A.REI.A.1: Properties of Integers

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 set is closed under division?
1) $\{1\}$
2) counting numbers
3) integers
4) whole numbers

3 The set of integers is *not* closed for
1) division
2) multiplication
3) addition
4) subtraction

4 Under which operation is the set of odd integers closed?
1) addition
2) subtraction
3) multiplication
4) division

5 Under which operation is the set $\{-1, 0, 1\}$ closed?
1) multiplication
2) division
3) addition
4) subtraction

6 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.

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

8 If a is an odd number, b an even number, and c an odd number, which expression will always be equivalent to an odd number?
1) $a(bc)$
2) $ac(b)^0$
3) $ac(b)^1$
4) $ac(b)^2$

9 If a and b are both odd integers, which expression must always equal an odd integer?
1) $a + b$
2) $a - b$
3) $a \cdot b$
4) $\frac{a}{b}$

10 If n represents an odd number, which computation results in an answer that is an even number?
1) $2 \times n + 1$
2) $2 \times n - 1$
3) $3 \times n - 2$
4) $3 \times n + 1$

11 Tom scored 23 points in a basketball game. He attempted 15 field goals and 6 free throws. If each successful field goal is 2 points and each successful free throw is 1 point, is it possible he successfully made all 6 of his free throws? Justify your answer.

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Answer Section

1 ANS: 4
The other equations are true only if $a = b$.

REF: 010107a

2 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

3 ANS: 1 REF: 011523ia

4 ANS: 3
An odd plus and 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

5 ANS: 1
$\frac{1}{0} = \text{undefined}$

$-1 + -1 = -2$

$-1 - 1 = -2$

REF: 060828a

6 ANS: 2 REF: 089335siii

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

8 ANS: 2
$ac(b)^0 = OO(E)^0 = O(1) = O$

REF: 060113a

9 ANS: 3
$O \cdot O = O$

REF: 060525a

10 ANS: 4
$3 \times n + 1 = O \times O + O = O + O = E$

REF: 080113a

11 ANS:
No, if Tom had made all his free throws, he would have scored an even number of points.

REF: 080326b