Nemeth Code Symbols Used in the Middle Grades and Strategies for Supporting Math Learning

## Lesson 4: Materials and Strategies for the Middle Grades

Objectives

Participants will be able to:

1. Understand what math concepts can be approached using a braillewriter, braille notetaker, or abacus.

2. Understand how APH products can be used by a student to increase concept development.

3. Recognize the importance of having knowledge about the use of braille notetakers for math class and when students might find it efficient to use them.

The Oh So Important Braillewriter!

- Some math problems don't need to be adapted and can just be done on the braillewriter such as:

  - Factors and the Greatest Common Factor (GCF) – 6th grade skills

  - Multiples and Least Common Multiple (LCM) – 6th grade skill

  - Proportions – 7th grade skill
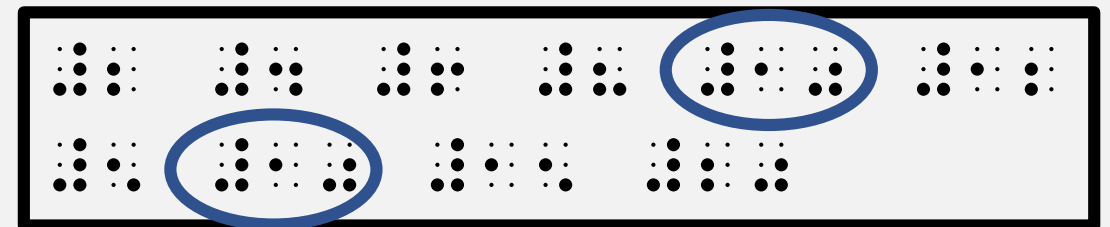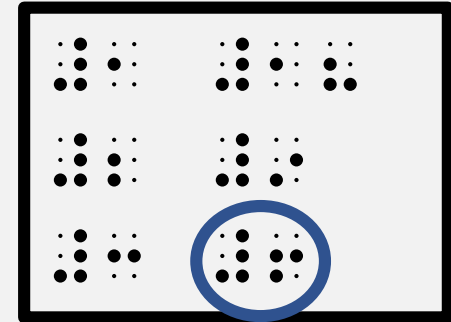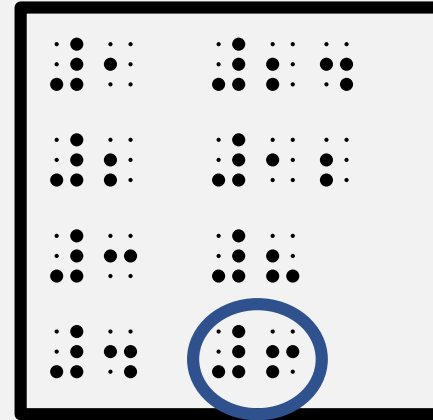
Braillewriter vs. Braille Notetaker

- Some math problems lend themselves to be solved on a braillewriter or braille notetaker while others can be done using either tool.

- Think about whether problems can be done on a single line of braille or if the student needs to refer back to multiple lines such as when:

  - Simplifying expressions

  - Using the distributive property

  - Solving equations

 - Solving problems using the order of operations

Braille Notetaker

- Problems that are very brief and linear can easily be completed on a braille notetaker and emailed to a teacher such as:

