

Solve the following problems. If necessary, round to the nearest penny.

1. A family of 12 went to the local Italian restaurant for dinner. Every family member ordered a drink and meal, 3 ordered an appetizer, and 6 people ordered cake for dessert.
 - a. Write an expression that can be used to figure out the cost of the bill. Include the definitions for the variables the server used.
 - b. The waitress wrote on her ordering pad the following expression: $3(4d + 4m + a + 2c)$. Was she correct? Explain why or why not.
 - c. What is the cost of the bill if a drink costs \$3, a meal costs \$20, an appetizer costs \$5.50, and a slice of cake costs \$3.75?
 - d. Suppose the family had a 10% discount coupon for the entire check and then left an 18% tip. What is the total?

2. Sally designs web pages for customers. She charges \$135.50 per web page; however, she must pay a monthly rental fee of \$650 for her office. Write an expression to determine her take-home pay after expenses. If Sally designed 5 web pages last month, what was her take-home pay after expenses?

3. While shopping, Megan and her friend Rylie find a pair of boots on sale for 25% off of the original price. Megan calculates the final cost of the boots by first deducting the 25%, and then adding the 6% sales tax. Rylie thinks Megan will pay less if she pays the 6% sales tax first and then takes the 25% discount.
 - a. Write an expression to represent each girl's scenario if the original price of the boots was x dollars.
 - b. Evaluate each expression if the boots originally cost \$200.
 - c. Who was right? Explain how you know.
 - d. Explain how both girls' expressions are equivalent.

Write three equivalent expressions that can be used to find the final price of an item costing g dollars that is on sale for 15% off and charged 7% sales tax.

$$(x - 0.15x) + 0.07(x - 0.15x)$$

$$1.07(x - 0.15x)$$

$$1.07(0.85x) = 0.85(1.07)x$$

1. Using all of the expressions, determine the final price for an item that costs \$75. If necessary, round to the nearest penny.

$$x = \$75$$

$$(x - 0.15x) + 0.07(x - 0.15x)$$

$$1.07(x - 0.15x)$$

$$1.07(0.85x) = 0.85(1.07)x$$

$$(75 - 0.15(75)) + 0.07(75 - 0.15(75))$$

$$1.07(75 - 0.15 * 75))$$

$$1.07(0.85 * 75)$$

$$63.75 + 0.07(63.75)$$

$$1.07(63.75)$$

$$1.07(63.75)$$

$$63.75 + 4.46$$

$$68.21$$

$$68.21$$

$$68.21$$

2. If each expression yields the same final sale price, is there anything to be gained by using one over the other?

Using the final two expressions makes the problem shorter and offers fewer areas to make errors. However, all three expressions are correct.

3. Describe the benefits, special characteristics, and properties of each expression.

The second and third expressions collect like terms. The third expression can be written either way using the commutative property of multiplication. The first and second expressions find the discount price first, where the third expression is written in terms of percent paid.

Solve the following problems. If necessary, round to the nearest penny.

1. A family of 12 went to the local Italian restaurant for dinner. Every family member ordered a drink and meal, 3 ordered an appetizer, and 6 people ordered cake for dessert.

- a. Write an expression that can be used to figure out the cost of the bill. Include the definitions for the variables the server used.

$$d = \text{drink}$$

$$m = \text{meal}$$

$$a = \text{appetizer}$$

$$c = \text{cake}$$

$$12d + 12m + 3a + 6c$$

- b. The waitress wrote on her ordering pad the following expression: $3(4d + 4m + a + 2c)$.

Was she correct? Explain why or why not.

Yes, she was correct because her expression is equivalent to expression from part (a). If the distributive property is applied, the expressions would be exact.

- c. What is the cost of the bill if a drink costs \$3, a meal costs \$20, an appetizer costs \$5.50, and a slice of cake costs \$3.75?

$$12d + 12m + 3a + 6c$$

$$12(3) + 12(20) + 3(5.50) + 6(3.75)$$

$$36 + 240 + 16.50 + 22.50$$

$$\$315$$

- d. Suppose the family had a 10% discount coupon for the entire check and then left an 18% tip. What is the total?

$$(315 - 315(0.10)) + 0.18(315 - 315(0.10))$$

$$1.18(315 - 315(0.10))$$

$$1.18(315(0.90))$$

$$\$334.53$$

2. Sally designs web pages for customers. She charges \$135.50 per web page; however, she must pay a monthly rental fee of \$650 for her office. Write an expression to determine her take-home pay after expenses. If Sally designed 5 web pages last month, what was her take-home pay after expenses?

w = number of webpages Sally's designs

$$135.50w - 650$$

$$135.50(5) - 650$$

$$\$27.50$$

3. While shopping, Megan and her friend Rylie find a pair of boots on sale for 25% off of the original price. Megan calculates the final cost of the boots by first deducting the 25%, and then adding the 6% sales tax. Rylie thinks Megan will pay less if she pays the 6% sales tax first and then takes the 25% discount.

- a. Write an expression to represent each girl's scenario if the original price of the boots was x dollars.

Megan

$$(x - 0.25x) + 0.06(x - 0.25x)$$

$$1.06(x - 0.25x)$$

$$1.06(0.75x)$$

Rylie

$$(x + 0.06x) - 0.25(x + 0.06x)$$

$$0.75(x + 0.06x)$$

$$0.75(1.06x)$$

- b. Evaluate each expression if the boots originally cost \$200.

Megan

$$1.06(0.75x)$$

$$1.06(0.75(200))$$

$$\$159$$

Rylie

$$0.75(1.06x)$$

$$0.75(1.06(200))$$

$$\$159$$

- c. Who was right? Explain how you know.

Neither girl was right. They both pay the same amount.

- d. Explain how both girls' expressions are equivalent.

Two expressions are equivalent if they yield the same number for every substitution of numbers for the variables in each expression. Since multiplication is commutative, the order of the multiplication can be reversed and the result will remain the same.