HIS VESSEL

Algebra 1

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His Vessel

Algebra 1

By Mary Carroll

"You are God's Holy Vessel." 1 Corinthians 3:16

Based on Ohio State Standards

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Table of Contents

Unit 1 Expressions 8

Lesson 1.1 - Rational vs. Irrational Numbers 9

Lesson 1.2 - Combining Like Terms 15

Lesson 1.3 – Evaluating Expressions 21

Lesson 1.4 - Math in Words Part 1 28

Lesson 1.5 – Writing Expressions & Scientific Notation 33

Lesson 1.6 - Math in Words Part 2 39

Unit 1 Project – Ezra 2 47

Unit 1 You Try Answers. 49

Unit 2 Equations 50

Lesson 2.1 - One-step Equations 51

Lesson 2.2 - Multi-step Equations 58

Lesson 2.3 - Ratios & Proportions 63

Lesson 2.4 - Introduction to Inequalities 71

Lesson 2.5 - Writing Equations 76

Lesson 2.6 - Compound Inequalities 82

Lesson 2.7 - Percentages 88

Unit 2 Project 95

Unit 2 You Try Answers 99

Math in Words Chart for Unit 2 101

Unit 3 - Introduction to Functions 102

Lesson 3.1 - Converting Units 103

Lesson 3.2 - Domain & Range 108

Lesson 3.3 - Modeling Functions 116

Lesson 3.4 - Literal Equations 123

Lesson 3.5 - Arithmetic Sequences 129

Lesson 3.6 - Function Notation 136

Unit 3 Project – Golden Statue 143

Unit 3 Project – Golden Statue 143

You Try Answers Unit 3 145

Unit 4 Introduction to Graphing 147

Lesson 4.1 - Graphing with a Table 148

Lesson 4.2 - Standard Form 157

Lesson 4.3 - Slope Formula 165

Lesson 4.4 - Slope Intercept Form 174

Lesson 4.5 - Parallel & Perpendicular Lines 181

Unit 4 Project – Golden Statue Part 2 191

Unit 4 - You Try Answers 192

Unit 5 Graphing 196

Lesson 5.1 - Linear Forms 197

Lesson 5.2 - Writing the Equation of a Line 202

Lesson 5.3 - Linear Equation Word Problems 209

Lesson 5.4 - Adding & Subtracting Scientific Notation 216

Lesson 5.5 - Graphing Inequalities 221

Lesson 5.6 - Direct Relations 228

Unit 5 Project – Crossing the Red Sea 238

Unit 5 - You Try Answers: 239

Unit 6 Statistics 241

Lesson 6.1 - Scatter Plots 242

Lesson 6.2 - Line of Best Fit 250

Lesson 6.3 - Residuals 257

Lesson 6.4 - Central Tendencies 262

Lesson 6.5 - Different Graphs 267

Lesson 6.6 – Introduction to Probability 277

Lesson 6.7 - Probability 285

Project Unit 6 – Bread of Life 295

Unit 6 You try Answers 298

Unit 7 Systems of Equations 301

Lesson 7.1 - Solving Systems of Equations by Graphing 302

Lesson 7.2 - Solving Systems of Equations by Elimination 308

Lesson 7.3 - Solving Systems of Equations by Substitution 315

Lesson 7.4 - Solving Systems of Inequalities 321

Lesson 7.5 - Solving Systems of Equations Word Problems 329
Unit 7 Project – The Great Flood 338
Unit 7 You Try Answers 341
Unit 8: Exponents 343
Lesson 8.1 – Exponent Rules 344
Lesson 8.2 – Exponent Rules 351
Lesson 8.3 – Adding & Subtracting Radicals 358
Lesson 8.4 – Multiplying Radicals 364
Lesson 8.5 – Geometric Sequences 372
Unit 8 Exponent Project – Jesus Feeds the Multitudes 379
Unit 8 - You Try Answers 381
Unit 9 - Exponential Functions 382
Lesson 9.1 – Introduction to Exponential Functions 383
Lesson 9.2 – Graphing Exponential Functions 390
Lesson 9.3 – Pythagorean Theorem 396
Lesson 9.4 –Compound Interest 403
Lesson 9.5 – Exponential Functions in Words 410
Unit 9 Project – Growth and Decay of the Israelite's Population 417
Unit 9 - You Try Answers 419
Unit 10 - Quadratics 421
Lesson 10.1 - Adding and Subtracting Polynomials 422
Lesson 10.2 - Multiplying Polynomials 428
Lesson 10.3 - Foiling Perfect Squares 434
Lesson 10.4 - Factoring by Grouping 441
Lesson 10.5 - Solving Quadratic Equations by Factoring 447
Lesson 10.6 - Real World Quadratic Equations 453
Lesson 10.7 – Factoring & Completing the Square 461
Unit 10 Project – The Temple of God 468
You Try Answers for Unit 10 471
Unit 11 - Parent Functions 473
Lesson 11.1 – Characteristics of Quadratic Graphs 474
Lesson 11.2 – Parent Functions 481
Lesson 11.3 – Transformations of Functions 491
Lesson 11.4 – Basic Transformations 498
Lesson 11.5 – Radical & Absolute Value Functions 505
Lesson 11.6 - Distance & Midpoint Formulas 512
Project – Paul's Travels 518
Unit 11 - You Try Answers 521
Glossary 524
Answer Key 533
References 557

Thank You to:

My mother, Joyce, and sister in law, Marsha Carroll for editing. Irene Harden for editing. Judy Ebbing for encouraging me. Cherie Sullivan and her kids, my nieces and nephews, Cianna and Erina, for typing answer keys and editing. Cecilia Wilhelmy for typing many answer keys as well. Patrick Sullivan for all the late-night talks about the projects. My mom and dad, who believed in me even when I was young and knew I could do great things with God. My three wonderful children, Mark, Chris, and Rachael (and their spouses) and three grandchildren, Hayley, Jackson, and Andrew who inspired me in many of my God moments. My wonderful understanding husband, Daniel Carroll, who did all the housework while I hid in my office and wrote. Without these wonderful Christian family members, I would not have been able to complete this book.