  - Ratios

  - Fractions

  - Integers

  - Absolute value

  - Exponents

  - Radicals

Long Division with Multi-Digit Numbers

$$342\,r3$$
$$11\overline{)3765}$$

- 6th grade skill
- The algorithm method
- [Hangman](), Hang 7, or [Big 7]() Method using place value
- On the abacus
  - The dividend goes on the right
  - The divisor, or what you are dividing by, goes on the left
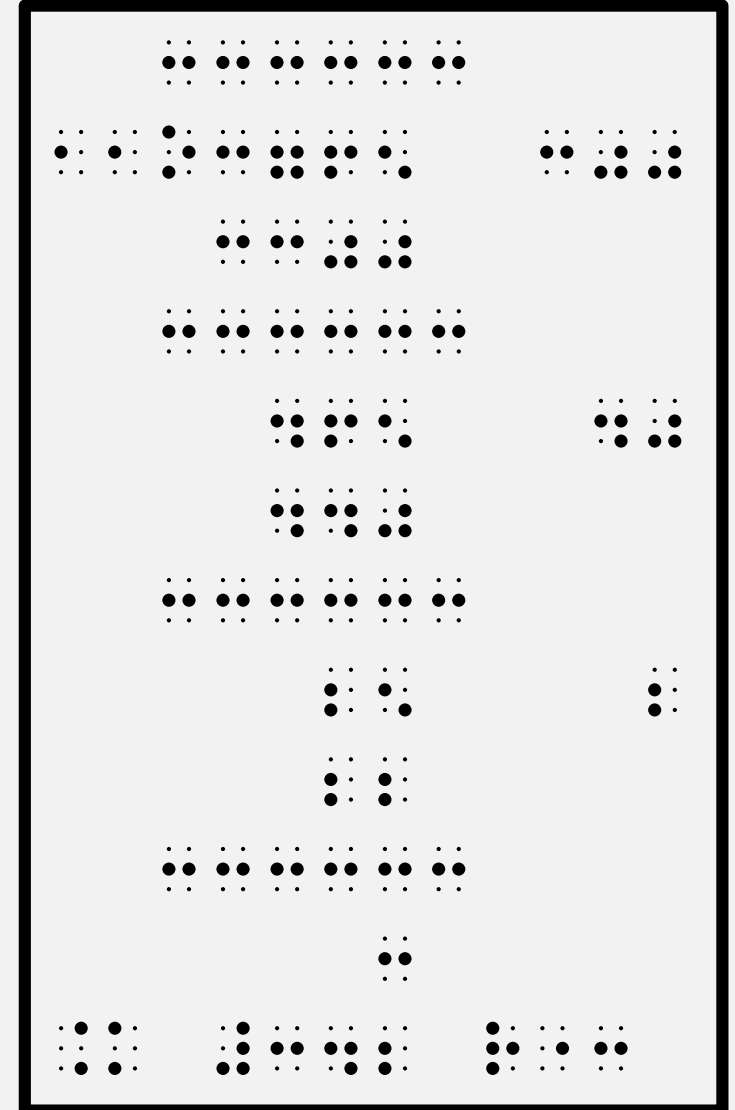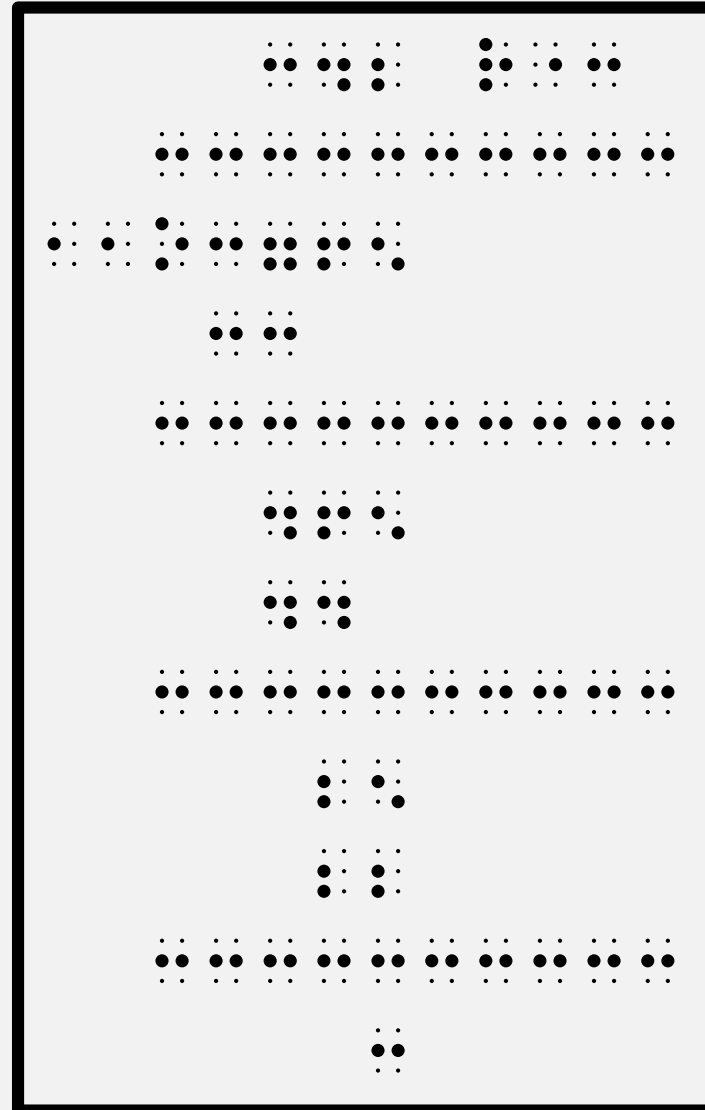
Decimals and Fractions

- A braillewriter or an abacus can be used when working with decimals and fractions.

