

## Lesson 2-5: Properties of Numbers

### Part 1: Identifying and Using Properties

1. 010107a, P.I. A.N.1  
If  $a$  and  $b$  are integers, which equation is always true?  
[A]  $a - b = b - a$  [B]  $a + b = b + a$   
[C]  $\frac{a}{b} = \frac{b}{a}$  [D]  $a + 2b = b + 2a$
2. 010720a, P.I. A.N.1  
If  $M$  and  $A$  represent integers,  
 $M + A = A + M$  is an example of which property?  
[A] closure [B] commutative  
[C] associative [D] distributive
3. 060424a, P.I. A.N.1  
Which expression is an example of the associative property?  
[A]  $(x + y) + z = x + (y + z)$   
[B]  $x \cdot 1 = x$  [C]  $x + y + z = z + y + x$   
[D]  $x(y + z) = xy + xz$
4. 010428a, P.I. A.N.1  
Which equation illustrates the associative property of addition?  
[A]  $3(x + 2) = 3x + 6$   
[B]  $(3 + x) + y = 3 + (x + y)$   
[C]  $3 + x = 0$  [D]  $x + y = y + x$
5. 080725a, P.I. A.N.1  
Which equation illustrates the associative property?  
[A]  $a(b + c) = (ab) + (ac)$  [B]  $a(1) = a$   
[C]  $(a + b) + c = a + (b + c)$   
[D]  $a + b = b + a$
6. fall0705ia, P.I. A.N.1  
Which property is illustrated by the equation  $ax + ay = a(x + y)$ ?  
[A] distributive [B] commutative  
[C] identity [D] associative
7. 080504a, P.I. A.N.1  
The equation  $*(\Delta + \Diamond) = * \Delta + * \Diamond$  is an example of the  
[A] distributive law [B] associative law  
[C] transitive law [D] commutative law
8. 080413a, P.I. A.N.1  
Which equation illustrates the distributive property of multiplication over addition?  
[A]  $6(3a + 4b) = 18a + 24b$   
[B]  $6(3a + 4b) = (3a + 4b)6$   
[C]  $6(3a + 4b) = 6(4b + 3a)$   
[D]  $6(3a + 4b) = 18a + 4b$
9. 010812a, P.I. A.N.1  
Which property is represented by the statement  $\frac{1}{2}(6a + 4b) = 3a + 2b$ ?  
[A] distributive [B] commutative  
[C] identity [D] associative
10. 060503a, P.I. A.N.1  
Which equation illustrates the distributive property?  
[A]  $a + (b + c) = (a + b) + c$   
[B]  $a + b = b + a$  [C]  $5(a + b) = 5a + 5b$   
[D]  $a + 0 = a$

11. 060108a, P.I. A.N.1  
Which equation illustrates the distributive property for real numbers?  
[A]  $-3(5 + 7) = (-3)(5) + (-3)(7)$   
[B]  $(1.3 \times 0.07) \times 0.63 = 1.3 \times (0.07 \times 0.63)$   
[C]  $\sqrt{3} + 0 = \sqrt{3}$  [D]  $\frac{1}{3} + \frac{1}{2} = \frac{1}{2} + \frac{1}{3}$
12. 060306a, P.I. A.N.1  
Tori computes the value of  $8 \times 95$  in her head by thinking  $8(100 - 5) = 8 \times 100 - 8 \times 5$ .  
Which number property is she using?  
[A] associative [B] commutative  
[C] closure [D] distributive
13. 080601a, P.I. A.N.1  
While solving the equation  $4(x + 2) = 28$ , Becca wrote  $4x + 8 = 28$ . Which property did she use?  
[A] distributive [B] commutative  
[C] identity [D] associative
14. 060714a, P.I. A.N.1  
Which property is illustrated by the equation  $\frac{3}{2}x + 0 = \frac{3}{2}x$ ?  
[A] additive identity property  
[B] commutative property of addition  
[C] additive inverse property  
[D] distributive property
15. 089907a, P.I. A.N.1  
Which equation is an illustration of the additive identity property?  
[A]  $x \cdot \frac{1}{x} = 1$  [B]  $x + 0 = x$   
[C]  $x - x = 0$  [D]  $x \cdot 1 = x$
16. 060624a, P.I. A.N.1  
Which statement best illustrates the additive identity property?  
[A]  $6 + (-6) = 0$  [B]  $6 + 0 = 6$   
[C]  $6(2) = 2(6)$  [D]  $6 + 2 = 2 + 6$
17. 010314a, P.I. A.N.1  
Which equation illustrates the multiplicative identity element?  
[A]  $x \cdot \frac{1}{x} = 1$  [B]  $x + 0 = x$   
[C]  $x \cdot 1 = x$  [D]  $x - x = 0$
18. 010207a, P.I. A.N.1  
Which expression must be added to  $3x - 7$  to equal 0?  
[A] 0 [B]  $3x + 7$   
[C]  $-3x + 7$  [D]  $-3x - 7$
19. 060315a, P.I. A.N.1  
What is the additive inverse of  $\frac{2}{3}$ ?  
[A]  $-\frac{3}{2}$  [B]  $\frac{3}{2}$  [C]  $\frac{1}{3}$  [D]  $-\frac{2}{3}$
20. 010821a, P.I. A.N.1  
The additive inverse of  $\frac{1}{a}$  is  
[A]  $a$  [B]  $-a$  [C]  $-\frac{1}{a}$  [D] 0
21. 060413a, P.I. A.N.1  
Which property of real numbers is illustrated by the equation  $-\sqrt{3} + \sqrt{3} = 0$ ?  
[A] additive identity  
[B] commutative property of addition  
[C] associative property of addition  
[D] additive inverse

22. 060011a, P.I. A.N.1

If  $a \neq 0$  and the sum of  $x$  and  $\frac{1}{a}$  is 0, then

[A]  $x = -\frac{1}{a}$  [B]  $x = -a$

[C]  $x = 1 - a$  [D]  $x = a$

23. 010516a, P.I. A.N.1

What is the multiplicative inverse of  $\frac{3}{4}$ ?