I dedicate this book to my dad. He would have been very proud: Robert Sullivan 1937 - 2020

Unit 1: Expressions

Unit 1 Expressions 8

Lesson 1.1 - Rational vs. Irrational Numbers 9

Lesson 1.2 - Combining Like Terms 15

Lesson 1.3 – Evaluating Expressions 21

Lesson 1.4 - Math in Words Part 1 28

Lesson 1.5 – Writing Expressions & Scientific Notation 33

Lesson 1.6 - Math in Words Part 2 39

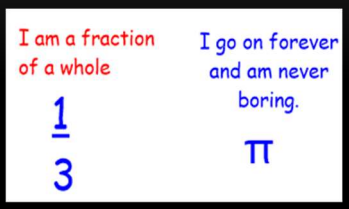
Unit 1 Project – Ezra 2 47

Unit 1 You Try Answers. 49

Lesson 1.1 – Rational vs. Irrational Numbers

A God Moment

"For the foolishness of God is wiser than human wisdom, and the weakness of God is stronger than human strength" 1 Corinthians 1:25



What the world sees as rational is limited thinking. It's finite logic- what they think is irrational- God's unfailing love is irrational to them because it's infinite and doesn't end. God's love for us defies all rational thought. It just doesn't make logical sense to die for someone that hasn't been born yet. But God in His infinite wisdom loves you irrationally by the world standards. An irrational number is infinite and doesn't repeat. There is no worldly understanding of something that goes on infinitely. We, as humans, are looking for the end, but we will never comprehend eternity without Jesus.

Objectives for this lesson:

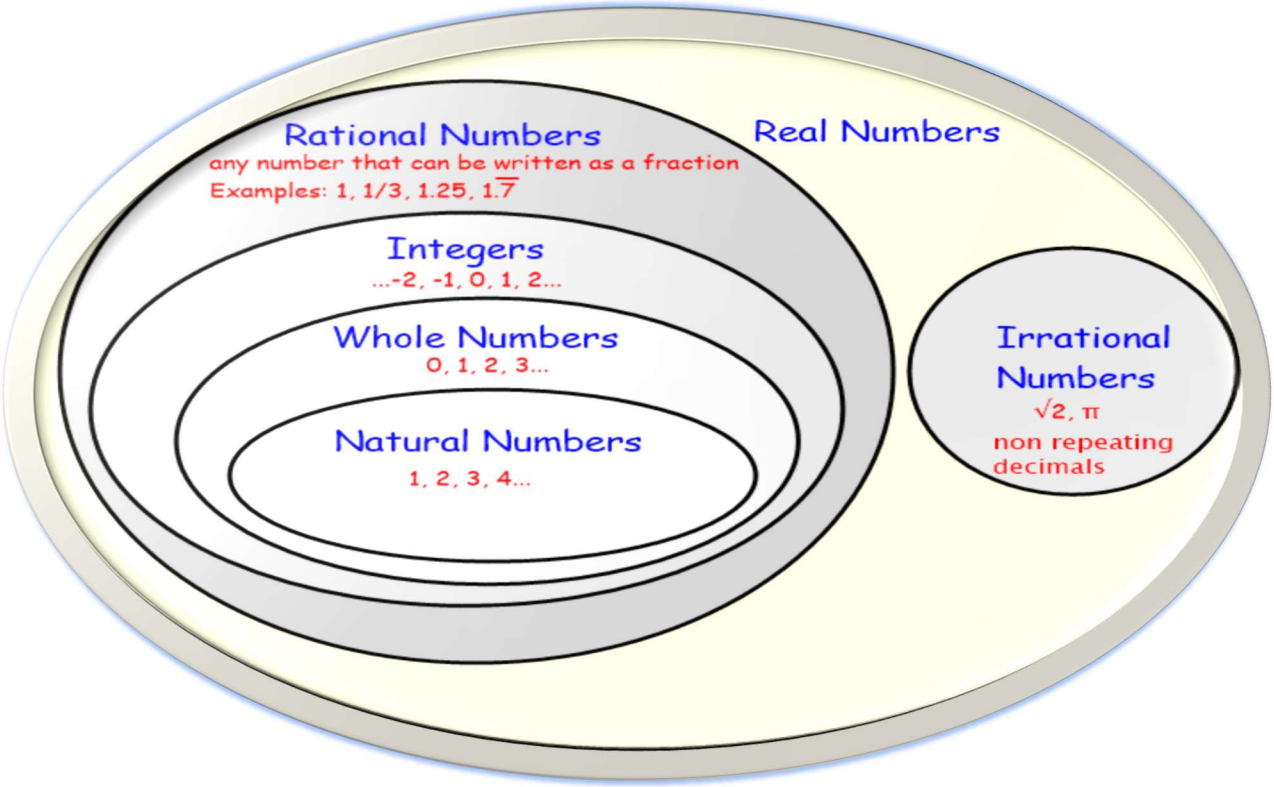
I Can….

- Classify real numbers as rational or irrational.
- Compare and contrast rational and irrational numbers.
- Understand and justify the sum and product of rational and irrational numbers with examples.
- Graph rational and irrational numbers on a number line.
- Identify and solve absolute values.

Vocabulary Terms

- **Absolute value** - How far a number is from zero.[3]
- **Algebra -** uses letters (like x or y) or other symbols in place of values, and then plays with them using special rules.[2]
- **Integers** – The set of whole numbers and their opposites (negatives).
- **Irrational numbers** – Numbers that CANNOT be expressed as a ratio (**fraction**) and when converted to decimals are non-terminating or non-repeating.
- **Natural numbers** – A set of counting numbers excluding zero.
- **Rational numbers** – Numbers that can be expressed as a ratio (**fraction**) and when converted to a decimal are terminating or repeating numbers.
- **Real numbers** – The set of all numbers both rational and irrational.
- **Whole numbers** – A set of counting numbers plus zero.
- **Sets –** A collection or group of things such as numbers.

Helpful Hint: Both Rational and irrational numbers are real numbers. The diagram below shows you how the number terms fit together.



Make it Clear

Rational numbers can be expressed as fractions where irrational numbers cannot be written as fractions.

0.333... is a rational number because it can be written as 1/3.

π is an irrational number; it NEVER stops and NEVER repeats.

It is a non-repeating and non-terminating decimal.

You Try 1:

Which ones are rational numbers (answers at the end of the lesson)?

.25252525 3/4

$\sqrt{6}$ 3.159159159

5/8 $\sqrt{31}$

Characteristics of Rational and Irrational Numbers

Will the **sum** of two rational numbers be rational?

