

CHAPTER 0

REVIEW OF ALGEBRA

02. Properties of Real Numbers

Exercised by: Rizal Bimanto

A list of properties of the real numbers.

1. The Transitive Property of Equality

If $a = b$ and $b = c$, then $a = c$

2. The Closures Properties of Addition and Multiplication

For all real numbers a and b , there are unique real numbers $a + b$ and ab

3. The Commutative Properties of Addition and Multiplication

$$a + b = b + a \text{ and } ab = ba$$

4. The Associative Properties of Addition and Multiplication

$$a + (b + c) = (a + b) + c \text{ and } a(bc) = (ab)c$$

5. The Identity Properties

There are unique real numbers denoted 0 and 1 such that, for each real number a ,

$$0 + a = a \text{ and } 1a = a$$

6. The Inverse Properties

For each real number a , there is unique real number denoted $-a$ such that

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

The number $-a$ is called the **negative** of a .

For each real number a , *except* 0, there is a unique real number denoted a^{-1} such that

$$a \times a^{-1} = 1$$

The number a^{-1} is called the **reciprocal** of a

7. The Distributive Properties

$$a(b + c) = ab + ac \text{ and } (b + c)a = ba + ca$$

$$0 \times a = 0 = a \times 0$$

1 Problems 0.2

In Problems 1 - 10, determine the truth of each statement

1. Every real number has a reciprocal.

False. Except 0

2. The reciprocal of 6.6 is $0.1515\dots$

$\frac{1}{6.6} = 0.1515\dots$ True

3. The negative of 7 is $\frac{-1}{7}$

$-(7) = -7$. *False. It should be -7*

4. $1(x \times y) = (1 \times x)(1 \times y)$

True. It can be simplified as xy

5. $-x + y = -y + x$

False. $-x + y = y - x$

6. $(x + 2)(4) = 4x + 8$

True.

7. $\frac{x+3}{5} = \frac{x}{5} + 3$

False. $\frac{x+3}{5} = \frac{x}{5} + \frac{3}{5}$

8. $3\left(\frac{x}{4}\right) = \frac{3x}{4}$

True.

9. $2(x \times y) = (2x) \times (2y)$

False. $2(x \times y) = (2x) \times (2y) = 2xy$

10. $x(4y) = 4xy$

True.

In Problems 11-20, state which properties of the real numbers are being used.

11. $2(x + y) = 2x + 2y$

The Distributive Properties

12. $(x + 5.2) + 0.7y = x + (5.2 + 0.7y)$

The Associative Property of Addition

13. $2(3y) = (2 \cdot 3)y$

The Associative Property of Multiplication

14. $\frac{a}{b} = \frac{1}{b} \cdot a$

The Inverse Property

15. $5(b - a) = (a - b)(-5)$

The Commutative Property of Multiplication and Distributive

16. $y + (x + y) = (y + x) + y$

The Commutative Property of Addition

17. $\frac{5x-y}{7} = 1/7(5x - y)$

The Distributive Property

18. $5(4 + 7) = 5(7 + 4)$

The Associative Property of Addition

19. $(2 + a)b = 2b + ba$

The Distributive Property

20. $(-1)(-3 + 4) = (-1)(-3) + (-1)(4)$

The Distributive Property