- On the abacus, any unit marker can be used to represent the decimal place.

- When working with fractions, the student will use the abacus to keep track of numbers while making mental math computations.

Decimal Operations Using the Abacus

- 6th grade skill
- Add and Subtract – Pay attention to place value

$$3.04+12.795-8.6 = 7.235$$

- Multiply – Ignore the decimal and place decimal at the end based on the total number of decimal places in the original

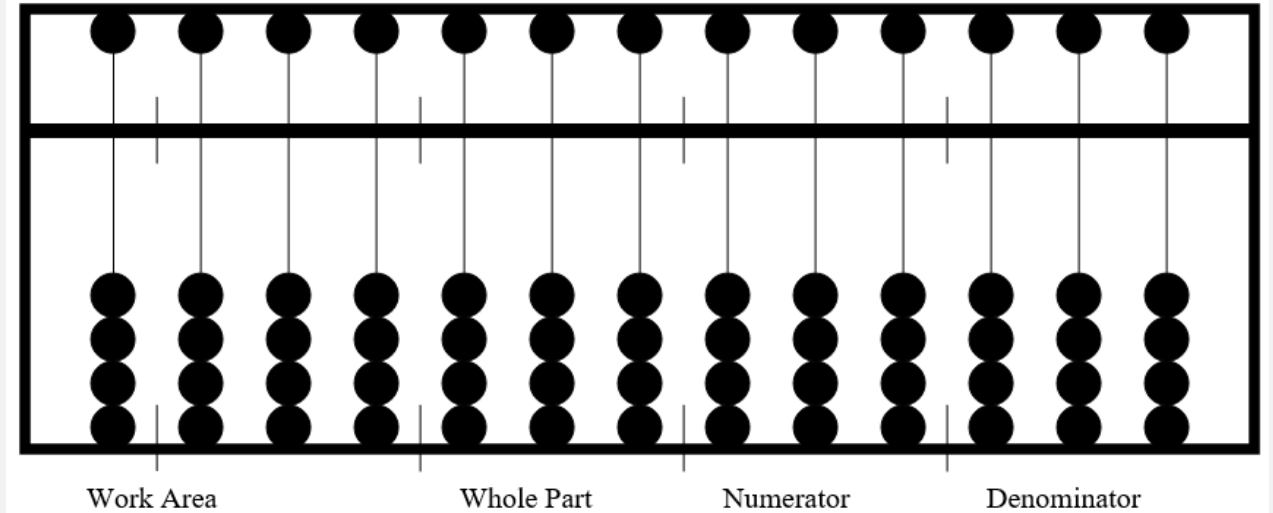$$3.49 \text{ x } 0.5 = 1.745$$

- Divide – Make sure there are no decimal places in the divisor before beginning
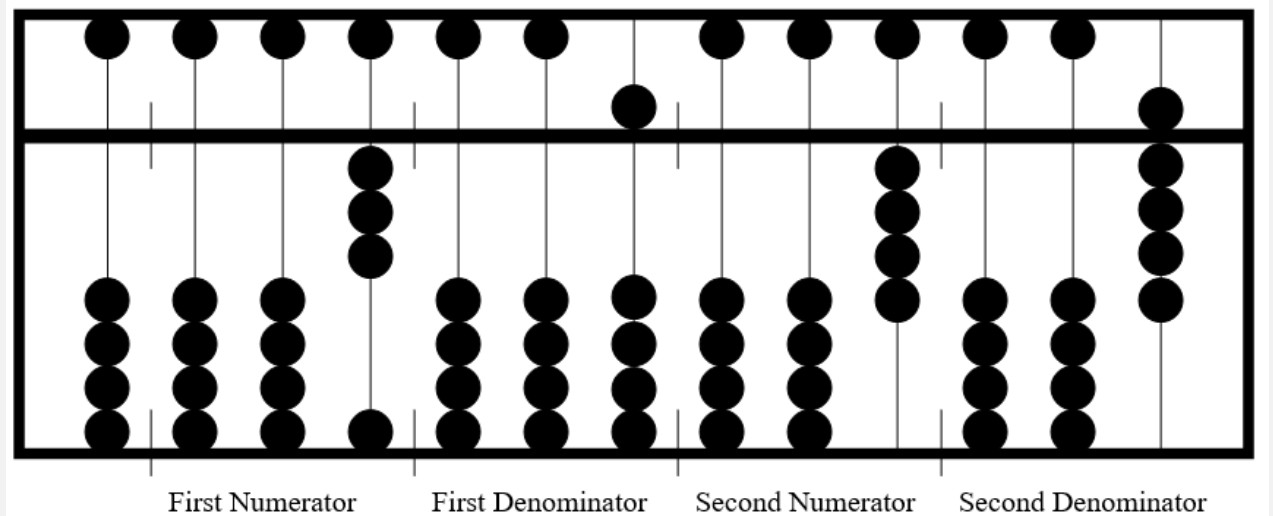
$$41.275 \div 0.25 = 4127.5 \div 25 = 165.1$$

Fractions Using the Abacus

- 6th – 7th grade skill

- Most students prefer to use the braillewriter and mental math.

$3\frac{4}{5} + 2\frac{3}{5}$

- The periods, or areas between the unit markers, become areas to keep track of the numerators and denominators.

$\frac{3}{5} \times \frac{4}{9}$

Work Area — Whole Part — Numerator — Denominator

First Numerator — First Denominator — Second Numerator — Second Denominator

Hands-on Fractions

- Students who need more hands-on concept development can use the MathBuilders, Unit 7: Fractions, Mixed Numbers, and Decimals

- Concepts

  - Equivalent fractions $\dfrac{1}{3} = \dfrac{2}{6}$

  - Adding, subtracting, multiplying, and dividing $\dfrac{1}{2} + \dfrac{1}{6} = \dfrac{4}{6} = \dfrac{2}{3}$

More Equivalent Fractions

$$\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12} = \frac{5}{15}$$

- 6th grade skill
- Use
  - Braillewriter to make tables to represent equivalent ratios
  - Multiplication table – pairs of rows or columns

Hands-on Algebra

- APH Tactile Algebra Tiles are great for concept development related to:
  - Distributive property 3x+6 = 3(x+2) or 3(x+2) = 3x+6
  - Adding and subtracting integers -6+4 = -2
    - Note that a positive and a negative make a "zero pair"
  - Simplifying expressions -2x+8+3x-4
  - Solving equations
    - 1-step   x-4 = 3 or 2x = -6
    - 2-step   3x+1 =7
    - Multi-step   2(x-2) = -8

