6/13

1. E.24

2. 7 clowns hold 4 balloons each at the fair. Draw and label a tape diagram to show the total number of balloons the clowns hold.

3. George swims 7 laps in the pool each day. How many laps does George swim after 4 days? Draw and label a tape diagram to solve.
1. Label the array. Then fill in the blanks below to make the statements true.

a. \(6 \times 4 = \____\)

\[
\begin{array}{cccc}
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\end{array}
\]

\((5 \times 4) = \underline{20}\)

\((1 \times 4) = \underline{_____}\)

\((6 \times 4) = (5 \times 4) + (1 \times 4)\)

\[= \underline{20} + \underline{_____}\]

\[= \underline{_____}\]

b. \(7 \times 4 = \____\)

\[
\begin{array}{cccc}
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\end{array}
\]

\((5 \times 4) = \underline{_____}\)

\((2 \times 4) = \underline{_____}\)

\((7 \times 4) = (5 \times 4) + (2 \times 4)\)

\[= \underline{_____} + \underline{_____}\]

\[= \underline{28}\]

c. \(8 \times 4 = \____\)

\[
\begin{array}{cccc}
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\end{array}
\]

\((5 \times 4) = \underline{_____}\)

\((____ \times 4) = \underline{_____}\)

\((8 \times 4) = (5 \times 4) + (____ \times 4)\)

\[= \underline{_____} + \underline{_____}\]

\[= \underline{_____}\]

d. \(9 \times 4 = \____\)

\[
\begin{array}{cccc}
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\bullet & \bullet & \bullet & \bullet \\
\end{array}
\]

\((5 \times 4) = \underline{_____}\)

\((____ \times 4) = \underline{_____}\)

\((9 \times 4) = (5 \times 4) + (____ \times 4)\)

\[= \underline{_____} + \underline{_____}\]

\[= \underline{_____}\]
2. Match the equal expressions.

\[
(5 \times 4) + (3 \times 4) = (5 \times 4) + (4 \times 4) = (5 \times 4) + (1 \times 4) = (5 \times 4) + (2 \times 4)
\]

3. Nolan draws the array below to find the answer to the multiplication fact $4 \times 10$. He says, "$4 \times 10$ is just double $4 \times 5$!" Explain Nolan’s strategy.
Destiny says, “I can use 5 \times 4 to find the answer to 7 \times 4.” Use the array below to explain Destiny’s strategy using words and numbers.

\[
(7 \times 4) = (5 \times 4) + (2 \times 4)
\]

\[
= \underline{\hspace{1cm}} + \underline{\hspace{1cm}}
\]

\[
= \underline{\hspace{1cm}}
\]
1. Label the array. Then fill in the blanks below to make the statements true.

   a.  \( 6 \times 4 = \_ \)

   \[
   \begin{array}{cccc}
   \bullet & \bullet & \bullet & \bullet \\
   \bullet & \bullet & \bullet & \bullet \\
   \bullet & \bullet & \bullet & \bullet \\
   \end{array}
   \]

   \( (5 \times 4) = \underline{20} \)

   \[
   \begin{array}{cccc}
   \bullet & \bullet & \bullet & \bullet \\
   \bullet & \bullet & \bullet & \bullet \\
   \end{array}
   \]

   \( (\_ \times 4) = \_ \)

   \( (6 \times 4) = (5 \times 4) + (\_ \times 4) \)

   \( = \_20\_ + \_ \)

   \( = \_ \)

   b.  \( 8 \times 4 = \_ \)

   \[
   \begin{array}{cccc}
   \bullet & \bullet & \bullet & \bullet \\
   \bullet & \bullet & \bullet & \bullet \\
   \bullet & \bullet & \bullet & \bullet \\
   \end{array}
   \]

   \( (5 \times 4) = \_ \)

   \[
   \begin{array}{cccc}
   \bullet & \bullet & \bullet & \bullet \\
   \bullet & \bullet & \bullet & \bullet \\
   \bullet & \bullet & \bullet & \bullet \\
   \end{array}
   \]

   \( (\_ \times 4) = \_ \)

   \( (8 \times 4) = (5 \times 4) + (\_ \times 4) \)

   \( = \_ + \_ \)

   \( = \_ \)
2. Match the multiplication facts with their answers.