EXAMPLES:

a. $\frac{2}{5}+\frac{5}{8}=\frac{2(8)}{5(8)}+\frac{5(5)}{8(5)}=\frac{16+25}{40}=\frac{41}{40}=1\frac{1}{40}=1.025$

b. $1\frac{3}{16}+2\frac{1}{4}=\frac{19}{16}+\frac{9}{4}=\frac{19}{16}+\frac{36}{16}=\frac{55}{16}=3\frac{7}{16}=3.4375$

Will the **product** of two rational numbers be rational?

EXAMPLES:

a. $\frac{2}{5}*\frac{5}{8}=\frac{2(5)}{5(8)}=\frac{10}{40}=\frac{1}{4}=0.25$

b. $1\frac{3}{16}*2\frac{1}{4}=\frac{19}{16}*\frac{9}{4}=\frac{171}{64}=2\frac{43}{64}=2.671875$

Will the **sum** of a **rational number** and an **irrational number** be rational or irrational?

EXAMPLES:

a. $\frac{3}{4}+\pi=0.75+3.141592\ldots=3.891592\ldots$

b. $19+\sqrt{8}=19+2.82842\ldots=21.82842\ldots$

Will the **product** of a **rational number** and an **irrational number** be rational or irrational?

EXAMPLES:

a. $\frac{3}{4}*\pi=0.75*3.141592\ldots=2.356194\ldots$

b. $19*\sqrt{8}=19*2.82842\ldots=53.74011\ldots$

If you **subtract** a **rational number** and an **irrational number**, will the answer be rational or irrational?

EXAMPLE:

a. $\frac{3}{4}-\pi=0.75-3.141592\ldots=-2.391\ldots$

b. $19-\sqrt{8}=19-2.82842\ldots=16.17157\ldots$

If you **divide** a **rational number** and an **irrational** number, will the answer be rational or irrational?

EXAMPLE:

a. $\frac{3}{4}\div\pi=0.75\div3.141592\ldots=0.2387\ldots$

b. $19\div\sqrt{8}=19\div2.82842\ldots=6.71751\ldots$

Review

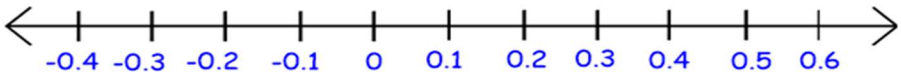
Things to Remember
rational + rational = rational
rational – rational = rational
rational x rational = rational
rational ÷ rational = rational
rational + irrational = irrational
rational - irrational = irrational
rational x irrational = irrational
rational ÷ irrational = irrational

Example 1

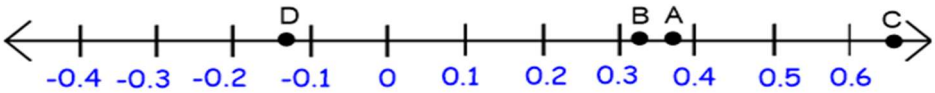
Find the rational numbers on a number line.

a. $\frac{3}{8}$
b. 0.335
c. 0.666...
d. -0.13

Step 1: Label your number line accordingly.



Step 2: If the number is a fraction, it might be easier if you turn it into a decimal. Label your number line with A - D.



Absolute Value – Means NO Negatives. Isn't it wonderful that God loves you so much that He sees your Absolute Value through Jesus Christ? You have Absolute Value!!!

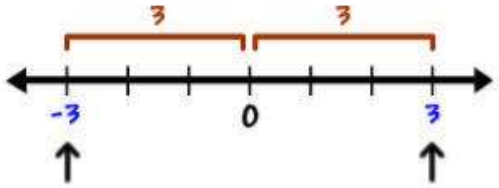
Example 2

Absolute Value

Example: |-3| = 3 & |3| = 3

You can think of absolute value as miles traveled. Can you go -3 miles? Even if you drive backward, the odometer in your car is still climbing. The absolute value is the distance traveled from a point on the number line. It goes in the positive and negative direction.

Let's look at it on a number line.
The distance is 3 from 0.



You can move three units in both the positive and negative direction from zero. You will always have a positive answer to the absolute value.

Family Activity

Compare the terms rational and irrational. The most famous irrational number is pi. So, in celebration of this lesson, make a pie. Explain the importance of 3.14 that never ends; we are like the pi. If we are Christians, we will live eternally in heaven because of what Jesus did for us. Now celebrate His gift by eating pi. (March 14 is pi day)

"For I am sure that neither death nor life, nor angels nor rulers, nor things present nor things to come, nor powers, nor height nor depth, nor anything else in all creation, will be able to separate us from the love of God in Christ Jesus our Lord"
Romans 8:38-39

Practice Problems 1.1 – Rational vs. Irrational Numbers

Determine if the number is Rational or Irrational, if rational, is it integer, whole, &/or natural number?

Ex: $\frac{21}{5}$ rational number

1. $\sqrt{25}$
2. 89.396668….
3. 61π
4. 12.253
5. -1.353535…
6. 2x + 3 (x is a natural number)
7. 2x + 3 (x is an irrational number)
8. Name one thing that is the same, and one thing that is different between a rational and an irrational number.

Where is the rational or irrational number on the number line?

9. $\frac{2}{3}$
10. $\sqrt{7}$
11. $-0.\overline{3}$
12. $-2\sqrt{5}$
13. $-|-3|$
14. $|-4|$

Solve and state whether rational or irrational.

15. $\frac{3}{5} + 6.285$
16. $\frac{6}{7} + \frac{8}{14}$
17. $\sqrt{2} + 5$
18. $\frac{1}{2} + \sqrt{4}$

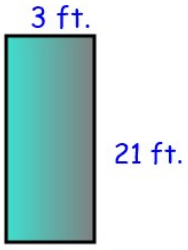
Review

Solve the following numeric expressions.

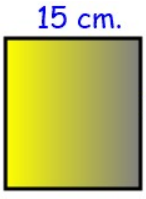
19. 4.23 (-|2.3|)
20. -5.24 (-12.2)
21. -0.325 + |-9.267|
22. 1.2 ÷ 0.24

Find the area of the following shapes.