Three Other Ways to Add Integers

- 7th grade skill
- Using

$$-6 + 4 = -2$$

  - Braillewriter

    ⠿ ⠿ ⠿ ⠿ ⠿

    ⠿ ⠿ ⠿ ⠿
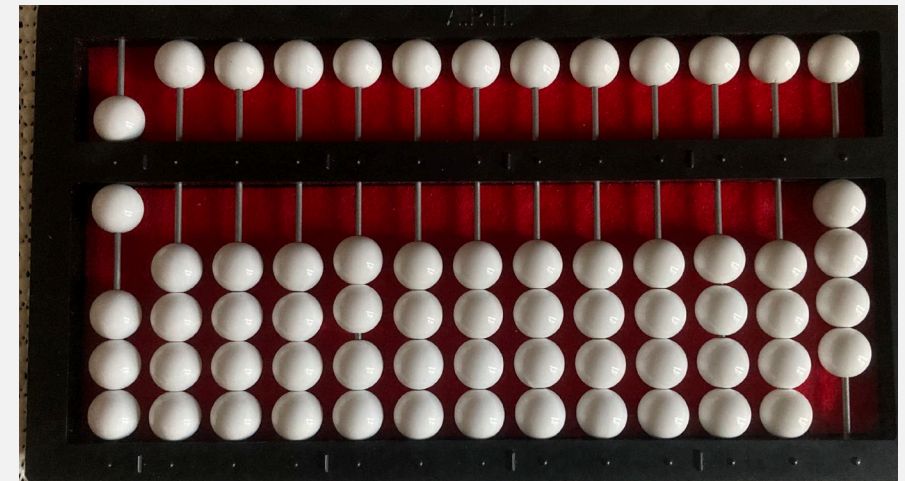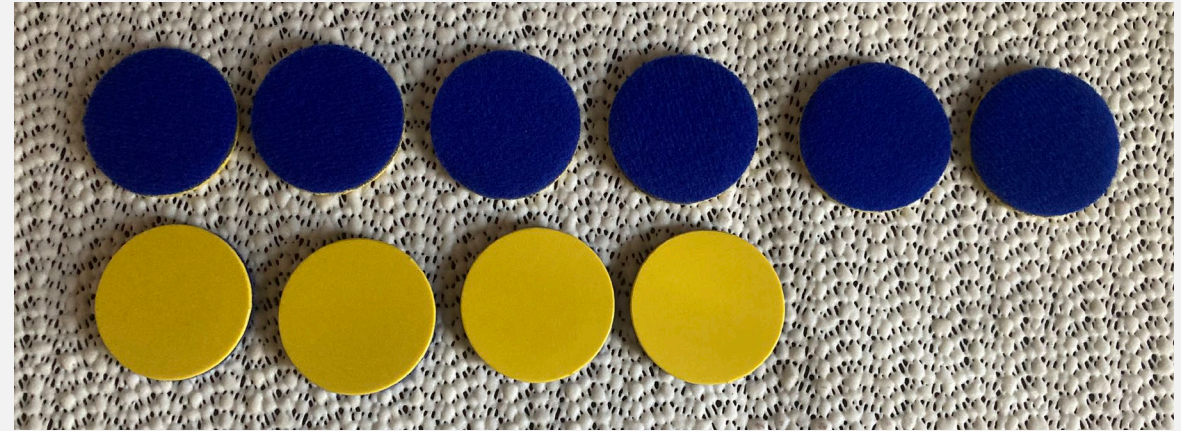
  - Tactile tokens