- $4 \times 6 = \_\_\_\_\_\_
- $4 \times 7 = \_\_\_\_\_\_
- $4 \times 8 = \_\_\_\_\_\_
- $4 \times 9 = \_\_\_\_\_\_

- $28 = \_\_\_\_\_\_
- $32 = \_\_\_\_\_\_
- $36 = \_\_\_\_\_\_
- $24 = \_\_\_\_\_\_

3. The array below shows one strategy for solving $4 \times 9$. Explain the strategy using your own words.

- $(5 \times 4) = \_\_\_\_\_\_
- $(4 \times 4) = \_\_\_\_\_\_$
1. Use the array to complete the related number sentences.

\[ 1 \times 4 = \_ \_ \_ \_ \_ \_ = 24 \]

\[ 2 \times 4 = \_ \_ \_ \_ \_ \_ \_ \div 4 = 2 \]

\[ \_ \_ \_ \_ \_ \_ \_ \times 4 = 12 \]

\[ 12 \div 4 = \_ \_ \_ \_ \_ \_ \_ \]

\[ \_ \_ \_ \_ \_ \_ \_ \times 4 = 16 \]

\[ 16 \div 4 = \_ \_ \_ \_ \_ \_ \_ \]

\[ \_ \_ \_ \_ \_ \_ \_ \_ \_ \times \_ \_ \_ \_ \_ \_ \_ = 20 \]

\[ 20 \div \_ \_ \_ \_ \_ \_ \_ = \_ \_ \_ \_ \_ \_ \_ \]

\[ \_ \_ \_ \_ \_ \_ \_ \_ \_ \times \_ \_ \_ \_ \_ \_ \_ = 24 \]

\[ 24 \div \_ \_ \_ \_ \_ \_ \_ = \_ \_ \_ \_ \_ \_ \_ \]

\[ \_ \_ \_ \_ \_ \_ \_ \_ \_ \times 4 = \_ \_ \_ \_ \_ \_ \_ \] \[ \_ \_ \_ \_ \_ \_ \_ \_ \_ \div 4 = \_ \_ \_ \_ \_ \_ \_ \]

\[ \_ \_ \_ \_ \_ \_ \_ \_ \_ \times 4 = \_ \_ \_ \_ \_ \_ \_ \]

\[ \_ \_ \_ \_ \_ \_ \_ \_ \_ \div 4 = \_ \_ \_ \_ \_ \_ \_ \]

\[ \_ \_ \_ \_ \_ \_ \_ \_ \_ \times \_ \_ \_ \_ \_ \_ \_ = \_ \_ \_ \_ \_ \_ \_ \]

\[ \_ \_ \_ \_ \_ \_ \_ \_ \_ \div \_ \_ \_ \_ \_ \_ \_ = \_ \_ \_ \_ \_ \_ \_ \]

\[ \_ \_ \_ \_ \_ \_ \_ \_ \_ \times \_ \_ \_ \_ \_ \_ \_ = \_ \_ \_ \_ \_ \_ \_ \]

\[ \_ \_ \_ \_ \_ \_ \_ \_ \_ \div \_ \_ \_ \_ \_ \_ \_ = \_ \_ \_ \_ \_ \_ \_ \]
2. The baker packs 36 bran muffins in boxes of 4. Draw and label a tape diagram to find the number of boxes he packs.

3. The waitress arranges 32 glasses into 4 equal rows. How many glasses are in each row?

4. Janet paid $28 for 4 notebooks. Each notebook costs the same amount. What is the cost of 2 notebooks?
Name ___________________________________________ Date __________________________

1. Mr. Thomas organizes 16 binders into stacks of 4. How many stacks does he make? Draw and label a number bond to solve.

