

# Five-Step Rule and Exceptions Lesson 5

## Geometry and Beyond

### Important Note

For all braille examples, emboss the "L5-Five-Step-Problems-Only.brf" file as a supplement to this lesson.

### Background

Sometimes a symbol is placed either directly over or under an expression in print. It often takes several braille cells in the Nemeth code to describe the type of modifier and where it is placed in print.

Most modified expressions:

- Start with a multipurpose indicator (dot 5). ⠠
- End with the termination indicator (dots 1-2-4-5-6). ⠠

The Five-Step Rule is used when writing modified expressions. It is called the Five-Step Rule because there are five steps that must be used in the same order each time an expression is modified.

**Step 1:** Multipurpose indicator (dot 5) ⠠

**Step 2:** Expression being modified

**Step 3:** Directly-over indicator (dots 1-2-6) ⠠  
or directly-under indicator (dots 1-4-6) ⠠

**Step 4:** Modifier

**Step 5:** Termination indicator (dots 1-2-4-5-6) ⠠

In this particular lesson, we will not be using the directly-under indicator.

Note that when reading these expressions in braille, the multipurpose indicator (dot 5) is often misread as a "1".

Modified expressions should be placed on a single line if possible.

Without the Five-Step Rule, modified expressions would be more difficult to read and understand.

Here are some examples of the Five-Step Rule used in geometry.


1. ray AB

- The letters are capitalized.
- The contracted right-pointing arrow is used to indicate the ray.

$$\overrightarrow{AB}$$

The following steps outline how to write Example 1. Note that in this geometry example, the Five-Step Rule begins in step 1.

**Step 1:** Multipurpose indicator (dot 5) ∴

**Step 2:** Expression being modified (AB) 

**Step 3:** Directly-over indicator (dots 1-2-6)    ⋮

**Step 4:** Contracted right-pointing arrow (dots 1-2-4-6, dots 1-3-5) 

**Step 5:** Termination indicator (dots 1-2-4-5-6) 

2. line CD

- The letters in the line are capitalized.
- The two-way horizontal arrow is used to indicate the line.


$$\overleftrightarrow{CD}$$

The following steps outline how to write Example 2. Note that in this geometry expression, the Five-Step Rule begins in step 1.

**Step 1:** Multipurpose indicator (dot 5) ∴

**Step 2:** Expression being modified (CD) 

**Step 3:** Directly-over indicator (dots 1-2-6)     ⋮

**Step 4:** Two-way horizontal arrow (dots 1-2-4-6, dots 2-4-6, dots 2-5, dots 2-5, dots 1-3-5)    

**Step 5:** Termination indicator (dots 1-2-4-5-6) 

### 3. segment EF

- The letters in the segment are capitalized.
- The horizontal bar is used to indicate segments.

 $\overline{EF}$ 

The following steps outline how to write Example 3. Note how the Five-Step-Rule starts in step one for this geometry expression.

### Step 1: Multipurpose indicator (dot 5)

**Step 2:** Expression being modified (EF) 

**Step 3:** Directly-over indicator (dots 1-2-6)    ⋮

**Step 4:** Horizontal bar (dots 1-5-6) ∴

**Step 5:** Termination indicator (dots 1-2-4-5-6) 

## Basic Rules

Sometimes the Five-Step Rule is used twice, once on each side of a comparison symbol. Here are some examples of comparison symbols commonly used with geometry symbols. There is a space before and after a comparison symbol.

is parallel to (dots 1-2-4-6, dots 1-2-3) 

is perpendicular to (dots 1-2-4-6, dots 1-2-3-4) 

is congruent to (dot 4, dots 1-5-6, dots 4-6, dots 1-3) 

## Examples


1. Line AB is parallel to line EF.

- The letters in the lines are capitalized.
- The Nemeth symbol for "is parallel to" is (dots 1-2-4-6) followed by (dots 1-2-3). ⠄⠕⠗⠑⠒⠁⠇⠞⠊⠏⠎⠈


$$\overleftrightarrow{AB} \cong \overleftrightarrow{EF}$$

The following steps outline how to write Example 1. Note that the Five-Step Rule is repeated for each modified expression.