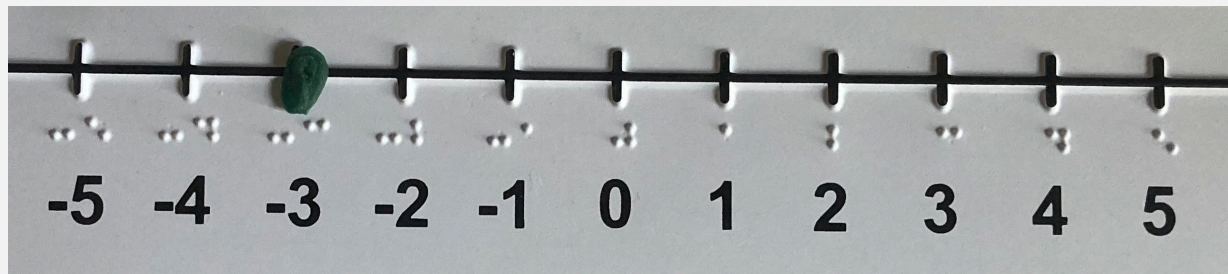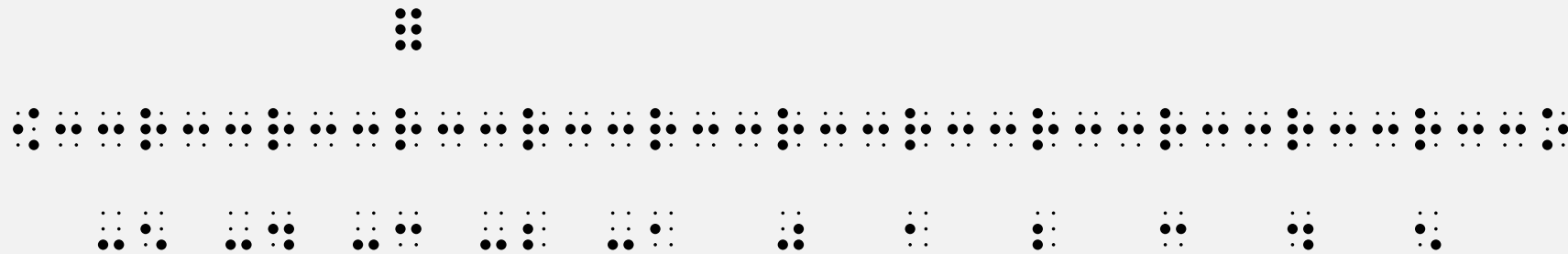   - Blue side is negative, yellow side is positive
  - Abacus
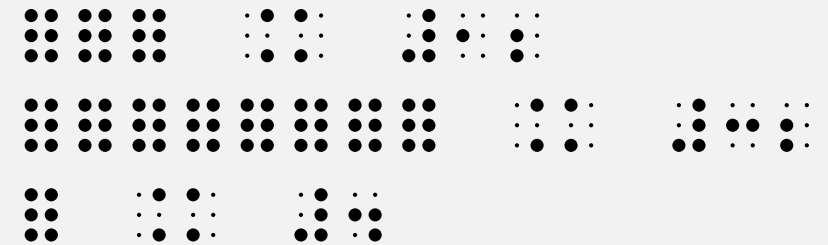   - Left side is negative, right side is positive
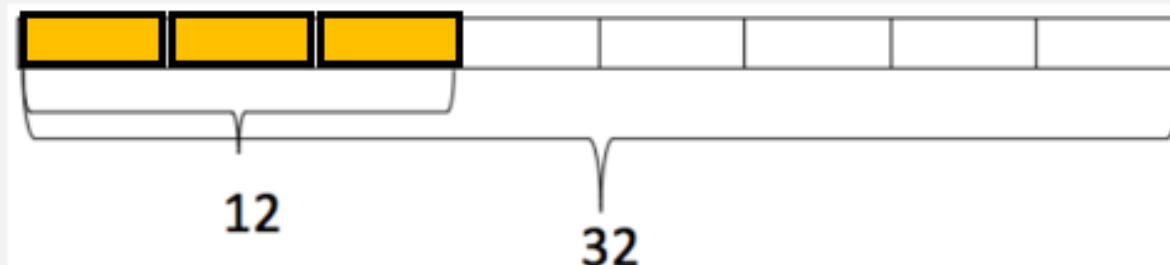