2. The chef uses 28 avocados to make 4 batches of guacamole. How many avocados are in 2 batches of guacamole? Draw and label a tape diagram to solve.
Name ________________________________________ Date ____________________

1. Use the array to complete the related number sentences.

   \[ 1 \times 4 = \_\_\_\_\_\; \quad \_\_\_\_\_\; \div 4 = 1 \]

   \[ 2 \times 4 = \_\_\_\_\_\; \quad \_\_\_\_\_\; \div 4 = 2 \]

   \[ \_\_\_\; \times 4 = 12 \; \quad \_\_\_\_\; \div 4 = \_\_\_\_\_\_\; \]

   \[ \_\_\_\; \times 4 = 16 \; \quad \_\_\_\_\; \div 4 = \_\_\_\_\_\_\; \]

   \[ \_\_\_\; \times \_\_\_\; = 20 \; \quad 20 \div \_\_\_\; = \_\_\_\_\_\_\; \]

   \[ \_\_\_\; \times \_\_\_\; = 24 \; \quad 24 \div \_\_\_\; = \_\_\_\_\_\_\; \]

   \[ \_\_\_\; \times 4 = \_\_\_\_\_\; \quad \_\_\_\_\_\; \div 4 = \_\_\_\_\_\_\; \]

   \[ \_\_\_\; \times 4 = \_\_\_\_\_\; \quad \_\_\_\_\_\; \div 4 = \_\_\_\_\_\_\; \]

   \[ \_\_\_\; \times \_\_\_\; = \_\_\_\_\_\; \quad \_\_\_\_\_\; \div \_\_\_\; = \_\_\_\_\_\_\; \]

   \[ \_\_\_\; \times \_\_\_\; = \_\_\_\_\_\; \quad \_\_\_\_\_\; \div \_\_\_\; = \_\_\_\_\_\_\; \]
2. The teacher puts 32 students into groups of 4. How many groups does she make? Draw and label a tape diagram to solve.

3. The store clerk arranges 24 toothbrushes into 4 equal rows. How many toothbrushes are in each row?

4. An art teacher has 40 paint brushes. She divides them equally between her 4 students. She finds 8 more brushes and divides these equally between the students as well. How many brushes does each student receive?
Lesson 18: Apply the distributive property to decompose units.

Name ________________________________ Date ____________________

1. $8 \times 10 = \underline{80}$

   8 tens
   5 tens

   $5 \text{ tens} + \underline{3 \text{ tens}} = 8 \text{ tens}$

   $(5 \times 10) + (\underline{3 \times 10}) = \underline{50 + 30} = \underline{80}$

   $8 \times 10 = \underline{80}$

2. $7 \times 4 = \underline{28}$

   7 fours
   5 fours

   $5 \text{ fours} + \underline{2 \text{ fours}} = 7 \text{ fours}$

   $(5 \times 4) + (\underline{2 \times 4}) = \underline{20 + 8} = \underline{28}$

   $7 \times 4 = \underline{28}$

3. $9 \times 10 = \underline{90}$

   9 tens
   5 tens

   $5 \text{ tens} + \underline{4 \text{ tens}} = 9 \text{ tens}$

   $(5 \times 10) + (\underline{4 \times 10}) = \underline{50 + 40} = \underline{90}$

   $9 \times 10 = \underline{90}$

4. $10 \times 10 = \underline{100}$

   10 tens
   5 tens

   $5 \text{ tens} + \underline{5 \text{ tens}} = 10 \text{ tens}$

   $(5 \times 10) + (\underline{5 \times 10}) = \underline{50 + 50} = \underline{100}$

   $10 \times 10 = \underline{100}$
5. There are 7 teams in the soccer tournament. 10 children play on each team. How many children are playing in the tournament?

There are __________ children playing in the tournament.

6. What is the total number of sides on 8 triangles?

7. There are 12 rows of bottled drinks in the vending machine. Each row has 10 bottles. How many bottles are in the vending machine?
Dylan used the distributive property to solve a multiplication problem. Look at his work below, write the multiplication problem Dylan solved and complete the number bond.

Dylan’s work:

\[(5 \times 4) + (1 \times 4) = \]
\[20 + 4 = 24\]

\[______ \times ____ = _____\]
1. Match.

2. 9 × 4 =

(____ × 4) + (____ × 4) =

____ + _____ = ______

9 × 4 = ______
3. Lydia makes 10 pancakes. She tops each pancake with 4 blueberries. How many blueberries does Lydia use in all?

Lydia uses _______ blueberries in all.

4. Steven solves $7 \times 3$ using the distributive property. Show an example of what Steven’s work might look like below.