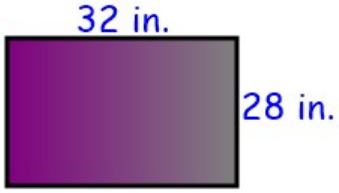
23. Rectangle



24. Square



25. Rectangle



Lesson 1.2 – Combining Like Terms

A God Moment

"This service that you perform is not only supplying the needs of the Lord's people but is also overflowing in many expressions of thanks to God." 2 Corinthians 9:12

We all have to learn to express ourselves. It doesn't mean it's who you end up becoming. We want to express ourselves, though, so we glorify God. When we do his work, we express our thanks to Him.
An expression doesn't have an answer, so there are no equal signs. We combine many instructions God gives us into our lives. Combining like terms is like combining like instructions. Noah was given instructions to design an ark; Aaron was given instructions on how to make his breastplate. These are two different units; Noah's Ark is in cubits and Aaron's breastplate is in span. You can't add cubits (c) and span (s) together. You can only combine the cubits, then the spans. Combining like terms is a lot like that. You want to only combine things that are exactly the same units.

Objectives for this lesson:

I Can…

- Determine the coefficient of a term.
- Determine the number of terms.
- Simplifying terms.
- Combine like terms.
- Find the algebraic expression for the perimeter of a shape.

Vocabulary Terms

- **Algebraic expressions -** Numbers, symbols, and operators (such as + and ×) grouped together that show the value of something.**[4]**
- **Coefficient -** The number in front of the variable.
- **Constant –** The parts of algebraic expressions that do not change.
- **Expressions –** A mathematical phrase without an equal sign.
- **Like terms -** Terms whose variables (such as x or y) with any exponents (such as the 2 in x^2) are the same.**[1]**
- **Numerical expression –** Numbers and operators (such as + and ×) grouped together that show the value of something. No variables are in the expression.**[4]**
- **Terms -** An expression is composed of one or more terms. Terms are separated by +, -, or = sign.
- **Variable -** Symbols, usually letters, which represent numbers.

Helpful Hint:

There are two types of expressions.

1. Numerical expressions have NO variables.
2. Algebraic expressions have variables.

Example of a Numerical Expression: $5^2 + 10$

Example of an Algebraic Expression: $4a^2 + 7$

Example 1

Simplify the following term and determine the coefficient.

5p7y3z

Step 1: Separate the coefficients from the variables.

(5•7•3) (pyz)

Step 2: Multiply the coefficients.

105pyz

The coefficient is 105

You Try 1:

Simplify the following term.

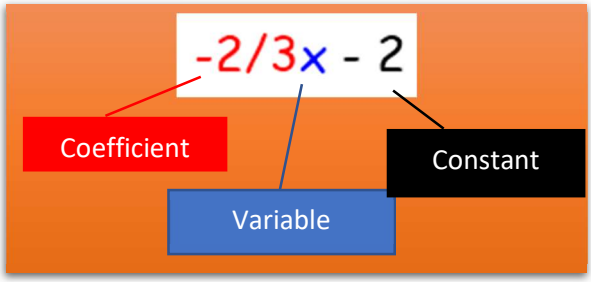
1. 2w3y8z
2. 0.63r0.42y
3. ½ a4b3c
4. $2y\frac{2}{3}$

Make it Clear

A **Coefficient** is the number in front of the variable.

The **Variable** is the letter in the expression; it represents a number.

A **constant** is a number without a variable.



Group the exact same

Like Terms	$3x$ and $2x$	w and $\frac{w}{7}$	5 and 1.8
Unlike Terms	$5x^2$ and $2x$	$6a$ and $6b$	3.2 and n
	The exponents are different.	*The variables are different*	*Only one term contains a variable*

Make it Clear

When ***combining like terms*** look for **LIKE variables.**

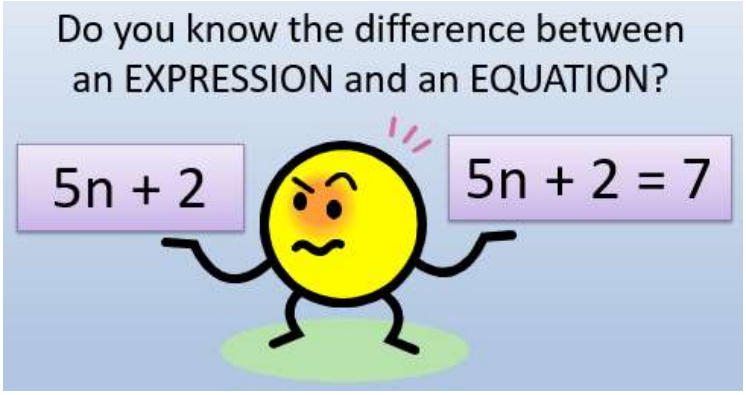
You can't combine anything unless the variables are **exactly alike**.

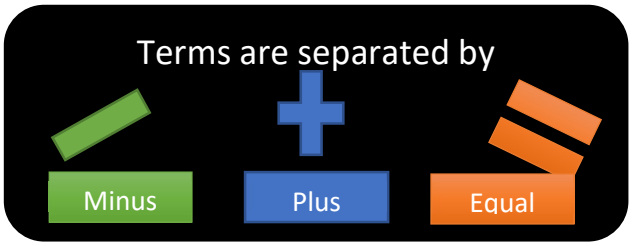
Example:

$7y^2 + 3y^2 = 10y^2$

You will notice that **ONLY** the coefficients are combined.

An expression doesn't have an equal sign, an equation does.





Example 2

Combine like terms, state how many terms are in the expression, and name the coefficients

$3x^2 + 4y - 9 - 3 + 2y - 2x^2$

Step 1: Rewrite the expression, so all variables and constants that are the same are next to each other.

$3x^2 - 2x^2 + (4y + 2y) + (-9 - 3)$

Step 2: Combine like terms.

$x^2 + 6y - 12$

Step 3: The terms are separated by a +, -, and = signs.

This expression has three terms: x^2, 6y and **-12**

Step 4: Coefficients are the numbers in front of the variable.

The coefficients are 1 and 6: -12 is NOT a coefficient but a *constant*.

You Try 2:

Combine like terms and state how many terms are in the expression.

1. $3x^2 + 4x^2 - 6x + 9x$
2. $5m^2 - 9k + m^2 + 8k - 8$
3. $5y^2 + 3x^2 - 2y^2$
4. $6x - 3y + 18 - 12x + 23y$

Example 3

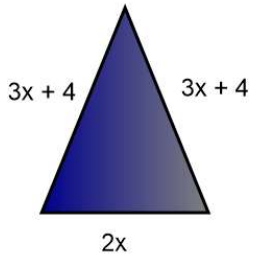
Find the perimeter of the shape.

