

Properties of Real Nbrs.

①

1. Closure property of \mathbb{R} with respect to $+$ & \times .

(i) For \oplus : $a, b \in \mathbb{R} \Rightarrow a + b \in \mathbb{R}$

(ii) For \otimes : $a, b \in \mathbb{R} \Rightarrow a \cdot b \in \mathbb{R}$

2. Commutative Property of $+$ & \times .

i) For \oplus : $a + b = b + a$

ii) For \otimes : $ab = ba$

3. Associative Property of $+$, \times .

i) For \oplus : $(a + b) + c = a + (b + c)$

ii) For \otimes : $(a \cdot b) \cdot c = a \cdot (b \cdot c)$

4. Distributive Property of \times with respect to $+$.

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

$$a \cdot (b - c) = ab - ac$$

5) Identity Property

i) For \oplus , 0 is the unique nbr such that

$$a + 0 = 0 + a = a$$

ii) For \otimes , 1 is the unique nbr such that

$$a \cdot 1 = 1 \cdot a = a$$

6. Inverse Properties

i) $a \in \mathbb{R}$, $(-a)$ is the only nbr

$$a + (-a) = (-a) + a = 0$$

ii) $a \neq 0$, $\frac{1}{a}$ is the only nbr

$$a \cdot \frac{1}{a} = \frac{1}{a} \cdot a = 1$$

Exp. Simplify using the properties.

a) $\frac{10}{11} (22z) = \left(\frac{10}{11} \cdot 22\right) z$ assoc
 $= 20z$

b) $\left(\frac{5}{8} p\right) 4 = 4 \cdot \left(\frac{5}{8} p\right)$ comm
 $= \left(4 \cdot \frac{5}{8}\right) p =$ Assoc
 $= \frac{5}{2} p.$

Exp Rewrite using distributive prop.

a) $-(2x - 3y)$
 $= (-1)(2x - 3y) = (-1)2x - (-1)(3y)$
 $= -2x + 3y$

b) $\frac{1}{2} \left(\frac{3}{2} m + \frac{2}{3} n - 14\right)$

c) $4x - 2[7 - 5(2x - 3)]$

Exp. Determine the property of real nbers illustrated in each statement.

a) $(2a)b = 2(ab)$ b) $(\frac{1}{5})11 \in \mathbb{R}$

c) $(a+5b)+7c = (5b+a)+7c$

d) $(\frac{1}{2}, 2)a = 1.a$

Absolute Value

$x \in \mathbb{R}, \quad |x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$

$|-2| = 2, \quad |2| = 2$

Properties of Absolute Value.

1) $|a| \geq 0$ 2) $|-a| = |a|$

3) $|ab| = |a| \cdot |b|$ 4) $|\frac{a}{b}| = \frac{|a|}{|b|}$

5) $|a+b| \leq |a| + |b|$

6) $|x-a| = \begin{cases} x-a & \text{if } x \geq a \\ a-x & \text{if } x < a \end{cases}$

(4)

Exp $x = -4$, $y = 3$, evaluate

a) $|3x - y|$

b) $\frac{2|x| + 4|y|}{|xy|}$, c) $|x^2 - 10|$

Exp. Write without Absolute Values.

$|x+6| + |x-2|$ if $2 < x < 3$.

Distance between 2 points on the real line.

$$d(a, b) = |b - a| = |a - b|$$

Exp. Find the distance between -5 & 8 ,