Unit 5 Parent Guide

Lesson 1—Expressions and Order of Operations--Helpful Hints

*In today's lesson students will learn some important vocabulary that they will need to use on their homework assignment. The vocabulary words and definitions are listed below:

-variable: a letter or symbol used to represent a number
examples: A x b h

-expression: is made up of one or more numbers, one or more variables, or both numbers and variables. An expression also often includes one or more operations, but does not include an equals sign.
examples: 4 x - 9 b + 2 - a

-terms: parts of an expression that are added or subtracted.
examples: y + 9 (term, term) g-2g (term, term)

-evaluate: to evaluate an algebraic expression means to substitute given values for the variables and then simplify by following the Order of Operations

*Students learned the meaning of these vocabulary words in order to assist them with solving specific equations.

*Students were also reminded of the Order of Operations:

P-Parentheses
E-Exponents
M-Multiplication → from left to right
D-Division →
A-Addition → from left to right
S-Subtraction →

Students will use the Order of Operations to solve expressions in this unit. Some example problems are below:

Example 1: 36 – (2 + 9) ▪ 3
Step 1: Solve what is inside the parentheses first **(2+9) =11**
Step 2: Re-write the problem with the solution to (2+9) **36- (11) ▪ 3**
Step 3: Solve the multiplication problem next **11 ▪ 3 = 33**
Step 4: Re-write the problem with the solution to 11 ▪ 3 **36-33**
Step 5: Solve the subtraction problem **36-33=3**
Step 6: Record the solution **The answer is 3**

Example 2: Evaluate x · (5-y) for x=8 and y=3
Step 1: Re-write the given expression **x · (5-y)**
Step 2: Substitute 8 for x and 3 for y **8 · (5-3)**
Step 3: Perform the operation inside the parentheses **8 · (2)**
Step 4: Multiply **8 · 2 = 16**
Step 5: Record the solution **The answer is 16**

*Lesson 2—Expressions with Exponents--Helpful Hints

*Today's learning builds off of yesterday's instruction. Today students reviewed exponents and practiced solving equations with exponents. Some example problems from today's learning are below:

Example 1: Understanding Exponents

-Problem 1: Write the expression as a repeated multiplication

$11^3 = 11 \times 11 \times 11$

explanation: the exponent (the 3 in this example) tells how many times to multiply the base number (11 in this example) by itself. **11^3** means to use 11 as a factor 3 times.

-Problem 2: Use an exponent to write the repeated multiplication

$4 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 4 \cdot 10^4$

explanation: the number 10 is multiplied 4 different times, so it can be shown as 10^4

Example 2: Solving Expressions with Exponents

-Problem: Simplify. Follow the Order of Operations

$4 + 3^2$

Step 1: Solve the exponents problem first **$3^2 = 3 \cdot 3 = 9$**

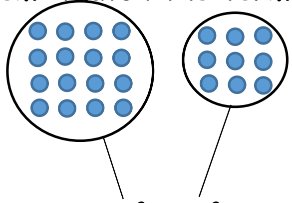
Step 2: Re-write the problem with the solution to 3^2 **$4 + 9$**

Step 3: Solve the addition problem next **$4 + 9 = 13$**

Step 4: Record the solution **The answer is 13**

Example 3: Visualizing exponents in expressions

-Problem: Match the terms of the expression to parts of the figure



$4^2 + 3^2$

total: 16 + 9 = 25 dots

explanation: The first group of dots show a 4 x 4 grid. 4 x 4 can also be shown as 4^2. The second group of dots show a 3 x 3 grid. 3 x 3 can also be shown as 3^2.

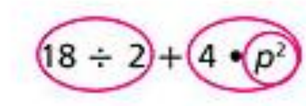
*Lesson 3—Interpreting and Analyzing Expressions--Helpful Hints

*Today students will use what they have learned about the Order of Operations to analyze and describe the steps in solving specific expressions by grouping different operations in order to make it easier to understand. Students will also review the vocabulary for each operation by completing tables like the one shown here:

Algebraic Expression	Plus, Minus, Times, Divided By	Add, Subtract, Multiply, Divide	Sum, Difference, Product, Quotient
$5 - y$	5 minus y	Subtract y from 5	$5 - y$ is a difference.
$12 \cdot a$	12 times a	Multiply 12 and a	$12 \cdot a$ is the product of 12 and a.
$c \div 3$	c divided by 3	Divide c by 3.	$c \div 3$ is a quotient.
$b + 2.3$	b plus 2.3	Add b and 2.3.	$b + 2.3$ is the sum of b and 2.3.