Step 1: Create an expression.

3x + 4 + 3x + 4 + 2x

Step 2: Combine like terms.

8x + 8



Family Activity

Discussion: Like Terms: How does God see you? How does the world see you? Compare how people are alike and different. Write down one compliment or encouragement to someone you know, then give it to that person. We never praise and encourage each other enough.

Dear friends, now we are children of God, and what we will be has not yet been made known. But we know that when **Christ** appears, we shall be **like** him, for we shall see him as he is.

1 John 3:2

Practice Problems 1.2 – Combining Like Terms

Identify the coefficient for the following terms.

1. 6b5c4d
2. 7q ÷ 9
3. -z
4. 0.08b6c
5. -93p
6. $\frac{5y}{6}$

Multiple Choice:

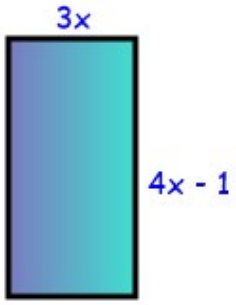
7. $x \div 5$ is an
   a. Algebraic expression with one term.
   b. Numerical expression with one term.
   c. Numerical expression with two terms.
   d. An algebraic expression with a coefficient of 5.

Combine like terms, state how many terms in the expression, and name the coefficients

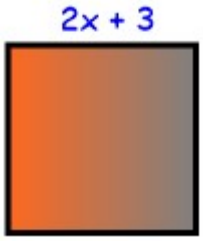
8. $-4h + 6 + 7 - 3h$
9. $7m^2 - m^2 + 3x - 5x + 2x$
10. $22x^2 + 4x^2 + 3x^2 - 5x^2$
11. $2x^2 - 6x + 7x^2 + 5x$
12. $0.36a + 1.36b - 0.9a + 3.648b$
13. $\frac{1}{3}x - \frac{3}{8}y + \frac{2}{9}x - \frac{1}{4}y$

Find the expression for the perimeter of the following shapes.

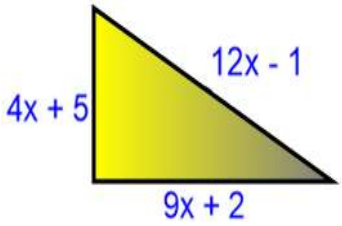
14. Rectangle



15. Square



16. Triangle



Review

Using the distributive property, solve the following expression.

17. $5(6 - 1)$

Solve the following expressions

18. $\frac{12}{13} + \frac{7}{26}$
19. $\frac{5}{14} \bullet 7$
20. $15 \bullet \frac{3}{5}$
21. $\frac{9}{10} - \frac{4}{15}$
22. $\frac{5}{8} \bullet \frac{6}{15} \bullet \frac{2}{10}$
23. $2\frac{1}{3} + 5\frac{4}{5}$
24. $0.35 - 0.21$
25. $9.26 + 12.05$
26. $10.35 - 11.942$
27. $8.0502 + 9.52$
28. $24.961 - 21.86$
29. $14.43 + 16.3$
30. $18.976 - 1.039$
31. $15.02 - 0.96$
32. $0.684 - 0.92$

Lesson 1.3 – Evaluating Expressions

A God Moment

"After the earthquake came a fire, but the Lord was not in the fire. And after the fire came a gentle whisper." 1 Kings 19:12

Evaluating expressions means we are given the answer to our problem, but now we need to use the answer and follow directions. God expresses Himself through His word. We pray, worship, and listen to the Word of God to hear from Him. When we follow His commands and really seek Him, we will find Him, when we seek with all of our hearts. We are always looking for answers, but usually in the wrong places. The world can't give us answers, only He can. God gives us the answers to each of our problems. We just need to listen to his still small voice and follow His commands. This will lead to a correct answer and God's will for your life. In math, if you don't put in the correct number you will not get the correct answer.

We are commanded to follow His instructions.

Objectives for this lesson:

I Can…

- Remember the Properties of Math: Commutative Property, Associative Property, Identity Property, and Distributive Property.
- Substitute values into an expression. Jesus substituted his life for ours. He replaced our sins and washed us so we can be new.
- Evaluate expressions.

Vocabulary Terms

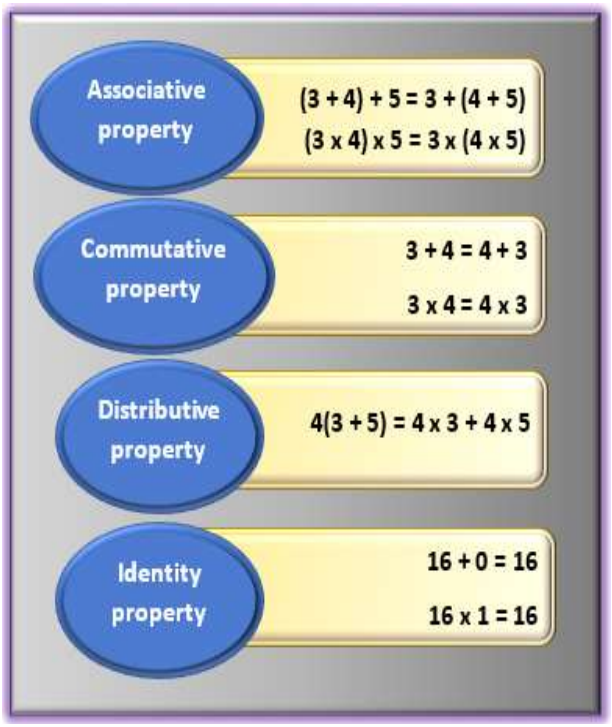
- **Associative property** of addition and multiplication - Grouping numbers or terms and still get the same answer.
- **Commutative property** of addition and multiplication – The numbers or terms can switch places and still get the same answer.
- **Distributive property** - Multiply a number by a group of numbers added together gives you the same answer as to when you do each multiplication separately.
- **Evaluating an expression** - Substitute (replace) a number in place of a variable (letter) and then simplify.
- **Identity property –** Either adding a 0 or multiplying by 1 does not change the number.

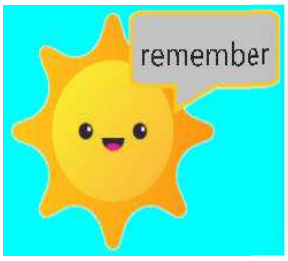
Commutative Property – Commute means to move or change locations. Our God is a moving God. He is asking us to move all the time. God wants to move us closer to Him.