13

Absolute Value

- 6th grade skill
- Meaning of absolute value on a number line is the distance from 0.

$$\left|-3\right| = 3$$

Ratios

- 6th grade skill
- Use the braillewriter to make symbols that represent tape diagrams.
  - Full cells to represent each equal part

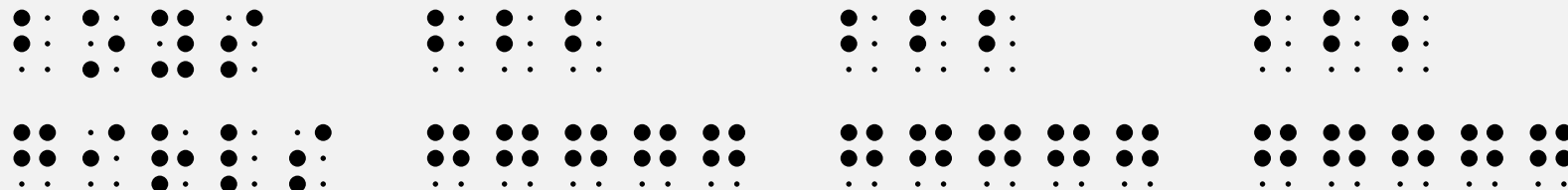 - Full cell for shaded part and x for unshaded part
    3 out of 5 ⠿⠿⠿⠒⠒