*The vocabulary in the table above is important for students to understand because expressions can be written in many different ways.
*In this lesson student will also be grouping different parts of expressions based off of the Order of Operations in order to understand the expression more deeply and make the problem simpler. Use the examples below for further explanation of this skill.

Follow the steps to analyze $18 \div 2 + 4 \bullet p^2$.



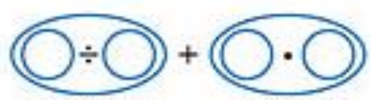
Step 1: Look for parts of the expression in **parentheses.** Circle them.

Step 2: Look for **powers.** Circle them.

Step 3: Look for **multiplications** and **divisions,** from left to right. Circle them.

Step 4: Look for **additions** and **subtractions,** from left to right. Circle any terms that are not already circled.

Below is a diagram for $18 \div 2 + 4 \bullet p^2$. Discuss how it matches the expression in Exercise 9.

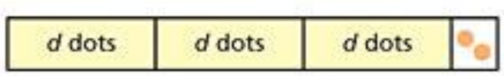


quotient **product**

2 terms

*Lesson 4—Modeling and Simplifying Expressions--Helpful Hints

*Today, students will continue to build on the visual models of expressions in order to gain insights about expressions, how to depict them and also how to use the models to show another way of solving. Use the examples below that students completed in class, to help provide them with reminders for their homework assignment.



Write an expression and analyze it.

Possible expressions: $3 \bullet d + 2$, $d + d + d + 2$

Evaluate the expression for $d = 7$.

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explanation: The answer described is acceptable because there are 3 boxes of *d* dots so this could be described a 3 · d. Then there is 2 additional dots, so adding 2 is correct. The other example answer is also acceptable because repeated addition (d + d + d) is the same as 3 · d.
Once d is shown as equal to 7, you are able to simplify the expression using Order of Operations:

3 · 7 + 2 =
3 · 7 = 21
21 + 2 =
23

Write an expression and analyze it.

Possible expressions: $4 \cdot (2 \cdot 5) + 3^2$, $4 \cdot 10 + 3^2$

Simplify the expression.

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explanation: The answer described is acceptable because there are 4 sets of 2 x 5 and then there is a 3 x 3 grid in the middle which can also be described as 3^2. The other example answer is also acceptable because this expression could also be described as 4 sets of 10 (4 x 10) around the outside and then a 3 x 3 grid in the middle which can also be described as 3^2.

Then you are able to simplify the expression using Order of Operations:

$4 \cdot (2 \cdot 5) + 3^2 =$

$4 \cdot (10) + 3^2 =$

$4 \cdot (10) + 9 =$

$40 + 9 =$

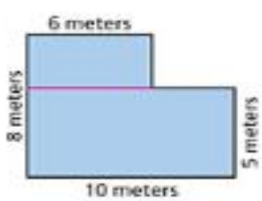
$40 + 9 = 49$

*Lesson 5—Expressions for Area and Surface Area--Helpful Hints

*Today students will use what they know about finding the area and surface area of shapes combined with what they have learned about expressions to help them create expressions for finding area or surface area of complex figures.

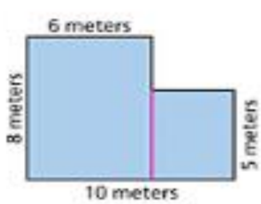
*One important part of today's instruction that students must remember is that area and/or surface area can be shown using multiple different expressions and still all be equal expressions once solved. This point was shown in the class activity and is included in this guide below as a reminder.

The figures below show a floor plan for a room. Keiko, Alex, and DeShun each found a different expression for the area of the room.



Keiko's expression: $5 \cdot 10 + 3 \cdot 6$ m²

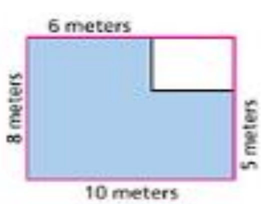
Keiko saw a smaller rectangle on top of a larger rectangle. $5 \cdot 10$ is the area of the larger rectangle at the bottom, and $3 \cdot 6$ is the area of the smaller rectangle at the top.



