

## Content and Language Objective:

Students will evaluate a variety of problems involving multiplication and division and be able to explain what the various terms that are related to multiplication and division in their own words.

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### Warm-Up

Evaluate each expression

$$1. \left(-\frac{2}{3}\right)_4 \left(-\frac{3}{4}\right)_3 = -\frac{8}{12} - \left(-\frac{9}{12}\right) = \boxed{\frac{1}{12}}$$

$$2. 2z - 5z - (-8z)$$
$$-3z - (-8z)$$
$$5z$$

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**Students will evaluate a variety of problems involving multiplication and division and be able to explain what the various terms that are related to multiplication and division in their own words.**

### **Terms:**

- **Factors/Product**
- **Multiplicative Inverse**
- **Reciprocal**
- **Dividend/Divisor**
- **Quotient**
- **Not Equal To**

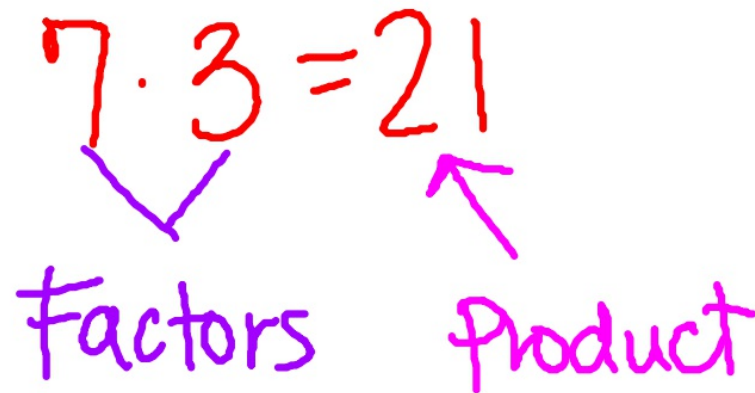
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### Definitions

- **Factors/Product**

In a multiplication problem, the two numbers multiplied are called **FACTORS**, and the answer is called the **PRODUCT**.



A handwritten diagram illustrating the components of a multiplication problem. The equation  $7 \cdot 3 = 21$  is written in red. Below the numbers 7 and 3, a purple bracket is drawn, with the word "Factors" written in purple below it. Below the number 21, a purple arrow points upwards, with the word "Product" written in purple below it.

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### Definitions

- **Multiplicative Inverse/Reciprocal**

Can only be used for *nonzero* numbers.

$$-5/1 \\ \text{reciprocal} = -1/5$$

$$-5/1 \cdot 1/5 = \frac{-5}{5} = -1$$

The product of a nonzero number and its reciprocal is

$$a \bullet \frac{1}{a} = 1$$



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### Practice:

Evaluate each expression.

1.  $-11 \bullet 8 = -88$

2.  $\frac{3}{5} \bullet \frac{4}{7} = \frac{12}{35}$

3.  $-1.2(-10) = 12$

4.  $(1.2)(5)(-7)$

$6 \cdot -7 = -42$

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### Definitions

- **Dividend/Divisor/Quotient**

In the division problem,  $20 \div 4 = 5$ , the number **20** is the **DIVIDEND**, **4** is the **DIVISOR**, and **5** is the **QUOTIENT**.

The division problem  $20 \div 4 = 5$ , can also be written as  $\frac{20}{4} = 5$

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### Important Facts

#### Rules of the Signs

A negative times a negative is a positive!

A negative divided by a negative is a positive!

$$\begin{array}{cc} (-)(-) = (+) & \frac{(-)}{(-)} = (+) \end{array}$$

A negative times a positive is a negative!

A negative divided by a positive is a negative!

$$\begin{array}{cc} (-)(+) = (-) & \frac{(-)}{(+)} = (-) \end{array}$$

A positive times a positive is a positive!

A positive divided by a positive is a positive!

$$\begin{array}{cc} (+)(+) = (+) & \frac{(+)}{(+)} = (+) \end{array}$$



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### Important Facts

$$\frac{12}{0} = k$$

$$0 \cdot k = 0$$

$$0 \cdot 5 \neq 12$$

$$\frac{12}{0} = 5$$

$$\frac{12}{6} = 2$$

$$6 \cdot 2 = 12$$

### WHY WE NEVER DIVIDE BY 0!!!!

The expression  $b \neq 0$  is read "*b not equal to 0.*"

Division by 0 is ALWAYS *undefined*.

For example, suppose we try to define  $12 \div 0$  to be equal to some number  $k$ . Then  $\frac{12}{0} = k$  and  $k$  must satisfy  $0 \bullet k = 12$  because a division problem can be checked by using multiplication.

But the product of 0 and any number  $k$  is 0, not 12. So there is no reasonable value for  $k$ , so division by 0 is undefined.



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### Practice:

Evaluate each expression.

1.  $-12 \div \frac{1}{2}$   $\rightarrow -24$   $-\frac{12}{1} \cdot \frac{2}{1} = -\frac{24}{1}$

2.  $\frac{\frac{2}{3}}{-7} = \frac{2}{3} \div -7 = \frac{2}{3} \cdot -\frac{1}{7} = -\frac{2}{21}$

3.  $\frac{-4}{-24} = \frac{4}{24} = \frac{1}{6}$   $-4 \cdot -\frac{1}{24} = \frac{4}{24} = \frac{1}{6}$

4.  $6 \div 0$  undefined

$0 \div 6 = 0$

$$|-6.1| = 6.1$$