5. There are 7 days in 1 week. How many days are there in 10 weeks?
Name __________________________________________ Date ______________________

1. Label the array. Then fill in the blanks below to make statements that are true.

   a. $36 \div 3 = _____$

   
   
   
   
   
   


   b. $25 \div 5 = _____$

   
   
   
   


   c. $28 \div 4 = _____$

   
   
   
   


   d. $32 \div 4 = _____$

   
   
   
   


   (36 \div 3) = (30 \div 3) + (6 \div 3)

   = 10 + _____

   = 12

   (25 \div 5) = (20 \div 5) + (5 \div 5)

   = 4 + _____

   = _____

   (28 \div 4) = (20 \div 4) + (_____ \div 4)

   = _____ + _____

   = _____

   (32 \div 4) = (_____ \div 4) + (_____ \div 4)

   = _____ + _____

   = _____
2. Match the equal expressions.

- \(24 \div 2\)
- \(36 \div 3\)
- \(39 \div 3\)
- \(26 \div 2\)

- \((30 \div 3) + (6 \div 3)\)
- \((30 \div 3) + (9 \div 3)\)
- \((20 \div 2) + (6 \div 2)\)
- \((20 \div 2) + (4 \div 2)\)

3. Nell draws the array below to find the answer to the division fact \(24 \div 2\). Explain Nell’s strategy.

\[
\begin{array}{cccc}
\odot & \odot & \odot & \odot \\
\odot & \odot & \odot & \odot \\
\odot & \odot & \odot & \odot \\
\hline
\odot & \odot & \odot & \odot \\
\odot & \odot & \odot & \odot \\
\odot & \odot & \odot & \odot \\
\end{array}
\]
Lesson 19 Exit Ticket

NYS COMMON CORE MATHEMATICS CURRICULUM

Complete the equations below to solve $22 \div 2 = \ldots$.

$(20 \div 2) =$ _____

$(\ldots \div 2) =$ _____

$(22 \div 2) = (20 \div 2) + (\ldots \div 2)$

$= \ldots + \ldots$

$= \ldots$

Name ____________________________ Date _________________
1. Label the array. Then complete the equations to make statements that are true.

a. \(18 \div 3 = \)  
   \[
   \begin{array}{c}
   \\
   \end{array}
   \]
   
   \((9 \div 3) = 3\)
   
   \[
   \begin{array}{c}
   \\
   \end{array}
   \]
   
   \((9 \div 3) = \) ___
   
   \[
   \begin{array}{c}
   \\
   \end{array}
   \]
   
   \[
   (18 \div 3) = (9 \div 3) + (9 \div 3) \]
   
   \[
   = 3 + \_
   \]
   
   \[
   = 6
   \]

b. \(21 \div 3 = \)  
   \[
   \begin{array}{c}
   \\
   \end{array}
   \]
   
   \((15 \div 3) = 5\)
   
   \[
   \begin{array}{c}
   \\
   \end{array}
   \]
   
   \((6 \div 3) = \) ___
   
   \[
   \begin{array}{c}
   \\
   \end{array}
   \]
   
   \[
   (21 \div 3) = (15 \div 3) + (6 \div 3) \]
   
   \[
   = 5 + \_
   \]
   
   \[
   = \_
   \]

c. \(24 \div 4 = \)  
   \[
   \begin{array}{c}
   \\
   \end{array}
   \]
   
   \((20 \div 4) = \) ___
   
   \[
   \begin{array}{c}
   \\
   \end{array}
   \]
   
   \((4 \div 4) = \) ___
   
   \[
   \begin{array}{c}
   \\
   \end{array}
   \]
   
   \[
   (24 \div 4) = (20 \div 4) + (\_ \div 4) \]
   
   \[
   = \_
   \]
   
   \[
   = \_
   \]

d. \(36 \div 4 = \)  
   \[
   \begin{array}{c}
   \\
   \end{array}
   \]
   
   \((20 \div 4) = \) ___
   
   \[
   \begin{array}{c}
   \\
   \end{array}
   \]
   
   \((16 \div 4) = \) ___
   
   \[
   \begin{array}{c}
   \\
   \end{array}
   \]
   
   \[
   (36 \div 4) = (\_ \div 4) + (\_ \div 4) \]
   
   \[
   = \_
   \]
   
   \[
   = \_
   \]
4. Match equal expressions.