Alex's expression: $8 \cdot 6 + 4 \cdot 5$ m²

Alex saw two rectangles side by side. $8 \cdot 6$ is the area of the larger rectangle at the left, and $4 \cdot 5$ is the area of the smaller rectangle at the right.

Homework Hint: This way of solving is a very similar method to the one used on #1 of the homework assignment



DeShun's expression: $8 \cdot 10 - 3 \cdot 4$ m²

DeShun saw a large rectangle with a small rectangle cut out of the upper right corner. $8 \cdot 10$ is the area of the larger rectangle, and $3 \cdot 4$ is the area of the small rectangle that is cut out of the corner.

*Homework hint for #4-7 on lesson 5 homework assignment:

#4-Students need to remember the formula for surface area and use that to help them make sense of why they are multiplying by 6 in #4.

#5-Remind students that finding the surface area of a shape is the same as finding the area of each face of the shape. Use this reminder to decide what e^2 could mean.

#6-Think about repeated addition or other ways to show an equivalent expression.

#7-Review of surface area. HINT—if it is a cube, all sides are the same, so the edges will all be equal.

*Lesson 6—Equivalent Expressions--Helpful Hints

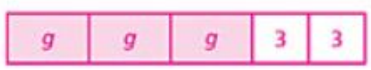
*In today's lesson students learned how to create and use diagrams to model expressions and then identify equivalent expressions based off of the model and combining like terms. Students also learned how analyze the expression in order to describe real life situations for each expression in order to deepen their understanding of the mathematical situation. Some examples are shown below:

Example 1: $3g + 3 + 3$

Situation: Three members of the Smith family picked *g* apples each. The two youngest children each picked three apples.

This scenario is appropriate because the word each describes multiplication or 3g. Then if 2 children pick exactly 3, it makes sense to add these in as sinale amounts.

Diagram



This diagram makes sense because when I have like terms next to each other I can describe this as repeated addition or as multiplication (3g) and then 3 + 3 is included as well.

Circle the equivalent expression(s):

$9g$ $\quad 3g + 6 \quad g + g + g + 6$

9g is not equivalent because I cannot combine 3g and 3 + 3 because they are not like terms. I can only add g's with other g's so 9g would not be true.

3g + 6 is equivalent because all I did is combine the like terms of 3 and 3 to make 6.

g + g + g + 6 is equivalent because g + g + g is just the repeated addition form of 3g. Also 3 + 3 does equal 6 and it is appropriate to combine those because they are like terms.

Example 2: A restaurant received a shipment of five crates of glasses with *g* glasses in each crate. The manager dropped one crate, breaking all of the glasses inside of it.

Diagram

This diagram is appropriate and makes sense because it shows each "box" with g glasses in each. Also, by the slash drawn through the last "box" it shows that one entire box has been taken away.

Expressions Possible expressions:

$5g - g = 4g$

These expressions make sense because when something is dropped or broken we can consider that as being taken away, which is subtraction in math. This expression shows that we started with 5 boxes with "g" amount of glasses in each and we took away one whole box with "g" glasses in it. It is appropriate to write this answer as 4g because 5g and g are like terms so they can be subtracted.

*Lesson 7—The Commutative and Associative Properties--Helpful Hints

*In this lesson, students were reminded of the commutative and associative properties. They reviewed what the properties are and applied this knowledge to expressions. See the properties described below:

Commutative Property of Addition	Associative Property of Addition
For any numbers *a* and *b*, $a + b = b + a$. For example, $5 + 2 = 2 + 5$.	For any numbers *a*, *b*, and *c*, $(a + b) + c = a + (b + c)$. For example, $(3 + 4) + 1 = 3 + (4 + 1)$.

Commutative Property of Multiplication	Associative Property of Multiplication
For any numbers *a* and *b*, $a \bullet b = b \bullet a$. For example, $4 \bullet 7 = 7 \bullet 4$.	For any numbers *a*, *b*, and *c*, $(a \bullet b) \bullet c = a \bullet (b \bullet c)$. For example, $(6 \bullet 2) \bullet 5 = 6 \bullet (2 \bullet 5)$.

*Another important skill that students learned in today's lesson was that you can **simplify an expression** by **combining like terms**. Students were reminded that simplify means to make a problem or number easier, shorter and simpler.