Associative Property - When you associate with God you are grouped with Him. When you associate with people you start to have some of their characteristics. When you associate with God you begin to have more characteristics of God.

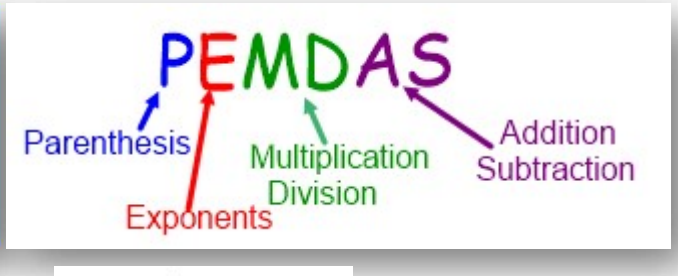
Identity Property - When you don't use your gifts that God has given you, you are not increasing God's glory. You are just handing Him back His gift. So, since you didn't add or multiply what God gave you, you have the same value. The Parable of the Ten Talents - Matthew 25:24-25

Distributive Property - God distributes His love, grace, and mercy to us. We all are loved by God equally. So, remember when you are distributing to make sure every term gets His love. *Galatians 3:28*





Praise
Emmanuel
My
Deliverer
And
Savior



dot = multiplication

Example 1

Distributive Property:

$3(6y - 7)$
$3(6y) - 3(7)$
$18y - 21$

watch your signs

You Try 1:

Use the distributive property to simplify the following expressions

1. 9a + 10(6a - 1)
2. -2n - (9 - 10n)
3. 10 - 5(9n - 9)
4. 23 + 4(5x – 2)

Example 2

Distribute and combine like terms.

9(x + 3) + 5(2x – 4)

Step 1: Distribute both the 9 and the 5.

9x + 27 + 10x - 20

Step 2: Combine like terms.

19x + 7

You Try 2:

Distribute and combine like terms.

1. 4x + 3(5x – 3)
2. -6a – 5(a + 4)
3. 12r + 11(3r – 8)
4. 0.25y – 0.1(y + 22)
5. $\frac{3}{4}x + 3(\frac{5}{12}x - \frac{2}{9})$
6. 9(2w-3) + 2(3w – 4)

Make it Clear

NOTE Anytime there is a number (coefficient) directly attached to a letter (variable), we are multiplying the two together.

Example 3

Distribute and combine like terms with more than one variable.

$-4[3^2(2x + 3) - 33y + 5(6y - 4)]$

Step 1: Using PEMDAS, solve the exponent.

$-4[9(2x + 3) - 33y + 5(6y - 4)]$

Step 2: Distribute the 9 and the 5.

$-4[18x + 27 - 33y + 30y - 20]$

Step 3: Combine like terms inside the parenthesis.

$-4[18x - 3y + 7]$

Step 4: Distribute -4.

$-72x + 12y - 28$

You Try 3:

Distribute and combine like terms.

1. $5x^2 - 2x^2 + 12x - (6x - x)$
2. $5(-5 + 3r) + 28r$
3. $\frac{1}{2}(4x - 8) + 6x - 5$
4. $0.25(0.5x - 0.9) + 3.2x - 5.92$

Make it Clear

When you are asked to **EVALUATE** an expression, you substitute (replace) a number for the variable(s) and then simplify.

How do we Evaluate expressions?

1. Identify the variable(s) in the expression.
2. Substitute the given value(s) for the variable(s).
3. Perform given operations on numbers.
4. Simplify all answers, if possible.

Example 4

Evaluate the expressions, when x = -5 and y = 12.

$0.29(16.2y - 1.9x^2) + 23.4$

Step 1: Substitute x and y.

$0.29(16.2(12) - 1.9(-5)^2) + 23.4$

Step 2: Using PEMDAS solve exponent.

$0.29(16.2(12) - 1.9(25)) + 23.4$

Step 3: Using PEMDAS, solve for multiplication inside the parenthesis.

$0.29(194.4 - 47.5) + 23.4$

Step 4: Using PEMDAS, solve for subtraction inside the parenthesis.

$0.29(146.9) + 23.4$

Step 5: Using PEMDAS, solve for multiplication and addition.

42.601 + 23.4 = 66.001

You Try 4:

Evaluate the expressions if x = -1 and y =3.

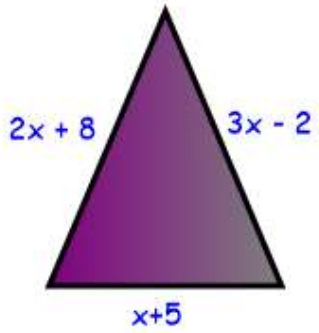
1. $5x^2 - 3(9x - 9)$
2. $\frac{3}{4}\left(12x - \frac{16}{3}\right) + 16.5x$
3. $3(9y - 6) + 8x$
4. $5(2y - 5) + 8y^2 + 7x$

Look to the LORD and his strength;
seek his face always.

1 Chronicles 16:11

Example 5

Find the perimeter of the shape if x = 5.



Step 1: To find the perimeter of a shape, add up all the sides.

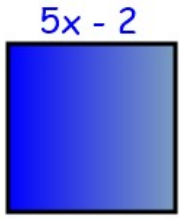
$2x + 8 + 3x - 2 + x + 5$

Step 2: Substitute x = 5.

$2(5) + 8 + 3(5) - 2 + (5) + 5 =$ **41**

You Try 5:

Find the perimeter of the shape if x = 12.



Family Activity

What does substitution mean to you? Share different ways Jesus substituted His life for your life. Evaluating an expression is substituting one number in for the variable. Jesus died on the cross and substituted His life for ours. Let's have some substitution time. Take over a chore that someone else completes: cook dinner or mow the grass. Everyone needs to see that all chores are difficult and we need help to complete them.

Practice Problems 1.3 – Evaluating Expressions

Distribute and combine like terms with more than one variable.

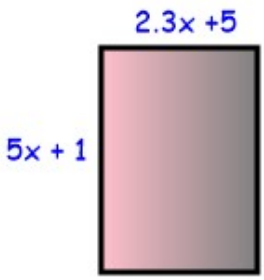
1. 15c – 4(c + 8)
2. 4y (10y – 5)
3. 9(-2 – 3r) + 4r
4. -6(-3z – 4) + 5z
5. 2(4x + 3) – 4
6. -4(-8x – 5) – 8(p + 12)

Evaluate the expressions when x = 6 and y = -9.

