

# Multiplication and Division Lesson 3

## Multiplication Cross and Beyond

### Important Note

For all braille examples, emboss the "L3-Mul-Div-Problems-Only.brf" file as a supplement to this lesson.

### Background

After you completed "Lesson 1 Multiplication Cross," you could write equations in a linear format with a multiplication cross and whole numbers in Nemeth Code. In this lesson, you will learn how to read and write equations in a linear format that include a multiplication cross as well as a grouping symbol and/or exponent.

### Basic Rules with Grouping Symbols

Let's begin with learning how to read and write an equation with a multiplication cross and **grouping symbols**. Although there are additional comparison symbols and grouping symbols, we will use the following Nemeth symbols:

- Multiplication cross (dot 4, dots 1-6) ( $\times$ ) ⠠⠨⠠⠠⠠⠠⠠
- Equals sign (dots 4-6, dots 1-3) (=) ⠠⠠⠠⠠⠠⠠
- Open parenthesis (dots 1-2-3-5-6) (()) ⠠⠠⠠⠠⠠⠠
- Close parenthesis (dots 2-3-4-5-6) (()) ⠠⠠⠠⠠⠠⠠
- Open bracket (dot 4, dots 1-2-3-5-6) ([) ⠠⠠⠠⠠⠠⠠
- Close bracket (dot 4, dots 2-3-4-5-6) (]) ⠠⠠⠠⠠⠠⠠

The following steps outline how to write open parenthesis four times three close parenthesis minus seven equals in Nemeth Code:

1. Open parenthesis (dots 1-2-3-5-6) ⠠⠠⠠⠠⠠⠠
2. Four (dots 2-5-6) ⠠⠠⠠⠠⠠⠠
3. Multiplication cross (dot 4, dots 1-6) ⠠⠠⠠⠠⠠⠠
4. Three (dots 2-5) ⠠⠠⠠⠠⠠⠠

5. Close parenthesis (dots 2-3-4-5-6) ⋆⋆
6. Minus (dots 3-6) ⋆⋆
7. Seven (dots 2-3-5-6) ⋆⋆
8. Space
9. Equals sign (dots 4-6, dots 1-3) ⋆⋆⋆⋆
10. Space
11. General omission symbol (dots 1-2-3-4-5-6) ⋆⋆⋆

$$) - 7 =$$

Since nothing is written after the equals sign, a general omission symbol is needed.

Notice that there is not a space before or after the multiplication cross. In addition, since a multiplication cross was used in print, a multiplication cross was used in braille.

## Examples with Grouping Symbols

1. Six plus open parenthesis six minus two close parenthesis times three equals what number?

$$6 + (6 - 2) \times 3 = ?$$

The figure consists of 10 diagrams arranged in a single row, each showing a pattern of black dots on a grid. The patterns evolve from left to right. The first diagram shows a small cluster of dots. The second diagram shows a larger cluster. The third diagram shows a more complex shape. The fourth diagram shows a pattern that is more spread out. The fifth diagram shows a pattern that is more compact. The sixth diagram shows a pattern that is more spread out. The seventh diagram shows a pattern that is more compact. The eighth diagram shows a pattern that is more spread out. The ninth diagram shows a pattern that is more compact. The tenth diagram shows a pattern that is more spread out.

2. Open parenthesis seven times ten close parenthesis plus open parenthesis four times one close parenthesis equals blank.

$$(7 \times 10) + (4 \times 1) =$$

3. Two times open bracket five plus open parenthesis fourteen minus eight plus three close parenthesis close bracket equals?

$$2 \times [5 + (14 - 8 + 3)] =$$

## Activity Time with Grouping Symbols

Write the equations with a multiplication cross and grouping symbols from Examples 1 to 3.

1. Six plus open parenthesis six minus two close parenthesis times three equals what number?
2. Open parenthesis seven times ten close parenthesis plus open parenthesis four times one close parenthesis equals blank.
3. Two times open bracket five plus open parenthesis fourteen minus eight plus three close parenthesis close bracket equals?

## Basic Rules with Exponents

Equations with the multiplication cross and **exponents** use the following Nemeth symbols:

- Multiplication cross (dot 4, dots 1-6) ( $\times$ ) ⠠⠨
- Equals sign (dots 4-6, dots 1-3) (=) ⠠⠨
- Superscript indicator (dots 4-5) ⠠⠨
- Baseline indicator (dot 5) ⠠⠨

The next equation includes a **superscript**, sometimes called an exponent or power. The following steps outline how to write the equation seventy times ten squared equals blank:

1. Numeric indicator (dots 3-4-5-6) ⠠⠨
2. Seventy (dots 2-3-5-6, dots 3-5-6) ⠠⠨
3. Multiplication cross (dot 4, dots 1-6) ⠠⠨
4. Ten (dot 2, dots 3-5-6) ⠠⠨
5. Superscript indicator (dots 4-5) ⠠⠨
6. Two (dots 2-3) ⠠⠨
7. Space
8. Equals sign (dots 4-6, dots 1-3) ⠠⠨
9. Space
10. Long dash (dots 3-6, dots 3-6, dots 3-6, dots 3-6) ⠠⠨⠠⠨⠠⠨⠠⠨

$$70 \times 10^2 = \underline{\hspace{2cm}}$$

Since a space came after the exponent, no baseline indicator was needed.

## Examples with Exponents

1. Ten squared times ten cubed equals what number?

$$10^2 \times 10^3 = ?$$

A baseline indicator was used after the first superscript (squared) to indicate that the following symbol, the multiplication cross, is on the baseline and not elevated.

2. Four point one times ten to the negative third power equals blank.

$$4.1 \times 10^{-3} = \underline{\hspace{2cm}}$$

3. Two to the fourth power times five equals?

$$2^4 \times 5 =$$

Again, a baseline indicator was used after the superscript to indicate that the following symbol, the multiplication cross, is on the baseline and not elevated.

## Activity Time with Exponents

Write the equations with a multiplication cross and exponents from Examples 1 to 3.

1. Ten squared times ten cubed equals what number?
2. Four point one times ten to the negative third power equals blank.
3. Two to the fourth power times five equals?