Example 1: Simplify this expression by combining like terms **$3x + 4 + 2x + 1$**

Step 1- Identify like terms. I see x's and numbers in this expression
Step 2- Combine variables. 3x and 2x are alike. **3x and 2x combined is 5x**
Step 3- Combine numbers. 4 and 1 are like terms. **4 + 1 is 5**
Step 4- Re-write as a simplified expression **$5x + 5$**

*Students also learned about identifying coefficients in expressions in order to simplify the expressions when multiplication is included in the expression.

coefficient: when a term is a number times a variable or a number times a product of variables, we call the number the coefficient.

Examples of coefficients (the underlined digit is the coefficient): $\underline{3}a$ $\underline{7}x^2$ $\underline{8}xy$

Example: Re-write the term so the coefficient is in front

(2y)8
Step 1: I would multiply the 2 and the 8 in order to combine like terms and bring the coefficient to the front.
Step 2: Re-write the expression **16y**

Example: Re-write the term so the coefficient is in front

2(3x)(4x)
Step 1: I would multiply (distribute) the 2 by the 3 and then multiply that answer by the 4 in order to combine like terms and bring the coefficient to the front.
Step 2: I would multiply the x by the other x in order to combine like terms to make x^2
Step 2: Re-write the expression **$24x^2$**

*Lesson 8—The Distributive Property--Helpful Hints

*In this lesson students learned about the distributive property and how it is used in expressions in order to simplify and solve expressions with multiplication and parentheses. The definition of the distributive property and examples of how it is used are outlined below:

► Two Ways to Use the Distributive Property

The **Distributive Property** gives us two opposite ways to transform expressions into equivalent expressions.

- We can distribute a factor to the terms of a sum or difference.

  $(5 + 2)c = 5c + 2c$ c is distributed to 5 and 2.

- We can pull out a common factor from the terms of a sum or difference.

  $5c + 2c = (5 + 2)c$ c is pulled out of 5c and 2c.

*Students will be able to use what they learn about the distributive property to decide whether 2 expressions are equivalent or not.

Example 1: The whether the expressions are equivalent

5 + 3(a + b) and 5 + 3a + b

-NO! These are not equivalent because the 3 would need to be distributed to the a and the b. In order for these to be equivalent the second expression would have to be 5 + 3a + 3b

3 + 2f + 4 and 2f + 7

-YES! These are equivalent because the only difference is that like terms are combined which is part of the simplifying process.

*Students also learned how to "pull out" the greatest common factor of 2 numbers in order to create an expression using the distributive property

Example 1: Write the sum as a product by using the Distributive Property to pull out the greatest common factor. Show all steps.

63 + 36 = 9 · 7 + 9 · 4 = 9 (7 · 4)

-These steps work because the greatest common factor of both 63 and 36 is 9, so you can pull a 9 out of each in order to create two multiplication problems and then use the distributive property to simplify the expression.

Example 1: Write the sum as a product by using the Distributive Property to pull out the greatest common factor. Show all steps.

7x + 35=

7 ÷ 7 = 1

35 ÷ 7 = 5

7 (x + 5)

-These steps work because the greatest common factor of both 7 and 35 is 7, so you can pull a 7 out of each in order to create two problems and then use the distributive property to simplify the expression

*Lesson 9—Practice with Expressions--Helpful Hints

*Today's lesson provides students with additional practice of all of the skills that they have learned about expressions in lessons 1-8. Use other parts of this guide (lessons 1-8) to assist with student homework for this lesson.

*Lesson 10—Relating Two Quantities--Helpful Hints

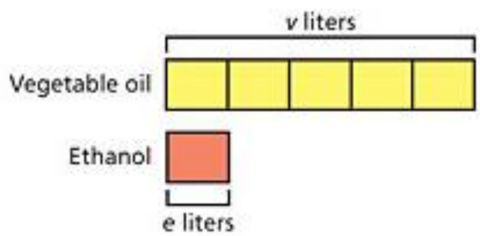
*In today's lesson students learned multiple ways to represent the relationship between two qualities or amounts. Students learned how to show the relationship of two quantities in a table, in a diagram and also as an equation. An example of a real world situation and how it was represented as a table, diagram and an equation is explained below:

Example 1: Mr. Prieto makes his own biodiesel fuel by mixing vegetable oil and ethanol in the ratio of 5 liters of vegetable oil to 1 liter of ethanol. The amount of vegetable oil and ethanol vary together.