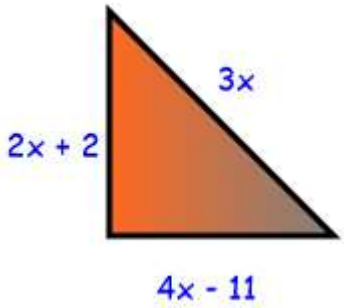
7. 12x - 3(x – 5y) – 13y
8. $6x^2 - 4y^2 – 5x - 6y$
9. 0.26(2.3x – 3.7y) + 6.1x + 17.3y
10. $\frac{2}{5}(5x - 15y) - 12x$
11. 25.2x – 31.9y – 28.3x + 54.3y
12. 26.9(0.6x + 0.8y)

Find the perimeter of the following shapes when x = 5.

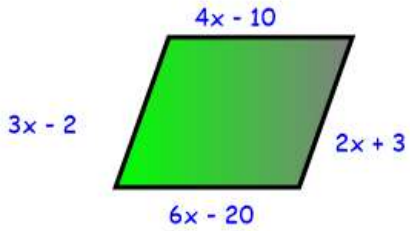
13.



14.



15.



Review

Compare the following terms using <, >, or =.

16. 3.21 _____ 3.2
17. -6.3 _____ -5.1
18. $\frac{12}{17}$ ____ $\frac{6}{11}$
19. 0.48 _____0.56
20. 3.20 _____3.02
21. -0.25 _____-0.26
22. -0.32 _____ -|-0.32|
23. $(-6)^2$ _____ -36
24. -8^2 _____ $(-8)^2$
25. $(0.25)^2$ _____ 0.25

Solve the following expressions using the order of operations.

26. $625 – 3(2 + 5)^2$
27. 153 + 6(5 - |-3|)
28. $(-3)^2 – 2(-5) + 6$
29. $3(10 + 8 – 4)^2$
30. $(-9) – (-7) + 2(3)^2$
31. $(-3)^3 – 2 + 8 \div (-2)$
32. $12(-8) + 6 – (-2)^2$
33. $8 \div (-4)(-6)^2 + 7$
34. $|-10| \div (-5 – (-2)) \bullet (-3)^2$
35. 5 ÷ (23 + 22 – 7)

Lesson 1.4 – Math in Words Part 1

A God Moment

"This is how you are to build it: The ark is to be three hundred cubits long, fifty cubits wide and thirty cubits high" Genesis 6:15

God uses His word to teach us about life, including math. Sometimes it is hard to understand. Think of Noah being told to build a boat. Not just a regular boat but one big enough to hold all the animals. God gave dimensions in words not in equations or blue prints. Think about how often God gave directions to His people in words and not diagrams. He made the ultimate word problems for His people in the Bible. What are the dimensions of the ark? That is math in words.

Objectives for this lesson:

I Can…

- Be able to define expression, terms and coefficients.
- Interpret the real-world meanings of math terms.
- Percentages in words.

Vocabulary Terms
Some of the math in words terms

- **Addition in words -** Plus, add, increase, increase by, some, together, total, perimeter, and, more than, more, and in all
- **Subtraction in words -** Difference, subtract, take away, decrease, decrease by, minus, remain, fewer, less, left, how much more, deduct, fewer than, and less than
- **Multiplication in words -** Multiply, times, of, double, triple, product, in all, total, factor, distribute, and area
- **Division in words -** Quotient, divide, per, share, split, out of, each, between, average, separate, and distribute, and equal parts
- **Parenthesis in words -** The quantity of

Example 1

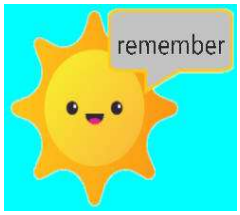
Math Words and What They Mean

A number divided by 7.	$\frac{n}{7}$
4 plus a number.	4 + x
The product of 3 and a number plus 7.	3x + 7
3 less than a number.	X - 3
The quantity of 9 minus h divided by 4.	(9 - h)/4

You Try 1:

Write an algebraic expression for the number sentence.

1. Three times a number.
2. Double a number.
3. The quotient of 5 and a number.
4. A number decreased by 13.



Percent	Fraction	Decimal
20%	$\frac{20}{100}$	0.2
6%	$\frac{6}{100}$	0.06

Percent to decimal - divide by 100 (move 2 decimal places to the left)

Decimal to percent - multiply by 100 (move 2 decimal places to the right)

Example 2

Write a numeric expression for the number sentence, then find the percent.

30% of 230

Step 1: Turn the percent into a decimal.

30% = 0.3

Step 1: Turn the number sentence into numeric expression.

0.3(230)

Step 2: Solve

0.3(230) = **69**

You Try 2:

Write a numeric expression for the number sentence, then find the percent.

1. 25% of 620
2. 22% of 250
3. 5% of 20
4. 80% of 25

Example 3

Write a numeric expression for the number sentence, then find the percent.

120% of 24

Step 1: Change the percent to a decimal.

120% = 1.2

Step 2: Turn the number sentence into numeric expression.

1.2(24)

Step 3: Solve.

1.2(24) = **28.8**

Example 4

Find the Percent

A discount of 35% off	**1X - 0.35x = 0.65x**
A raise of 4%	**X + 0.04x = 1.04x**
A price decrease of 12%	**X - 0.12x = 0.88x**
5% tax on an item. Total cost?	**X + 0.05x = 1.05x**

Family Activity

Name some other places where God explains something in words that would be easier if He just drew up blue prints. Sometimes we think it is easy to explain things in words. Have everyone write out how to make a peanut butter and jelly sandwich. You will need to write out all the steps. Now, give your directions to someone else. They have to do the steps exactly as they are written down. If you forgot to open the jar of peanut butter, then you are not going to make a very good sandwich. Have fun with it and see if anyone can eat the sandwich. You will find it is not as easy to write instructions as you thought.

"The fear of the LORD is the beginning of knowledge,
but fools despise wisdom and instruction."

