

1.2 Fundamental Operations of Algebra

Commutative law - the sum (product) of two numbers is the same, regardless of the order in which they are added.

ex:

$$3 + 5 = 5 + 3$$

literal numbers:

$$a + b = b + a$$

Associative law - the sum (product) of three or more numbers is the same, regardless of the way in which they are grouped for addition

ex:

$$(5 + 4) + 2 = 5 + (4 + 2)$$

literal numbers:

$$(a + b) + c = a + (b + c)$$

Distributive law - the product of one number and the sum of two or more other numbers is equal to the sum of the products of the first number and each of the other numbers of the sum.

ex:

$$3(2 + 6) = 3(2) + 3(6)$$

$$a(b + c) = ab + ac$$

literal numbers:

chapter 1 section 2

Operations on Positive and Negative Numbers

addition of two numbers of the same sign \bigcirc
 ex: $5+6=11$ \bigcirc Keep the Sign and add the numbers
 $-4+-7=-11$

$|x|$ Keep the sign of the number with the greater (abs) and then subtract.
 addition of two numbers of different signs \bigcirc

ex: $-4+6=2$
 $-3+2=-1$
 $-7+17=+10$

subtraction of one number from another

ex: $5-3=2$ $a-(-b)=a+b$
 $-7-3=-10$ $a-b=a+(-b)$

\rightarrow \bigcirc when signs are same
 multiplication and division of two numbers
 $+ * + = +$ } Ans is pos
 $- * - = +$ }
 ex: $- * + = -$ } diff. signs Ans is (-)
 $+ * - = -$ }

$-5 * -6 = 30$
 $-4 * +3 = -12$

$-4 + +3 = -1$

Order of Operations

1. Operations within groupings are done first $()$, $\{ \}$, $[]$ _
2. Perform multiplications and divisions (from left to right)
3. Then perform additions and subtractions (from left to right)

div bar
O

ex:

$$\frac{(2(6) - 10)}{2} = \frac{12 - 10}{2}$$
$$\frac{2}{2} = 1$$

Operations with zero

zero in the denominator

$$\frac{5+6(2)}{8-(6+2)}$$

undefined

ex:

$$\frac{7}{0}$$

$x=y$

$x=3$

$$\frac{x-y}{x-y} = \frac{3-3}{3-3} = \frac{0}{0}$$

indeterminate

ex:

$$b = \frac{0}{0} \quad 0 \cdot b = 0$$

$$23 \quad \frac{17-7}{7-7} = \frac{10}{0} \quad \text{undefined}$$

27)

$$3 - 2(6) + \left| \frac{8}{2} \right|$$

Left to right
→

$$3 - 12 + 4$$

$$\begin{array}{r} -9 + 4 \\ \hline -5 \end{array}$$

$$33) \rightarrow -7 - \frac{|-14|}{2(2-3)} - 3(2-6) +^{-}14$$

$$-7 + \frac{-14}{-2} - 3(2)$$

$$-7 + 7 - 6$$
$$0 - 6 = \boxed{-6}$$

$$\begin{aligned} & -a + (-b) \\ & -a - b \end{aligned}$$

$$\begin{aligned} & -b + (+a) \\ & a - b \end{aligned}$$

$$-a + b$$

$$-5 + 6 = 1$$

$$6 + -5 = 1$$

$$\begin{aligned} x &= 5 \\ y &= \frac{1}{5} \\ \frac{1}{\left(\frac{5}{1}\right)} &= \frac{1}{5} \\ \frac{1}{5/1} &= \frac{1}{5} \\ &= \frac{1}{5} \end{aligned}$$

$\alpha^{-1} = \frac{1}{\alpha}$

$$\begin{aligned} \frac{1}{5} \times \frac{1}{5} &= 1 \\ - (5) \left(\frac{1}{5}\right) &= \\ \frac{+5}{5} &= 1 \end{aligned}$$

$x \neq y$ $\frac{x - y}{x - y} = 1$ $x=2$
 $y=10$

$x=7$
 $y=7$ $\frac{7-7}{7-7}$ $\frac{0}{0}$