Table

e	v
1	5
2	10
3	15
4	20

Diagram



Equations

$v = e + e + e + e + e$

$v = 5e$

$e = v \div 5$

$e = \frac{1}{5}v$

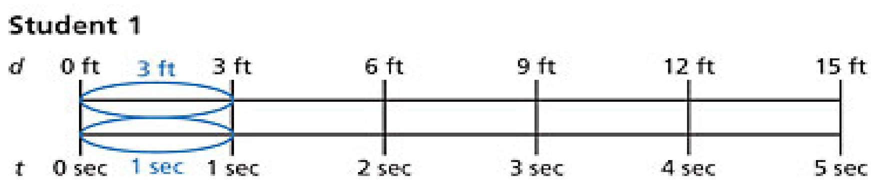
*Students learn in this lesson that each of these representations give the same information. It is important for students to be able to represent a situation in multiple ways because they will see it shown in different ways and it also helps them to understand the problem better.

*Lesson 11—Motion at a Constant Speed--Helpful Hints

*Students will use what they know about tables, graphs and equations to relate time and the amount of distance traveled. Students will use their previous knowledge of unit rates in a table to assist them in their learning today. Below are examples of a situation shown as a number line, a table and a graph to represent the relationship between time and distance walked. A very similar problem will be given on the homework assignment.

Example 1: Student 1 walks at a constant rate of 3 feet per second

Number Line Representation:



Students could use this number line to answer questions about how long Student 1 would walk in 1 ½ seconds or 4 ½ seconds

Table Representation:

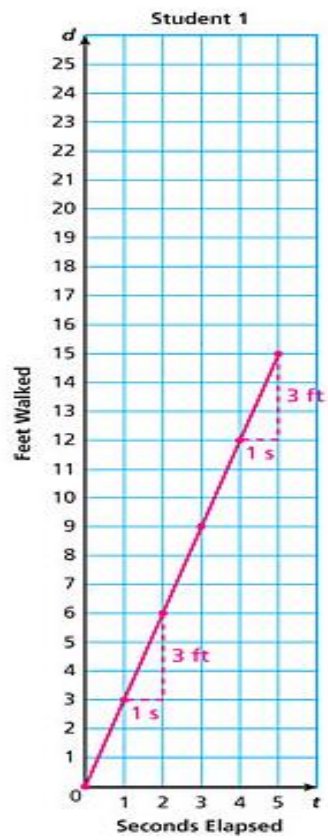
Students could use this table to relate the two amounts, look for patterns and find the unit rate.

Student 1

Elapsed Time in Seconds (t)	Distance Walked in Feet (d)
0	0
1	3
2	6
3	9
4	12
5	15

Graph Representation:

Students could use the graph to create a visual model of the information. A number line shows change over time, so this would be the best way to show a visual aid of distance traveled over time.



*Lesson 12—Relating Equations, Tables, and Graphs--Helpful Hints

*Today students will use what they learned in Lesson 11 about equations, tables and graphs to practice more with creating tables and graphs. But today, the equations will be more complex and Order of Operations will need to be used to show the change in the table or graph. Some examples are described below:

Example 1: SuperHero Supplies, Inc. produces different Superpower Soups. In the factory, each type of soup flows into a different vat.

Let t be the number of seconds elapsed.

Let v be the number of liters of soup in the vat.

For each vat, v and t vary together and are related by an equation.

For this example, we will focus on Vat 3 that has the equation of **v= 5t + 3**

Step 1: Create a table of the information based off of the equation **v= 5t + 3**

Seconds Elapsed (t)	Liters in Vat (v)
0	3
1	8
2	13
3	18
4	23
5	28
6	33

Step 2: Plug in each number into the "t" portion of the equation in order to solve for v for each different second elapsed and to complete the table.

