Symbols and Notations

➢ **Experiencing Mathematics** (student activity)

In this activity, we explore the meaning of various mathematics symbols. In transitioning from arithmetic to algebra, we need to recognize that the "=" symbol can have two interpretations:

a) The "=" symbol can represent an instruction to "get an answer".

b) The "=" symbol can communicate that each side of the equation represents the same quantity and that both sides are "equivalent."

A mathematical statement which includes the **equal symbol**, **"="**, is called an **equation**. We will call everything to the left of the "=" symbol, the "left-hand side" of the equation, and everything to the right of the "=" symbol, the "right-hand side" of the equation.

1. Perform the indicated operations. The "=" symbol in these problems is an instruction to "get an answer".

   a) $3+4$ = _____

   b) $\frac{11}{5}-\frac{4}{5}$ = _____

   c) 7 ↔3 = _____

   d) 14 ü 2 = _____

2. To explore the concept of equivalency, think about how many ways $1.00 may be obtained with different combinations of coins. List two combinations of pennies, nickels, dimes and quarters that total $1.00 in the table below. Multiply the number of coins by the value of each coin. Add the total value of each type of coin. Write an equation showing the total of $1.00. It is not necessary to use each type of coin in every combination. Each entry in the last column should be equivalent to $1.00.

	Number of coins multiplied by the value of each coin:				
	Pennies	Nickels	Dimes	Quarters	Write an equation representing the TOTAL of $1.00:
Example	5 ↔$0.01	3 ↔$0.05	3 ↔$0.10	2 ↔$0.25	5 ↔$0.01 + 3 ↔$0.05 + 3 ↔$0.10 + 2 ↔$0.25 = $1.00
a)					
b)					

3. The **"=" symbol** is used to indicate that two quantities that are "equivalent". The **"?" symbol** is used between two expressions that are "not equivalent". Complete the statements by writing the appropriate symbol, either "=" or "?", on the line between the two quantities.

a) 15 + 15 + 4 _____ 9 ↔4

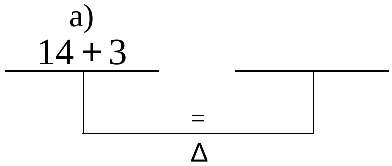
b) $3\frac{1}{2}$ _____ 3.5

c) 50 ü 5 _____ 7 + 5

d) $\frac{1}{2}$ _____ $\frac{4}{8}$

e) 6 ↔7 _____ 8 ↔7

4. Equivalency can be visualized with a balanced scale. When the quantity on the left side is equivalent to the quantity on the right side, the scale will be <u>balanced</u>. Fill in the box in each problem with the number that keeps the scale balanced.

a)


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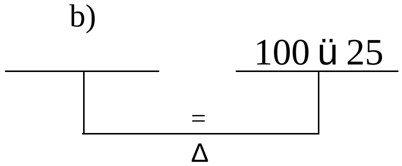

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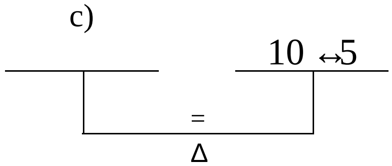

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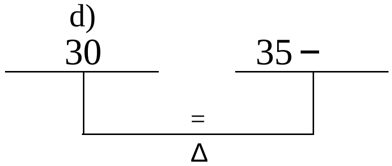
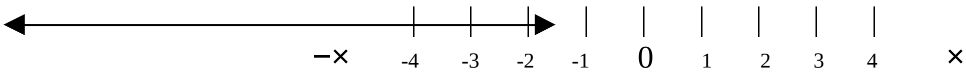


The set of real numbers comprises the **real number line** shown below:



Positive numbers are written to the right of zero and negative numbers to the left of zero. When a number is <u>negative</u>, the " − " symbol is always written. When a number is <u>positive</u>, the "+" symbol may or may not be written. The farther a number is to the right on the number line, the larger the number. The farther a number is to the left on the number line, the smaller the number. The arrows on each end of the real number line indicate that the line continues forever. Infinity symbols can be written at the end of the line, × on the right and −× on the left, and do not represent particular points or numbers on the line, but communicate that the line continues forever.

5. The ">" and "<" symbols are used to express relationships between quantities. The **">" symbol** means "greater than" and the **"<" symbol** means "less than". Complete the statements by writing the appropriate symbol, either "<" or ">", on the line between the two quantities.

   Example: 20 __>__ $1+6$

   a) 10 _____ $5+3$

   b) $\frac{1}{2}$ _____ 8

   c) $5+7$ _____ $6\frac{3}{4}$

   d) -10 _____ -5.3256

   e) 3 _____ -6

   f) 0 _____ -1

6. Some mathematics symbols have multiple meanings. The **"+" symbol** can be an instruction to <u>add</u> or it may denote that a number is <u>greater than zero</u> (a positive number). Write whether the "+" symbol is an instruction to add (A) or whether it denotes that the number is a positive number (P) in these expressions:

   a) $2+4$ ____________ b) $10-(+3)$ ____________

   c) $+12-4$ ____________ d) $1+3$ ____________

7. The **“ − ” symbol** can be an instruction to <u>subtract</u> or it may denote that a number is <u>less than zero</u> (a negative number). Write whether the “ − ” symbol is an instruction to subtract (S) or whether it denotes that the number is a negative number (N) in these expressions:

a) $200 + (-6)$ ____________ b) $7 - 3$ ______________

c) $(-2) + 6$ ____________ d) $15 - 8$ ______________

8. Let's explore the multiple symbols used to denote multiplication and division. Circle the indicated operation in each problem:

a) 10 ↔5 Multiplication or Division?

b) 10 ü 5 Multiplication or Division?

c) 10 ?5 Multiplication or Division?

d) (10)(5) Multiplication or Division?

e) 10 / 5 Multiplication or Division?

f) $\frac{10}{5}$ Multiplication or Division?

g) $5\overline{)10}$ Multiplication or Division?

9. Mathematicians have invented other notations that have specific meanings and are a kind of shorthand notation. Numbers or operations are understood, but not always written explicitly.

a) The operation in a mixed number is not written explicitly.
Does the number $5\frac{3}{4}$ mean $5+\frac{3}{4}$ or $5 \leftrightarrow \frac{3}{4}$? ______________

b) An **exponent** is a symbol that denotes repeated multiplication. The expression 3^4 is read 3 to the fourth power. The exponent, 4, is an instruction to multiply the **base**, 3, four times:

$$3^4 = \underbrace{3\,?3\,?3\,?3}_{\text{4 times}} = 81.$$

Rewrite the expression 5^3 without an exponent: ___________________