

**A.N.1: Properties of Integers: Identify and apply the properties of real numbers (closure, commutative, associative, distributive, identity, inverse)**

- 1 If  $a$  and  $b$  are integers, which equation is always true?
  - 1)  $\frac{a}{b} = \frac{b}{a}$
  - 2)  $a + 2b = b + 2a$
  - 3)  $a - b = b - a$
  - 4)  $a + b = b + a$
- 2 Which statement is *not* true for the set of integers?
  - 1) Every integer has an additive inverse.
  - 2) Every integer has a multiplicative inverse.
  - 3) The set of integers is closed under addition.
  - 4) The set of integers is closed under multiplication.
- 3 Which set is closed under division?
  - 1)  $\{1\}$
  - 2) counting numbers
  - 3) integers
  - 4) whole numbers
- 4 The set of integers is *not* closed for
  - 1) division
  - 2) multiplication
  - 3) addition
  - 4) subtraction
- 5 Under which operation is the set of odd integers closed?
  - 1) addition
  - 2) subtraction
  - 3) multiplication
  - 4) division
- 6 Under which operation is the set  $\{-1, 0, 1\}$  closed?
  - 1) multiplication
  - 2) division
  - 3) addition
  - 4) subtraction
- 7 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:
  - a positive even integer and a zero
  - a positive and a negative even integer
  - two negative even integersBe sure to explain why *each* of your examples illustrates that the set of integers is *not* closed for that operation.

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**Answer Section**

1 ANS: 4

The other equations are true only if  $a = b$ .

REF: 010107a

2 ANS: 2 REF: 089335a

3 ANS: 1

$1 \div 1 = 1$ . (2)-(4) are not closed sets because  $1 \div 2 = \frac{1}{2}$  and while 1 and 2 are counting numbers, integers and whole numbers,  $\frac{1}{2}$  is not a counting number, integer or whole number.

REF: 010217a

4 ANS: 1 REF: 011523ia

5 ANS: 3

An odd plus an odd is even. An odd minus an odd is even. An odd divided by an odd can be a fraction. An odd times an odd is always odd.

REF: 010928a

6 ANS: 1

$$\frac{1}{0} = \text{undefined}$$

$$-1 + -1 = -2$$

$$-1 - 1 = -2$$

REF: 060828a

7 ANS:

The set of integers is not closed under division.

- a positive even integer and a zero:  $2 \div 0 = \frac{2}{0}$ , which is not an integer
- a positive and a negative even integer:  $2 \div -4 = -\frac{1}{2}$ , which is not an integer
- two negative even integers:  $-2 \div -4 = \frac{1}{2}$ , which is not an integer

REF: 080129a