v= 5t + 3 when t=0

v= 5 (0) + 3

v= 0 + 3

v= 3

v= 5t + 3 when t=1

v= 5 (1) + 3

v= 5 + 3

v= 8

v= 5t + 3 when t=2

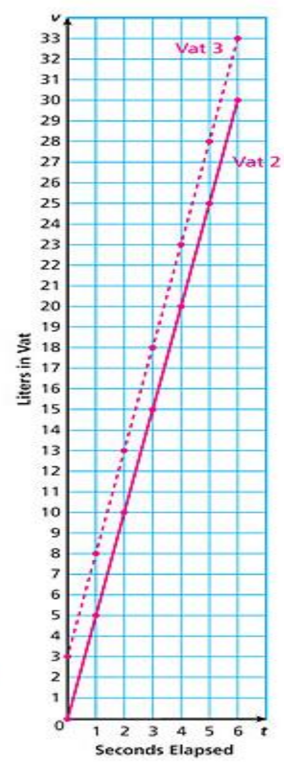
v= 5 (2) + 3

v= 10 + 3

v= 13

**you would continue to complete the equations by subbing in the number for "t" in order to complete the table.

Step 3: Students would then use the information in the table to create a graph in order to show a visual model of the relationship. Students must remember to plot the points based of off the table (so the "t" amounts would be on the x axis and the "v" amounts would be on the y axis.)



*Students will need to complete a similar problem on the homework assignment tonight. Use this example to guide your student through this problem.

*Lesson 13—Writing Equations--Helpful Hints

*Today students will use what they have learned in Unit 5 to write equations using information from a table. Below is an example table and how to use the table to write and answer equations.

Example 1:

Company A charges $30 for 24 bracelets, plus a flat rate of $4 for shipping any number of bracelets.

Company B charges $13 for 10 bracelets and does not charge for shipping.

Company C charges $18 for 15 bracelets, plus a flat rate of $10 for shipping any number of bracelets.

So 1 bracelet would be 1.25 if I divide 30 by 24. Then I would add 4 for shipping. **T= 1.25n + 4**

So 1 bracelet would be 1.30 if I divide 13 by 10. There is no shipping charge, so there isn't anything else to add . **T= 1.30n**

So 1 bracelet would be 1.20 if I divide 18 by 15. Then I would add 10 for shipping. **T= 1.20n + 10**

Complete this table for Company A. In the shaded cells, write expressions, rather than the final values.

Number of Bracelets (n)	Cost in Dollars	Shipping Cost in Dollars	Total Cost (t) in Dollars
24	30	4	34
12	15	4	19
6	7.50	4	11.50
2	2.50	4	6.50
1	1.25	4	1 • 1.25 + 4
5	5 • 1.25	4	5 • 1.25 + 4
17	17 • 1.25	4	17 • 1.25 + 4
33	33 • 1.25	4	33 • 1.25 + 4
n	n • 1.25	4	1.25n + 4

Using the information from above, students can create a table to Company A in order to extend the information and organize the patterns.

Students can then complete the information in a combined table in order to compare and contrast information between the different companies.

Number of Bracelets (n)	Company A Cost t = 1.25n + 4	Company B Cost t = 1.30n	Company C Cost t = 1.20n + 10	Lowest Total Cost?
25	$35.25	$32.50	$40	Company B
100	$129	$130	$130	Company A
150	$191.50	$195	$190	Company C
250	$316.50	$325	$310	Company C

*Lesson 14—Inequalities--Helpful Hints

*Today students learned all about inequalities. An **Inequality** is a statement that compares two expressions using one of these symbols:

- > greater than
- ≥ greater than or equal to
- ≠ not equal to
- < less than
- ≤ less than or equal to

*Students will learn how to **read inequalities** in order to use them effectively in math situations. Use this table to help remind your student how to read different inequality examples.

Example	How to Read It
$x > 7$	x is greater than 7.
$7 < 5 + 4$	7 is less than 5 plus 4.
$b - 1 \geq 12$	b minus 1 is greater than or equal to 12.
$10 \leq 2 \cdot w$	10 is less than or equal to 2 times w.
$6 \div 3 \neq 1$	6 divided by 3 is not equal to 1.

*Students also learned how to **represent real world situations with inequalities**. Some examples are shown below:

Example 1:

Situation: Children younger than 3 years old are admitted to the amusement park for free.

What it means: Any child whose age in years is *less than* 3 is admitted free.

Using an inequality: If a represents a child's age in years, then the child is admitted free if $a < 3$.

Example 2:

Situation: Children 3 years old or younger can ride the train for free.

What it means: Any child whose age in years is *less than or equal to* 3 can ride for free.

Using an inequality: If a represents a child's age in years, then the child rides for free if $a \leq 3$.

*When learning about inequalities, students also learned how to **find solutions of inequalities**. See below for some examples:

Example 1: Write three solutions of $x < 15$.