Ratios Continued

- You can also use a letter for what the part represents

    Example: The ratio of boys to girls is 3:5. Draw a tape diagram that represents the ratio. Extend the tape diagram to find how many boys if there are 10 girls and how many girls if there are 9 boys.
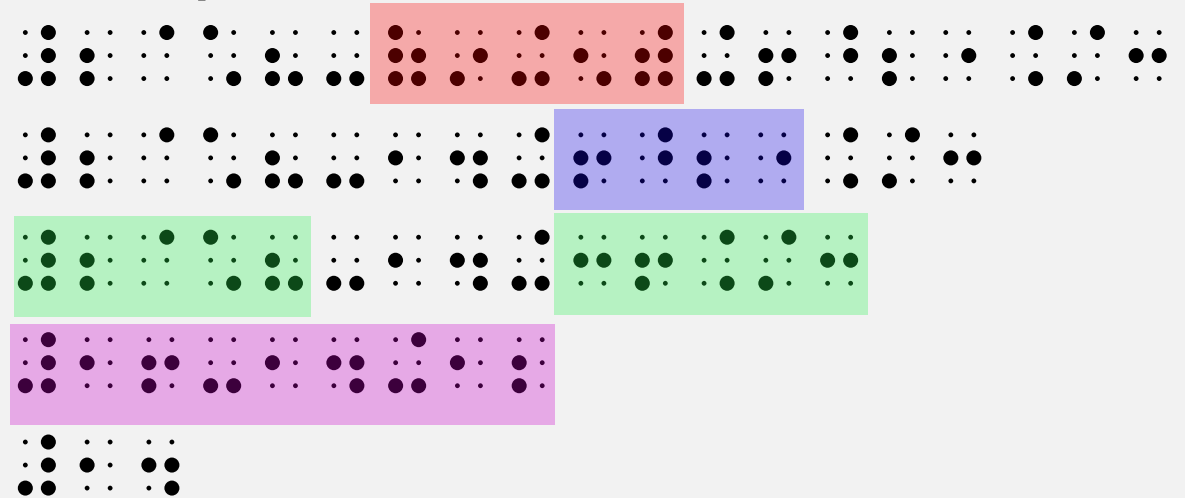
Boys

Girls

Order of Operations

$$2 \times 8 - (9 + 5) + 6^2 \div 3$$
$$2 \times 8 - 14 + 6^2 \div 3$$
$$2 \times 8 - 14 + 36 \div 3$$
$$16 - 14 + 12$$
$$14$$

- $6^{th} - 8^{th}$ grade

- **P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally
  - **P**arentheses
  - **E**xponents
  - **M**ultiplication and **D**ivision
 - **A**ddition and **S**ubtraction

- Use a braillewriter because of the need to look at previous steps.

Scientific Calculator

• As peers begin using a handheld calculator, students who read braille should also move to some type of calculator.

• Examples of accessible calculators

  • [Orion TI-30XS – Multi-View Talking Scientific Calculator](#) (no longer available on federal quota)

  • [Desmos Scientific Calculator](#) (student must have keyboarding skills)

$$5^2 - \sqrt{9}$$
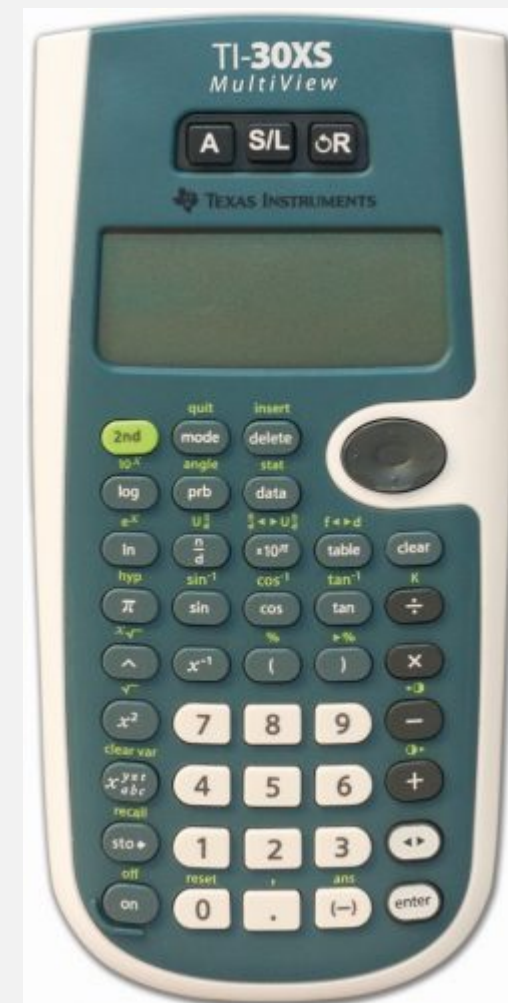
Using Braille Notetakers in Math Class

- Students can:
  - Use the scientific calculator.
  - Write math in Nemeth Code and email it to their teacher.
- It is important for TVIs to stay current on the math capabilities available on notetakers.
- Take advantage of manufacturer's
  - Resources on their websites
  - Sessions at conferences
  - Willingness to come to your school for demos/troubleshooting
  - Video tutorials available on YouTube