**Step 1:** Multipurpose indicator (dot 5) ∴

**Step 2:** Expression being modified (AB) 

**Step 3:** Directly-over indicator (dots 1-2-6) 

**Step 4:** Two-way horizontal arrow (dots 1-2-4-6, dots 2-4-6, dots 2-5, dots 2-5, dots 1-3-5)     


**Step 5:** Termination indicator (dots 1-2-4-5-6) 

Space, is parallel to, space (dots 1-2-4-6, dots 1-2-3) 

**Step 1:** Multipurpose indicator (dot 5)    ∴

**Step 2:** Expression being modified (EF) 

**Step 3:** Directly-over indicator (dots 1-2-6) 

**Step 4:** Two-way horizontal arrow (dots 1-2-4-6, dots 2-4-6, dots 2-5, dots 2-5, dots 1-3-5)    

**Step 5:** Termination indicator (dots 1-2-4-5-6) 

2. Ray BA is perpendicular to ray BC.

- The letters in the rays are capitalized.
- The Nemeth symbol for "is perpendicular to" is (dots 1-2-4-6) followed by (dots 1-2-3-4).    ⠄⠈

$$\overrightarrow{BA} \perp \overrightarrow{BC}$$

The figure consists of 10 small diagrams arranged in a single row, each showing a grid of dots with some dots filled in black. The diagrams illustrate the growth of a pattern over time. The first diagram shows a small cluster of 5 black dots. The second diagram shows the cluster growing to 8 dots. The third diagram shows further growth to 12 dots. The fourth diagram shows the pattern becoming more complex with 18 dots. The fifth diagram shows the pattern growing to 25 dots. The sixth diagram shows the pattern growing to 32 dots. The seventh diagram shows the pattern growing to 40 dots. The eighth diagram shows the pattern growing to 48 dots. The ninth diagram shows the pattern growing to 56 dots. The tenth diagram shows the pattern growing to 64 dots.

The following steps outline how to write Example 2. Note that the Five-Step Rule is repeated for each modified expression.

**Step 1:** Multipurpose indicator (dot 5) ∴

**Step 2:** Expression being modified (BA) 

**Step 3:** Directly-over indicator (dots 1-2-6) ∴

**Step 4:** Contracted right-pointing arrow (dots 1-2-4-6, dots 1-3-5)  $\rightarrow$

**Step 5:** Termination indicator (dots 1-2-4-5-6) 

Space<sub>1</sub> is perpendicular to, space<sub>2</sub> (dots 1-2-4-6, dots 1-2-3-4) 

**Step 1:** Multipurpose indicator (dot 5) ∴


**Step 2:** Expression being modified (BC) 

**Step 3:** Directly-over indicator (dots 1-2-6) ∴

**Step 4:** Contracted right-pointing arrow (dots 1-2-4-6, dots 1-3-5) 

**Step 5:** Termination indicator (dots 1-2-4-5-6) ☼☼

3. Segment JK is congruent to segment LM.

- The letters in the segments are capitalized.
- The Nemeth symbol for "is congruent to" is (dot 4, dots 1-5-6, dots 4-6, dots 1-3). 

$$\overline{JK} \cong \overline{LM}$$

The figure consists of 10 sub-diagrams arranged in a single row, each showing a 5x5 grid of dots. Black dots represent the presence of a variable at a specific time and location. The sequence shows a pattern that starts as a small cluster of dots on the left and grows and moves towards the right over time.

The following steps outline how to write Example 3. Note that the Five-Step Rule is repeated for each modified expression.

**Step 1:** Multipurpose indicator (dot 5)    ⋮

**Step 2:** Expression being modified (JK) 

**Step 3:** Directly-over indicator (dots 1-2-6) 

**Step 4:** Horizontal bar (dots 1-5-6)    ∴

**Step 5:** Termination indicator (dots 1-2-4-5-6) 

Space, is congruent to, space (dot 4, dots 1-5-6, dots 4-6, dots 1-3)

**Step 1:** Multipurpose indicator (dot 5) ∴

**Step 2:** Expression being modified (LM)  

**Step 3:** Directly-over indicator (dots 1-2-6) 

**Step 4:** Horizontal bar (dots 1-5-6) ∴

**Step 5:** Termination indicator (dots 1-2-4-5-6) 

## Activity Time

Write the geometry statements from Examples 1 to 3:

1. Line AB is parallel to line EF.
2. Ray BA is perpendicular to ray BC.
3. Segment JK is congruent to segment LM.