-One solution of $x < 15$ would be x=9, because 9 is less than 15

-Another solution of $x < 15$ would be x=14, because 14 is less than 15

-A third solution of $x < 15$ would be x=3, because 3 is less than 15

Example 2: Write three solutions of $b + 4 > 6$.

-One solution of $b + 4 > 6$ would be b=2.2, because 2.2 + 4 is 6.2 and 6.2 is greater than 6

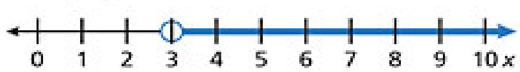
-Another solution of $b + 4 > 6$ would be b=3 , because 3 + 4 is 7 and 7 is greater than 6

-A third solution of $b + 4 > 6$ would be b=85, because 85 + 4 is 89 and 89 is greater than 6

*In Lesson 14 students also learned how to **graph inequalities**.

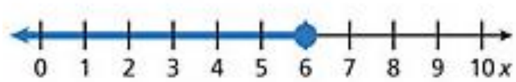
***It is very important for students to remember that when you are graphing inequalities with a < or > sign then the number line will be created with an OPEN DOT. When you are graphing inequalities with a ≤ or ≥ sign then the number line will be created with a CLOSED DOT. See below for examples:

Example 1: This graph shows the solutions of $x > 3$.



The open dot at 3 shows that 3 is *not* a solution. The blue arrow shows that all the numbers to the right of 3 (greater than 3) are solutions.

Example 2: This graph shows the solutions of $x \leq 6$.



The filled-in dot at 6 shows that 6 is a solution. The blue arrow shows that all the numbers to the left of 6 are also solutions.

*Lesson 15—Solutions of Equations and Inequalities--Helpful Hints

*Today students will use what they know about solving equations to find solutions of equations and inequalities. Multiple skills were taught today to solve equations and inequalities. Examples of each are shown below:

Example 1: Checking for Solutions

Evaluate $7x - 1$ for $x=11$ and then check for solutions

$7(11) - 1 =$
$77 - 1 = 76$

Is $x = 11$ a solution of:

$7x - 1 = 83$? NO! Because $7x-1$ for $x=11$ is 76 and 76 does not equal 83
$7x - 1 < 83$? YES! Because $7x-1$ for $x=11$ is 76 and 76 is less than 83
$7x - 1 > 83$? NO! Because $7x-1$ for $x=11$ is 76 and 76 is NOT greater than 83

Example 2: Variable on Both Sides

Evaluate $3x + 6$ for $x=0$

$3(0) + 6 =$
$0 + 6 = 6$

Evaluate $7x + 4$ for $x=0$

$7(0) + 4 =$
$0 + 4 = 4$

Is $x = 0$ a solution of:

$3x + 6 = 7x + 4$? NO! Because $3x + 6 = 6$ and $7x + 4 = 4$ and 6 and 4 are not equal
$3x + 6 < 7x + 4$? NO! Because $3x + 6 = 6$ and $7x + 4 = 4$ and 6 is NOT less than 4
$3x + 6 > 7x + 4$? YES! Because $3x + 6 = 6$ and $7x + 4 = 4$ and 6 is greater than 4

Example 3: Solve by Making the Sides Equal

To solve $2x + 6 = 8 + 6$, you might reason like this:

Both sides have two terms. On both sides, one of the terms is 6. For the sides to be equal, the other terms must be equal. So, $2x$ must be equal to 8, which means $x = 4$.

You can use substitution to check the solution.

$$\begin{aligned} 2x + 6 &= 8 + 6 \\ 2(4) + 6 &= 8 + 6 \\ 8 + 6 &= 8 + 6 \\ 14 &= 14 \end{aligned}$$

The sides of the equation are equal, so $x = 4$ is the solution.

*Lesson 16—Addition and Subtraction Equations--Helpful Hints

*Today students learned how to add and subtract equations by using the inverse (opposite) operation to solve as well as how to solve with algebra tiles and how to maintain equivalent expressions. Examples of each is shown below:

Example 1: Use Inverse Operations

*Students learned how to use an **inverse operation** to write a related equation

$$x + 9 = 20$$

Step 1-THINK...what is the inverse (opposite) of addition? Subtraction!