- \( 28 \div 2 \)
- \( 33 \div 3 \)
- \( 36 \div 3 \)
- \( 26 \div 2 \)

- \( (30 \div 3) + (3 \div 3) \)
- \( (20 \div 2) + (6 \div 2) \)
- \( (30 \div 3) + (6 \div 3) \)
- \( (20 \div 2) + (8 \div 2) \)

5. Alex draws the array below to find the answer to \( 35 \div 5 \). Explain Alex's strategy.
Lesson 20 Problem Set

Name ___________________________ Date ______________


   ![Diagram of books and magazine]

   a. What is the total cost of the books?

   b. How much does Ted spend altogether?

2. Seven children share 28 silly bands equally.

   ![Diagram of 28 silly bands]

   a. How many silly bands does each child get?

   b. How many silly bands do 3 children get?
3. Eighteen cups are equally packed into 6 boxes. Two boxes of cups break. How many cups are unbroken?

4. There are 25 blue balloons and 15 red balloons at a party. Five children are given an equal number of each color balloon. How many blue and red balloons does each child get?

5. Twenty-seven pears are packed in bags of 3. Five bags of pears are sold. How many bags of pears are left?
Name ___________________________________________ Date __________________

1. Thirty-two jellybeans are shared by 8 students.

   32 jelly beans

   a. How many jellybeans will each student get?

   b. How many jellybeans will 4 students get?

2. The teacher has 30 apple slices and 20 pear slices. Five children equally share all of the fruit slices. How many fruit slices does each child get?
Lesson 20: Solve two-step word problems involving multiplication and division and assess the reasonableness of answers.

Date: 5/6/13


   a. What is the total cost of the markers?

   b. How much more does David spend on 4 sets of markers than Jerry spends on a pack of pencils?

2. Thirty students are eating lunch at 5 tables. Each table has the same number of students.

   a. How many students are sitting at each table?

   b. How many students are sitting at 4 tables?
3. The teacher has 12 green stickers and 15 purple stickers. Three super star students are given an equal number of each color sticker. How many green and purple stickers does each student get?

4. Three friends go apple picking. They pick 13 apples on Saturday and 14 apples on Sunday. They share the apples equally. How many apples does each person get?

5. The store has 28 notebooks in packs of 4. Three packs of notebooks are sold. How many packs of notebooks are left?
1. Jason earns $6 per week for doing all his chores. On the fifth week he forgets to take out the trash so he only earns $4. Write and solve an equation to show how much Jason earns in 5 weeks.

Jason earns \[ \text{___________}. \]

2. Miss Lianto orders 4 packs of 7 markers. After passing out 1 marker to each student in her class, she has 6 left. Label the tape diagram to find how many students are in Miss Lianto’s class.

There are \[ \text{_______ students in Miss Lianto’s class.} \]
3. Orlando buys a box of 18 fruit snacks. Each box comes with an equal amount of strawberry, cherry, and grape flavored snacks. He eats all of the grape flavored snacks first. Draw and label a tape diagram to find how many fruit snacks he has left.

4. Eudora buys 21 m of ribbon. She cuts the ribbon so that each piece measures 3 m in length.
   a. How many pieces of ribbon does she cut?
   b. If Eudora needs a total of 12 pieces of ribbon, how many more pieces of ribbon does she need?
Lesson 21 Exit Ticket

Name ___________________________ Date _________________

Ms. Egeregor buys 27 books for her classroom library. She buys an equal amount of fiction, nonfiction, and poetry books. She shelves all of the poetry books first. Draw and label a tape diagram to show how many books Ms. Egeregor has left to shelve.
Lesson 21: Solve two-step word problems involving all four operations and assess the reasonableness of answers.

Date: 5/6/13

1. Tina eats 8 crackers for a snack each day at school. On Friday she drops 3 and only eats 5. Write and solve an equation to show the total number of crackers Tina eats during the week.

\[8 \text{ crackers} - 3 \text{ crackers} + 5 \text{ crackers} = \text{ total crackers eaten}\]

Tina eats \(\underline{10}\) crackers.

