

Section 2-2: Properties of Operations

The Property of Closure

1. 010217a, P.I. A.N.1
Which set is closed under division?
[A] integers [B] whole numbers
[C] counting numbers [D] {1}
2. 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.

Commutative Property of Addition

3. 010720a, P.I. A.N.1
If M and A represent integers,
 $M + A = A + M$ is an example of which property?
[A] distributive [B] associative
[C] commutative [D] closure
4. 010107a, P.I. A.N.1
If a and b are integers, which equation is always true?
[A] $a - b = b - a$ [B] $\frac{a}{b} = \frac{b}{a}$
[C] $a + b = b + a$ [D] $a + 2b = b + 2a$

Associative Property of Addition

5. 010428a, P.I. A.N.1
Which equation illustrates the associative property of addition?
[A] $3(x + 2) = 3x + 6$ [B] $3 + x = 0$
[C] $(3 + x) + y = 3 + (x + y)$
[D] $x + y = y + x$
6. 060424a, P.I. A.N.1
Which expression is an example of the associative property?
[A] $x \cdot 1 = x$ [B] $x + y + z = z + y + x$
[C] $x(y + z) = xy + xz$
[D] $(x + y) + z = x + (y + z)$
7. 080725a, P.I. A.N.1
Which equation illustrates the associative property?
[A] $a + b = b + a$
[B] $a(b + c) = (ab) + (ac)$ [C] $a(1) = a$
[D] $(a + b) + c = a + (b + c)$

The Distributive Property

8. 060108a, P.I. A.N.1
Which equation illustrates the distributive property for real numbers?
[A] $\frac{1}{3} + \frac{1}{2} = \frac{1}{2} + \frac{1}{3}$ [B] $\sqrt{3} + 0 = \sqrt{3}$
[C] $(1.3 \times 0.07) \times 0.63 = 1.3 \times (0.07 \times 0.63)$
[D] $-3(5 + 7) = (-3)(5) + (-3)(7)$

9. 060503a, P.I. A.N.1
Which equation illustrates the distributive property?
[A] $a + (b + c) = (a + b) + c$
[B] $a + 0 = a$
[C] $a + b = b + a$ [D] $5(a + b) = 5a + 5b$
10. 080413a, P.I. A.N.1
Which equation illustrates the distributive property of multiplication over addition?
[A] $6(3a + 4b) = 6(4b + 3a)$
[B] $6(3a + 4b) = (3a + 4b)6$
[C] $6(3a + 4b) = 18a + 4b$
[D] $6(3a + 4b) = 18a + 24b$
11. fall0705ia, P.I. A.N.1
Which property is illustrated by the equation $ax + ay = a(x + y)$?
[A] associative [B] identity
[C] distributive [D] commutative
12. 010812a, P.I. A.N.1
Which property is represented by the statement $\frac{1}{2}(6a + 4b) = 3a + 2b$?
[A] commutative [B] distributive
[C] associative [D] identity
13. 080504a, P.I. A.N.1
The equation $*(\Delta + \Diamond) = * \Delta + * \Diamond$ is an example of the
[A] distributive law [B] transitive law
[C] commutative law [D] associative law
14. 060306a, P.I. A.N.1
Tori computes the value of 8×95 in her head by thinking $8(100 - 5) = 8 \times 100 - 8 \times 5$. Which number property is she using?
[A] distributive [B] commutative
[C] associative [D] closure
15. 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] associative
[C] commutative [D] identity
- Addition Property of Zero and the Additive Identity Element
16. 089907a, P.I. A.N.1
Which equation is an illustration of the additive identity property?
[A] $x + 0 = x$ [B] $x \cdot \frac{1}{x} = 1$
[C] $x - x = 0$ [D] $x \cdot 1 = x$
17. 060624a, P.I. A.N.1
Which statement best illustrates the additive identity property?
[A] $6(2) = 2(6)$ [B] $6 + (-6) = 0$
[C] $6 + 0 = 6$ [D] $6 + 2 = 2 + 6$
18. 060714a, P.I. A.N.1
Which property is illustrated by the equation $\frac{3}{2}x + 0 = \frac{3}{2}x$?
[A] distributive property
[B] commutative property of addition
[C] additive identity property
[D] additive inverse property

Additive Inverses (Opposites)

19. 060315a, P.I. A.N.1

What is the additive inverse of $\frac{2}{3}$?

- [A] $-\frac{3}{2}$ [B] $\frac{1}{3}$ [C] $\frac{3}{2}$ [D] $-\frac{2}{3}$

20. 010821a, P.I. A.N.1

The additive inverse of $\frac{1}{a}$ is

- [A] $-\frac{1}{a}$ [B] 0 [C] $-a$ [D] a

21. 010207a, P.I. A.N.1

Which expression must be added to $3x - 7$ to equal 0?

- [A] $3x + 7$ [B] $-3x + 7$
[C] $-3x - 7$ [D] 0

22. 060413a, P.I. A.N.1

Which property of real numbers is illustrated by the equation $-\sqrt{3} + \sqrt{3} = 0$?

- [A] additive inverse [B] additive identity
[C] commutative property of addition
[D] associative property of addition

23. 060011a, P.I. A.N.1

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

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

Multiplication Property of One and the Multiplicative Identity Element

24. 010314a, P.I. A.N.1

Which equation illustrates the multiplicative identity element?

- [A] $x - x = 0$ [B] $x \cdot \frac{1}{x} = 1$
[C] $x \cdot 1 = x$ [D] $x + 0 = x$

25. 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] b , only [B] a , only
[C] c [D] a and b

26. 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

27. 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

31. 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] r [B] v [C] p [D] s

Multiplicative Inverses (Reciprocals)

28. 010516a, P.I. A.N.1

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

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

29. 010730a, P.I. A.N.1

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

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

30. 010630a, P.I. A.N.1

Which equation illustrates the multiplicative inverse property?

[A] $1 \cdot 0 = 0$ [B] $-1 \cdot x = -x$
[C] $x \cdot \frac{1}{x} = 1$ [D] $1 \cdot x = x$

32. 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

[1] 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

[2] incorrect procedure.

[3] C

[4] C

[5] C

[6] D

[7] D

[8] D

[9] D

[10] D

[11] C

[12] B

[13] A

[14] A

[15] A

[16] A

[17] C

[18] C

[19] D

[20] A

[21] B

[22] A

[23] B

[24] C

[25] B

[26] D

[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

[27] incorrect procedure.

[28] B

[29] B

[30] C

[31] B

[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

[32] incorrect procedure.