Step 2- Subtract 9 from both sides

Step 3- Subtracting 9 from the x + 9 side of the equation will cause it to become just x

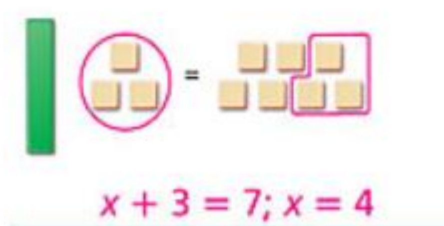
Step 4- Subtracting 9 from the 20 side of the equation will create the problem 20-9 which is 11

Step 5- Solve for x x=11

$$\begin{aligned} x + 9 &= 20 \\ -9 \quad & \;\; -9 \\ \mathbf{x} &= \mathbf{11} \end{aligned}$$

Example 2: Solve with Algebra Tiles

Write and solve the equation each model represents. Circle the tiles you remove from both sides.



HINT: Students were taught to use a line to represent x and a square to represent 1 whole.

Example 3: Maintain Equivalent Operations

Write and solve the equation each balance represents.

Step 1: Students will use the inverse (opposite) operation to solve for x

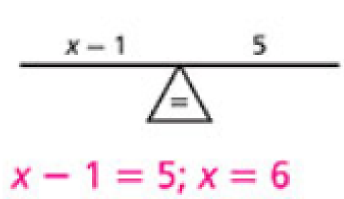
Step 2: THINK...what is the inverse (opposite) of subtraction? Addition!

Step 3- Add 1 to both sides

Step 3- Adding 1 from the x - 1 side of the equation will cause it to become just x

Step 4- Adding 1 from the 5 side of the equation will create the problem 1 + 5 which is 6

Step 5- Solve for x x=11



Example 4: Solve the Equation

x – 3 = 3

Step 1: Students will use the inverse (opposite) operation to solve for x

Step 2: THINK...what is the inverse (opposite) of subtraction? Addition!

Step 3- Add 3 to both sides

Step 3- Adding 3 from the x - 3 side of the equation will cause it to become just x

Step 4- Adding 3 from the 3 side of the equation will create the problem 3 + 3 which is 6

Step 5- Solve for x x=6

*Lesson 17—Multiplication and Division Equations--Helpful Hints

*Today students will use the knowledge from yesterday's lesson about addition and subtraction equations and apply it to multiplication and division equations. The same type of problems from yesterday's learning, were shown today but with multiplication and division relationships rather than addition and subtraction. Examples of each is shown below:

Example 1: Use Inverse Operations

*Students learned how to use an **inverse operation** to write a related equation

$$2x = 18$$

Step 1-THINK...what is the inverse (opposite) of multiplication? Division!

Step 2- Divide each side by 2

Step 3- Dividing the first side of the equation by 2 will create the problem 2 ÷ 2 which will leave that side as just x

Step 4- Dividing the second side of the equation by 2 will create the problem 18 ÷ 2 which will equal 9

Step 5- Solve for x x=9

$$2x = 18$$
$$\div 2 \quad \div 2$$
$$\mathbf{x = 9}$$

$$x \div 5 = 5$$

Step 1-THINK...what is the inverse (opposite) of division? Multiplication!

Step 2- Multiply each side by 5

Step 3- Multiplying the first side of the equation by 5 will leave that side as just x

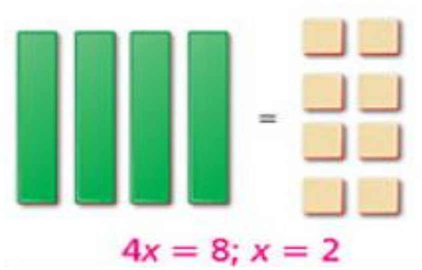
Step 4- Multiplying the second side of the equation by 5 will create the problem 5 x 5 which will equal 25

Step 5- Solve for x x=25

$$x \div 5 = 5$$
$$\times 5 \quad \times 5$$
$$\mathbf{x = 25}$$

Example 2: Solve with Algebra Tiles

Write and solve the equation each model represents.



HINT: Students were taught to use a line to represent x and a square to represent 1 whole.

Example 3: Solve the Equation

$$6x = 18$$

Step 1: Students will use the inverse (opposite) operation to solve for x

Step 2: THINK...what is the inverse (opposite) of multiplication? Division!

Step 3- Divide each side of the equation by 6

Step 3- Dividing 6x by 6 will create the problem 6÷ 6 which will leave that side as just x

Step 4- Dividing 18 by 6 will create the problem 18÷ 6 which will leave that side as just 3

Step 5- Solve for x x=3