2. Ballio has a reading goal. He checks 3 boxes of 9 books out from the library. After finishing them, he realizes that he beat his goal by 4 books! Label the tape diagrams to find Ballio’s reading goal.

Ballio’s goal is to read \(\underline{29}\) books.
3. Mr. Nguyen plants 24 trees around the neighborhood pond. He plants equal numbers of Maple, Pine, Spruce, and Birch trees. He waters the Spruce and Birch trees before it gets dark. How many trees does Mr. Nguyen still need to water? Draw and label a tape diagram.

4. Anna buys 24 seeds and plants 3 in each pot. She has 5 pots. How many more pots does Anna need to plant all of her seeds?
1. Mrs. Tran plants 2 rows of 5 carrots in her garden.
   
   a. Draw an array that represents Mrs. Tran’s carrots using an ‘x’ to show each carrot.

   b. Mrs. Tran adds 3 more rows of 5 carrots to her garden.
      - Use circles to show her new carrots on the array in part a.
      - Complete the number sentence below showing how she added five rows.

         _______ fives + _______ fives = _______ fives

      - Write a sentence to explain your thinking.

   c. Find the total number of carrots Mrs. Tran planted.

   d. Write a multiplication sentence to describe the array representing the total number of carrots Mrs. Tran planted.
2. Mrs. Tran picks 15 tomatoes from her garden. She puts 5 tomatoes in each bag.
   a. Draw Mrs. Tran’s bags of tomatoes.
   b. Write and solve a multiplication sentence to describe your drawing in part a.

3. Mrs. Tran plants 12 sunflowers in her garden. She plants them in 3 rows.
   a. Write a division sentence in the spaces below. What does the answer represent?
      
      ______ ÷ ______ = ______
      
   b. Mrs. Tran adds 2 more identical rows of sunflowers to her 3 original rows. Draw an array to show how many flowers she has now.
   c. Mrs. Tran figured out how many flowers she planted. Her work is shown in the box below. Would Mrs. Tran get the same result if she multiplied 5 x 4? Explain why or why not.
      
      \[(3 \times 4) + (2 \times 4) = 12 + 8 = 20\]
1. Melanie works in a bakery. She bakes different types of breads. She bakes 18 biscuits on a pan. 3 rows fit on the pan. Draw an array to show the total number of biscuits.

   a. Fill in the missing factor. Write a sentence telling what it represents.

   \[ 3 \times \underline{\phantom{1}} = 18 \]

   b. Write a related division sentence to find the number of biscuits in each row.

2. Melanie packs the 18 biscuits into bags of 2.

   a. Draw a picture to show how many bags of biscuits Melanie packs. How many bags of biscuits does she pack?

   b. Melanie bakes 18 rolls and packs them into bags of 9. Draw a picture to show how many bags of rolls Melanie packs. How many bags of rolls does she pack?

   c. Draw an array to represent her biscuits. Draw a second array to represent her rolls. Explain the relationship between the 2 arrays using number sentences and words.
3. Melanie bakes cupcakes for a birthday party. They are shown to the right. 20 are vanilla and 20 are chocolate. This shows how she calculated the total number of cupcakes:

\[(4 \times 5) + (4 \times 5) = 8 \times 5\]

a. Use Melanie’s method to find the total. Explain each step with words.

b. She burns 2 rows of five cupcakes. Fill in the unknowns below to describe how many are on the plate and how many are burnt.

\[8 \times 5 = \underline{\hspace{2cm}} \times 5 + \underline{\hspace{2cm}} \times 5\]

4. Melanie decides to bake blueberry muffins next. Her recipe calls for 5 blueberries per muffin. She makes 10 muffins.

a. Draw a picture and write a multiplication sentence to find the total number of blueberries she uses for 10 muffins.

b. Melanie uses the equation \(10 = \underline{\hspace{2cm}} \div 5\) to figure out how many blueberries she needs. Is her method correct? Why or why not?

c. If she has a total of 90 blueberries, how many are left after she makes the 10 muffins?

d. She boxes the 10 muffins. Each box fits 2. Draw a picture and write a number sentence to show how many boxes Melanie fills.
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