[A]  $\frac{4}{3}$  [B] -1 [C]  $-\frac{3}{4}$  [D]  $-\frac{4}{3}$

24. 010730a, P.I. A.N.1

The multiplicative inverse of  $-\frac{1}{3}$  is

[A] -3 [B]  $\frac{1}{3}$  [C] 3 [D]  $-\frac{1}{3}$

25. 010630a, P.I. A.N.1

Which equation illustrates the multiplicative inverse property?

[A]  $-1 \cdot x = -x$  [B]  $1 \cdot 0 = 0$

[C]  $1 \cdot x = x$  [D]  $x \cdot \frac{1}{x} = 1$

26. 080129a, P.I. A.N.1

Ramón said that the set of integers is *not* closed for one of the basic operations (addition, subtraction, multiplication, or division). You want to show Ramón that his statement is correct. For the operation for which the set of integers is *not* closed, write an example using:

- o a positive even integer and a zero
- o a positive and a negative even integer
- o two negative even integers

Be sure to explain why *each* of your examples illustrates that the set of integers is *not* closed for that operation.

27. 010217a, P.I. A.N.1

Which set is closed under division?

[A] whole numbers [B] integers

[C] {1} [D] counting numbers

28. 060224a, P.I. A.N.1

An addition table for a subset of real numbers is shown below. Which number is the identity element? Explain your answer.

+	0	1	2	3
0	0	1	2	3
1	1	2	3	4
2	2	3	4	0
3	3	4	0	1

29. 080112a, P.I. A.N.1

The operation element @ is determined by the following table:

@	a	b	c
a	a	b	c
b	b	c	a
c	c	a	b

What is the identity element of this operation?

[A] a and b

[B] c

[C] b, only

[D] a, only

30. 080514a, P.I. A.N.1

What is the identity element for  $\clubsuit$  in the accompanying table?

$\clubsuit$	$r$	$s$	$t$	$u$
$r$	$t$	$r$	$u$	$s$
$s$	$r$	$s$	$t$	$u$
$t$	$u$	$t$	$s$	$r$
$u$	$s$	$u$	$r$	$t$

- [A]  $u$       [B]  $r$       [C]  $t$       [D]  $s$

31. 080222a, P.I. A.N.1

In the addition table for a subset of real numbers shown below, which number is the inverse of 3? Explain your answer.

$\oplus$	1	2	3	4
1	2	3	4	1
2	3	4	1	2
3	4	1	2	3
4	1	2	3	4

32. 080010a, P.I. A.N.1

The operation  $*$  for the set  $\{p, r, s, v\}$  is defined in the accompanying table. What is the inverse element of  $r$  under the operation  $*$ ?

$*$	$p$	$r$	$s$	$v$
$p$	$s$	$v$	$p$	$r$
$r$	$v$	$p$	$r$	$s$
$s$	$p$	$r$	$s$	$v$
$v$	$r$	$s$	$v$	$p$

- [A]  $v$       [B]  $r$       [C]  $s$       [D]  $p$

- [1] B
- [2] B
- [3] A
- [4] B
- [5] C
- [6] A
- [7] A
- [8] A
- [9] A
- [10] C
- [11] A
- [12] D
- [13] A
- [14] A
- [15] B
- [16] B
- [17] C
- [18] C
- [19] D
- [20] C
- [21] D
- [22] A
- [23] A
- [24] A
- [25] D

[3] All three examples are illustrated under division correctly, such as  $2 \div 0$ ,  $-2 \div 4$ ,  $-2 \div -4$ , and correct explanations are given.

[2] Only two of the three examples are illustrated and explained correctly.

or [2] All three examples are illustrated correctly, but only one explanation is given or is correct.

or [2] The division examples and explanations are correct, but at most two incorrect examples are also shown, such as examples for addition, subtraction, or multiplication.

[1] The division examples and explanations are correct, but more than two incorrect examples are shown, such as examples for addition, subtraction, or multiplication.

or [1] All three examples are illustrated correctly, but no correct explanation is given.

or [1] Only one correct example with a correct explanation is given.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[26] incorrect procedure.

[27] C

[2] 0, and an appropriate explanation is given, such as 0 is the number that when added to any number results in that number or does not change it, or  $1 + 0 = 1$ ,  $2 + 0 = 2$ , and  $3 + 0 = 3$ .

[1] 0, but no explanation or an incorrect explanation is given.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[28] incorrect procedure.

[29] D

[30] D

[2] 1, and an appropriate explanation is given, such as when 1 is added to 3, the result is the identity element, 4; therefore 1 is the inverse of 3.

[1]  $1 + 3 = 4$ , but the identity element is not identified.

or [1] 4 is identified as the inverse because the identity element and inverse element are confused.

or [1] 1, but no explanation or an incorrect explanation is given.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[31] incorrect procedure.

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[32] A \_\_\_\_\_