

### 1-3 Properties of Numbers

Evaluate each expression if  $a = -1$ ,  $b = 4$ , and  $c = 6$ .

31.  $4a + 9b - 2c$

**SOLUTION:**

$$\begin{aligned}4a + 9b - 2c &= 4(-1) + 9(4) - 2(6) \\ &= -4 + 36 - 12 \\ &= 32 - 12 \\ &= 20\end{aligned}$$

32.  $-10c + 3a + a$

**SOLUTION:**

$$\begin{aligned}-10c + 3a + a &= -10(6) + 3(-1) + (-1) \\ &= -60 + (-3) + (-1) \\ &= -63 + (-1) \\ &= -64\end{aligned}$$

33.  $a - b + 5a - 2b$

**SOLUTION:**

$$\begin{aligned}a - b + 5a - 2b &= (-1) - 4 + 5(-1) - 2(4) \\ &= -1 - 4 + (-5) - 8 \\ &= (-1 - 4) + (-5 - 8) \\ &= -5 + (-13) \\ &= -18\end{aligned}$$

34.  $8a + 5b - 11a - 7b$

**SOLUTION:**

$$\begin{aligned}8a + 5b - 11a - 7b &= 8(-1) + 5(4) - 11(-1) - 7(4) \\ &= -8 + 20 + 11 - 28 \\ &= (-8 + 20) + (11 - 28) \\ &= 12 + (-17) \\ &= -5\end{aligned}$$

35.  $3c^2 + 2c + 2c^2$

**SOLUTION:**

$$\begin{aligned}3c^2 + 2c + 2c^2 &= 3(6^2) + 2(6) + 2(6^2) \\ &= 3(36) + 2(6) + 2(36) \\ &= 108 + 12 + 72 \\ &= (108 + 12) + 72 \\ &= 120 + 72 \\ &= 192\end{aligned}$$

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36.  $3a - 4a^2 + 2a$

**SOLUTION:**

$$\begin{aligned}3a - 4a^2 + 2a &= 3(-1) - 4(-1)^2 + 2(-1) \\ &= -3 - 4(1) - 2 \\ &= -3 - 4 - 2 \\ &= (-3 - 4) - 2 \\ &= -7 - 2 \\ &= -9\end{aligned}$$

55. **JUSTIFY ARGUMENTS** Explain why 0 has no multiplicative inverse.

**SOLUTION:**

0 has no multiplicative inverse. You cannot divide by 0.

57. **JUSTIFY ARGUMENTS** Does the Commutative Property *sometimes*, *always* or *never* hold for subtraction? Explain your reasoning.

**SOLUTION:**

Sometimes; when a number is subtracted by itself then it holds but otherwise it does not.

58. **ANALYZE RELATIONSHIPS** Explain whether 1 can be an additive identity. Give an example to justify your answer.

**SOLUTION:**

1 cannot be an additive identity.  $3 + 1 \neq 3$

59. **WHICH ONE DOESN'T BELONG?** Identify the equation that does not belong with the other three. Explain your reasoning.

$$x + 12 = 12 + x$$

$$7h = h \cdot 7$$

$$1 + a = a + 1$$

$$(2j)k = 2(jk)$$

**SOLUTION:**

$(2j)k = 2(jk)$ ; The other three equations illustrate the Commutative Property of Addition or Multiplication. This equation represents the Associative Property of Multiplication.

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61. Abassi will use the Additive Identity Property to solve an equation. Which of the following best illustrates the Additive Identity Property?

**A**  $a \cdot 1 = a$

**B**  $b + 0 = b$

**C**  $c + (-c) = 0$

**D**  $d + 1 = d + 1$

**SOLUTION:**

The Additive Identity Property states that the sum of any number and 0 is that number.  $b + 0 = b$  means that a number  $b$  plus 0 is equal to  $b$ . This is an illustration of the Additive Identity Property.

So, choice B is the correct answer.

62. When a number is tripled, its value increases by 10. What is the original number?

**F** 5

**G** 10

**H** 15

**J** 30

**SOLUTION:**

"When a number is tripled" means that a number is multiplied by 3. Let  $n$  represent that number and  $3n$  represent the number multiplied by 3.

"Its value increases by 10" means to add 10 to the number. So,  $n + 10$  represents the sum of the number and 10.

Set the expressions equal to each other and solve for  $n$ .

$$3n = n + 10 \quad \text{Original equation}$$

$$2n = 10 \quad \text{Subtract } n \text{ from each side.}$$

$$n = 5 \quad \text{Divide each side by 2.}$$

So, the original number is 5 and the correct answer is choice F.

63. Which property justifies rewriting the equation  $\frac{1}{6} \cdot 6 + z = 8$  as  $1 + z = 8$ ?

**A** Additive Identity Property

**B** Multiplicative Identity Property

**C** Multiplicative Inverse Property

**D** Substitution

**SOLUTION:**

The Multiplicative Inverse Property says that  $\frac{a}{b} \cdot \frac{b}{a} = 1$ .

Substitute 1 for  $a$  and 6 for  $b$  to get  $\frac{1}{6} \cdot \frac{6}{1} = 1$ .

This is the property demonstrated in the equation, so the correct answer is choice C.

### 1-3 Properties of Numbers

64. A company creates mobile apps for a smartphone. When the app was free, they had 880 downloads. After the price was set to \$0.99, they had  $d$  downloads. The company receives \$0.70 in revenue for each app that is sold for \$0.99. Which equation gives the average revenue  $R$  for all downloads of this app?

**F**  $R = \frac{0.7d}{880+d}$

**G**  $R = 0.7(880 - d)$

**H**  $R = 0.7d$

**J**  $R = \frac{0.7}{880+d}$

**SOLUTION:**

The average revenue is equal to the total revenue divided by the total number of downloads.

Let  $R$  represent the average revenue and  $d$  represent the number of downloads when the app was \$0.99.

To find the total revenue add the revenue from when the app was free to the revenue from when the app was \$0.99. When the app was free, the revenue was \$0. Now that the app is \$0.99, the revenue is \$0.70 per app. So  $0.7d$  represents the amount of revenue from when the app was \$0.99. Since there was no revenue when the app is free, this is also the total revenue.

To find the total number of downloads add the free downloads and the \$0.99 downloads. There were 880 downloads when the app was free and  $d$  downloads when the app was \$0.99, so the total number of downloads is  $880 + d$ .

Therefore,  $R = \frac{0.7d}{880+d}$  represents the average revenue. The correct answer is choice F.