Relationship with Mult. And Div.

(division is the inverse of math)
**Standard: 3.N.2.6**

*Identify and use relationship between multiplication and division (e.g., division is the inverse of multiplication) to solve problems.*

**Concept Skill:**

**Relationship with Multiplication and Division**

**Multiplication** is an operation that finds the total number of items that are in equal groups or the product.

- Multiplication is the same thing as repeated addition. Multiplying 6 times 3 is the same thing as adding 6 three times: \(6 \times 3 = 6 + 6 + 6 = 18\)

**Division** is an operation that results in a quotient.

*Division is the same as repeated subtraction. Dividing 30 by 5 is the same thing as subtracting 5 until there are none left: \(30 - 5 - 5 - 5 - 5 - 5 - 5 = 0\). You have subtracted 5 six times to get to zero. So, 30 divided by 5 = 6.*
A farmer is filling baskets with apples. The farmer has 24 apples and 4 baskets. If he divides them equally, how many apples will he put in each basket?

\[
24 \div 4 = 6
\]

When you divide to find the number of groups, the division is called measuring or repeated subtraction. It is easy to see that you can keep subtracting 4 from 24 until you reach zero. Each 4 you subtract is a group or basket.

A farmer has 24 apples. He wants to sell them at 4 apples for $1.00. How many baskets of 4 can he fill?

\[
24 \div 4 = 6
\]
Manipulatives and visual aids are important when teaching multiplication and division. Students have used arrays to illustrate the multiplication process. Arrays can also illustrate division.

\[12 \div 4 = 3 \quad \text{and} \quad 12 \div 3 = 4\]

Since division is the inverse, or opposite, of multiplication, you can use arrays to help students understand how multiplication and division are related. If in multiplication we find the product of two factors, in division we find the missing factor if the other factor and the product are known.

In the multiplication model below, you multiply to find the number of counters in all. In the division model you divide to find the number of counters in each group. The same three numbers are used. The model shows that division “undoes” multiplication and multiplication “undoes” division. So when multiplying or dividing, students can use a fact from the inverse operation. For example, since you know that \(4 \times 5 = 20\), you also know the related division fact \(20 \div 4 = 5\) or \(20 \div 5 = 4\). Students can also check their work by using the inverse operation.
Notice that the numbers in multiplication and division sentences have special names. In multiplication the numbers you multiply are called **factors**; the answer is called the **product**. In division the number being divided is the **dividend**, the number that divides it is the **divisor**, and the answer is the **quotient**. Discuss the relationship of these numbers as you explain how multiplication and division are related.

There are other models your students can use to explore the relationship between multiplication and division. Expose your students to the different models and let each student choose which model is most helpful to him or her. Here is an example using counters to multiply and divide.

\[
\begin{align*}
7 \times 3 &= 21 \\
18 \div 3 &= 6
\end{align*}
\]
Here is an example using a number line.

\[
\text{dividend} \quad 12 \quad \div \quad \text{divisor} \quad 4 \quad = \quad \text{quotient} \quad 3
\]

\[
\text{total number of counters} \quad \div \quad \text{number of groups} \quad = \quad \text{counters in each group}
\]

\[
\text{factor} \quad 4 \quad \times \quad \text{factor} \quad 5 \quad = \quad \text{product} \quad 20
\]

\[
\text{dividend} \quad 20 \quad \div \quad \text{divisor} \quad 5 \quad = \quad \text{quotient} \quad 4
\]
Example: 1

Find the product for:

5 x 4

Step 1: Use skip counting.
(Since 5 is multiplied by 4, count by 5’s until you reach the 4^{th} number: 5, 10, 15, 20)

Step 2: Write the answer.
(The answer for 5 x 4 is 20).
Example: 2

Find the quotient for:

35 divided by 7

Step 1: Use repeated subtraction.

35 – 7 = 28
28 – 7 = 21
21 – 7 = 14
14 – 7 = 7
7 – 7 = 0

Step 2: Count how many times you needed to subtract.

(You needed to subtract seven 5 times. So 35/7=5).
Example: 3

Patrick is studying Native American homes. He made a village, as shown below.

Which could be used to find the total number of homes in Patrick’s model village?

- $4 + 8 = ___$
- $8 - 4 = ___$
- $4 \times 8 = ___$
- $8 \div 4 = ___$

**Step 1:** Count the total number of homes in each group. (There are 8 homes in each group).

**Step 2:** Count the number of total groups. (There are 4 total groups).

**Step 3:** Multiply the number of homes by the number of groups. ($8 \times 4 = 32$)
Pat wrote the following number sentence to show her array.

\[ 7 \times 2 = 14 \]

Which of the following number sentences could also represent the array?

A. \( 14 \times 2 = 7 \)
B. \( 7 \div 2 = 14 \)
C. \( 14 \div 2 = 7 \)
D. \( 14 + 7 = 2 \)

4 \times 2 = 8 so,

\[ 8 \div 4 = \]

A. 8
B. 4
C. 2
D. 0
Harvey had 5 plates of cookies. Each plate contained 8 cookies. Write one multiplication and one division sentence below to show how many cookies Harvey has in all.
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\[ 4 \times 2 = 8 \text{ so,} \]
\[ 8 \div 4 = \]

A. 8
B. 4
*C. 2
D. 0
Harvey had 5 plates of cookies. Each plate contained 8 cookies. Write one multiplication and one division sentence below to show how many cookies Harvey has in all.

5 x 8 = 40 or
8 x 5 = 40 and
40 ÷ 5 = 8 or
40 ÷ 8 = 5