Lesson 18: Writing, Evaluating, and Finding Equivalent Expressions with Rational Numbers

Classwork

Example 1

John's father asked him to compare several different cell phone plans and identify which plan will be the least expensive for the family. Use the information contained in the table below to answer the following questions.

Cell Phone Plans

Name of Plan	Monthly Fee (Includes 1,500 shared minutes)	Price per Phone Line x	Price per line for Unlimited Texting y	Price per line for Internet Access z
Company A	\$70	\$20	\$15	\$15
Company B	\$90	\$15	\$10	\$20
Company C	\$200	\$10	included in monthly fee	included in monthly fee

All members of the family may not want identical plans, therefore we will let x represent the number of phone lines, y represent the number of phone lines with unlimited texting, and z represent the number of phone lines with Internet access.

Expression

Company A _____

Company B _____

Company C _____

Using the expressions above, find the cost to the family of each company's phone plan if:

a. Four people want a phone line, four people want unlimited texting, and the family needs two Internet lines.

Company A	Company B	Company C

Which cell phone company should John's family use? Why?

b. Four people want a phone line, four people want unlimited texting, and all four people want internet lines.

Company A	Company B	Company C

Which cell phone company should John's family use? Why?

c. Two people want a phone line, two people want unlimited texting and the family needs two Internet lines.

Company A	Company B	Company C

Which cell phone company should John's family use? Why?

Example 2

Three friends went to the movies. Each purchased a medium-sized popcorn for p dollars and a small soft drink for s dollars.

a. Write the expression that represents the total amount of money (in dollars) the three friends spent at the concession stand.

b. If the concession stand charges $\$6.50$ for a medium-sized popcorn and $\$4.00$ for a small soft drink, how much did the three friends spend on their refreshments all together?

Example 3

Equivalent Expressions			
EXAMPLE: Evaluate $x = 2, y = -1$	$4(x + 2y)$ $4(2 + 2(-1))$ $4(0)$ 0	$4x + 8y$ $4(2) + 8(-1)$ $8 + (-8)$ 0	$4x + 4y + 4y$ $4(2) + 4(-1) + 4(-1)$ $8 + (-4) + (-4)$ 0
1. Evaluate $y = 1$	$5(3 - 4y)$		
2. Evaluate $x = 5, y = -2$	$-3x + 12y$		
3. Evaluate $x = -\frac{1}{2}$, $y = 1$			$-2x + 10x - 6y$

Lesson Summary

- An expression is a number or a letter, which can be raised to a whole number exponent. An expression can be a product whose factors are any one of the entities described above. An expression can also be the sum and/or difference of the products described above.
- To evaluate an expression, replace each variable with its corresponding numerical value. Using order of operations, the expression can be written as a single numerical value.
- Expressions are equivalent if they evaluate to the same number for every substitution of numbers into all the letters in each expression.

Problem Set

1. Sally is paid a fixed amount of money to walk her neighbor's dog every day after school. Each month, when she is paid, she puts aside $\$20$ to spend and saves the remaining amount. Write an expression that represents the amount Sally will save in 6 months if she earns *m* dollars each month. If Sally is paid $\$65$ each month, how much will she save in 6 months?

2. A football team scored 3 touchdowns, 3 extra points and 4 field goals. Write an expression to represent the total points the football team scored.

   Write another expression that is equivalent to the one written above.

   If each touchdown is worth 6 points, each extra point is 1 point, and each field goal is 3 points, how many total points did the team score?

3. Write three other expressions that are equivalent to $8x - 12$.

4. Profit is defined as earnings less expenses (earnings – expenses). At the local hot air balloon festival, the Ma & Pops Ice Cream Truck sells ice cream pops, which cost them $\$0.75$ each, for $\$2$ each. They also paid $\$50$ to the festival's organizers for a vendor permit. The table below shows the earnings, expenses and profit earned when $50, 75$ and 100 ice cream pops were sold at the festival.

Number of Pops Sold	Earnings	Expenses	Profit
50	$50(2) = 100$	$50(0.75) + 50$ $37.5 + 50 = 87.5$	$100 - 87.5$ 12.50
75	$75(2) = 150$	$75(0.75) + 50$ $56.25 + 50 = 106.25$	$150 - 106.25 = 43.75$
100	$100(2) = 200$	$100(0.75) + 50$ $75 + 50 = 125$	$200 - 125 = 75$

Write an expression that represents the profit (in dollars) Ma & Pop earned by selling ice cream pops at the festival.

Write an equivalent expression.

How much did Ma & Pops Ice Cream Truck profit if it sold 20 ice cream pops? What does this mean? Explain why this might be the case?

How much did Ma & Pops Ice Cream truck profit if it sold 75 Ice Cream Pops? What does this mean? Explain why this might be the case?