

Five-Step Rule and Exceptions Lesson 3

Multi-Digit Repeating Decimal Number

Important Note

For all braille examples, emboss the “L3-Five-Step-Problems-Only.brf” file as a supplement to this lesson.

Background

As you learned in “Lesson 2 Single-Digit Repeating Decimal,” the Five-Step Rule must not be used when writing modified expressions consisting of a single digit or letter. For these expressions, there is a contracted form that makes them easier and quicker to read.

When a horizontal bar is used over a **single** digit or letter, write the horizontal bar symbol (dots 1-5-6) immediately after the digit or letter.



Basic Rules

Sometimes a symbol is placed either directly over or under an expression in print. For example, a horizontal bar is often placed over **multiple** digits in a repeating decimal, such as point zero three with the 03 repeating.

$$\overline{.03}$$

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.

Examples

1. zero point two five seven with the 257 repeating

- There is a horizontal bar over the 257, so this would be considered a modified expression.
- Note that when reading these expressions in braille, the multipurpose indicator (dot 5) is often misread as a "1".

$$0.\overline{257}$$

The figure shows a sequence of 10 diagrams, each representing a state of a pattern on a 3x10 grid. The pattern consists of black dots. The sequence shows the pattern growing from a small cluster on the left towards the right, with some internal rearrangements. The diagrams are labeled 1 through 10.

The following steps outline how to write Example 1. Note that the Five-Step Rule begins in step d, right before the repeating digits, which is the expression being modified.

- a. Numeric indicator (dots 3-4-5-6) ⋮
- b. Zero (dots 3-5-6) ⋮
- c. Decimal point (dots 4-6) ⋮

The following steps outline how to write Problem 1. Note that the Five-Step Rule begins in step j.

- a. Open Fraction Indicator (dots 1-4-5-6) ⠠
- b. One (dot 2) ⠠
- c. Horizontal Fraction bar (dots 3-4) ⠡
- d. Seven (dots 2-3-5-6) ⠨
- e. Close Fraction Indicator (dots 3-4-5-6) ⠡
- f. Space, equals, space (dots 4-6, dots 1-3) ⠶
- g. Numeric Indicator (dots 3-4-5-6) ⠠
- h. Zero (dots 3-5-6) ⠠
- i. Decimal point (dots 4-6) ⠠
- j. **Step 1:** Multipurpose indicator (dot 5) ⠠
- k. **Step 2:** Digits that will be repeating (142857) ⠠⠠⠠⠠⠠⠠
- l. **Step 3:** Directly-over indicator (dots 1-2-6) ⠠
- m. **Step 4:** Horizontal bar (dots 1-5-6) ⠡
- n. **Step 5:** Termination indicator (dots 1-2-4-5-6) ⠠

Activity Time

Write the expressions from Examples 1 to 3:

1. zero point two five seven with the 257 repeating
2. point zero nine with the 09 repeating
3. One seventh equals zero point one four two eight five seven with the 142857 repeating.