Proverbs 1:7

Practice Problems 1.4 – Math in Words Part 1

Match the correct algebraic expression to the verbal expression

Algebraic Expressions	Verbal Expressions
1. $x - 18$	a. The quotient of x and 7 plus 18.
2. $\frac{x}{18}$	b. A number from 18.
3. $18(x + 7)$	c. 18 from 7 times a number.
4. $18x - 7$	d. 18 times a number increased by 7.
5. $18 - x$	e. 18 from a number.
6. $2x + 18$	f. 18 times a number and 7.
7. $18x + 7$	g. 18 times seven and the opposite of a number.
8. $7x - 18$	h. The quotient of a number and 18.
9. $\frac{x}{7} + 18$	i. 18 times a number decreased by 7.
10. $18(7 - x)$	j. Two times a number plus 18.

Write a numeric expression for the number sentence, then solve it.

11. 35% of 63
12. 92% of 45
13. 2% of 580
14. 7% of 5
15. 162% of 24
16. 210% of 480

Write an expression for the following numerical sentences on percentages. Simplify the form if possible. Use the given variable.

17. A sweater sale of 35%. (**w**)
18. Hayley gets a 13% raise. (**h**)
19. The bank gives 3% interest if you put your money in a CD. (**b**)
20. A 20% coupon off one regularly priced item. (**R**)

Review

Solve the following expressions and simplify them.

21. $2(3 + 2) - 9$
22. $-4 + 3(6 + 15) - 12^2$
23. $0.64 + 1.2(6 - 0.5)$
24. $-2(x - 8) + 5(-3x - 6)$, evaluate for $x = 5$

Lesson 1.5 - Writing Expressions & Scientific Notation

A God Moment

"I looked, and saw a windstorm coming out of the north - an immense cloud with flashing lightning and surrounded by brilliant light. The center of the fire looked like glowing metal, and in the fire was what looked like four living creatures. In appearance their form was human, but each of them had four faces and four wings" Ezekiel 1:4-6

When given an expression, you need to be able to write it out in words. God gave us instructions in words and it had to be turned into expressions and equations. Ezekiel was given a vision from God while he and the Israelites were exiled in Babylon. He saw the thrown of God and all the incomprehensible creatures that were in heaven. He then had to put that vision into words.

Objectives for this lesson:

I Can…

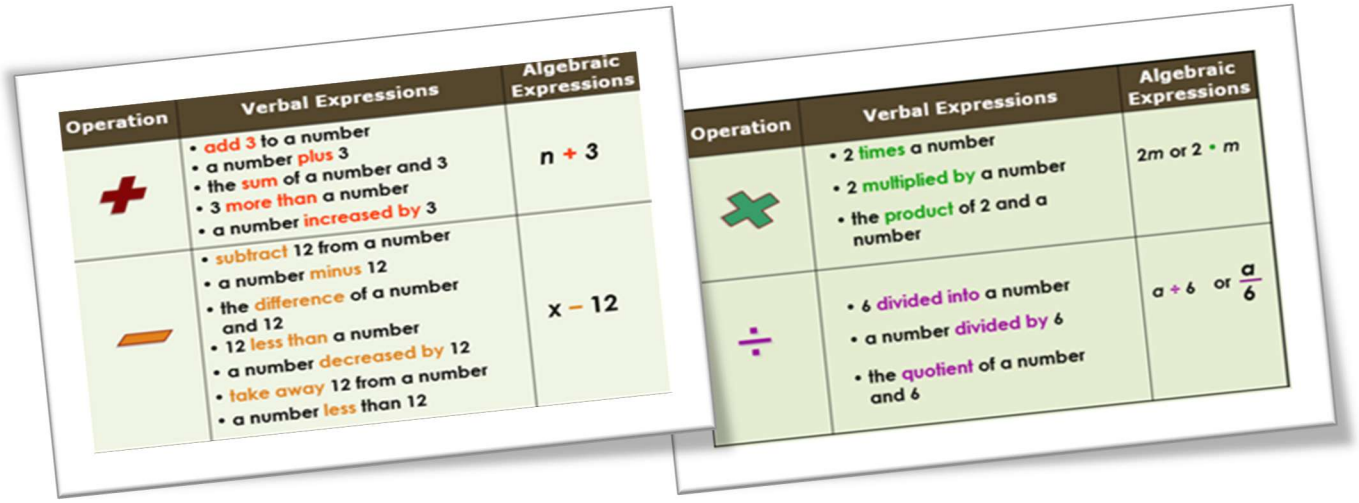
- Determine Key operation words.
- Interpret algebraic expressions and create verbal expressions.
- Practice and create algebraic expressions.
- Write a number in scientific notation.

Vocabulary Terms

- **Scientific notation** – A simpler way of writing a large or small number.
- **Verbal expressions –** A statement that is expressed in words.

Helpful Hint:
Use the algebraic words learned in the previous lesson.

Example: $3x + 4$ ⇨ three times a number plus four.



Operation	Verbal Expressions	Algebraic Expressions
+	• add 3 to a number • a number plus 3 • the sum of a number and 3 • 3 more than a number • a number increased by 3	n + 3
−	• subtract 12 from a number • a number minus 12 • the difference of a number and 12 • 12 less than a number • a number decreased by 12 • take away 12 from a number • a number less than 12	x − 12

Operation	Verbal Expressions	Algebraic Expressions
×	• 2 times a number • 2 multiplied by a number • the product of 2 and a number	2m or 2 • m
÷	• 6 divided into a number • a number divided by 6 • the quotient of a number and 6	a ÷ 6 or $\frac{a}{6}$

Example 1

Write a verbal expression from the algebraic expression.

Algebraic Expressions	Verbal Expressions
25 – x	• Subtract a number from twenty-five • Twenty-five minus a number • The difference between twenty-five and a number • A number less than twenty-five • Twenty-five decreased by a number • Take away a number from twenty-five • Twenty-five less than a number

One algebraic expression can be written in many different ways as a verbal expression.

'The quantity of a number and 5' means parenthesis (). (x + 5)

You Try 1:

Write a verbal expression from the algebraic expression.

1. 6x – 10
2. 9(-x + 9)
3. $\sqrt{c} - 15$

Example 2

Which of the following is the verbal expression that represents x – 5?

a. A number less than five
b. five minus a number
c. A number times five
d. five from a number

Step 1: Eliminate any with the incorrect operation.
Times is a multiplication term: eliminate c.

Step 2: Write out the remaining verbal expressions into algebraic expressions.

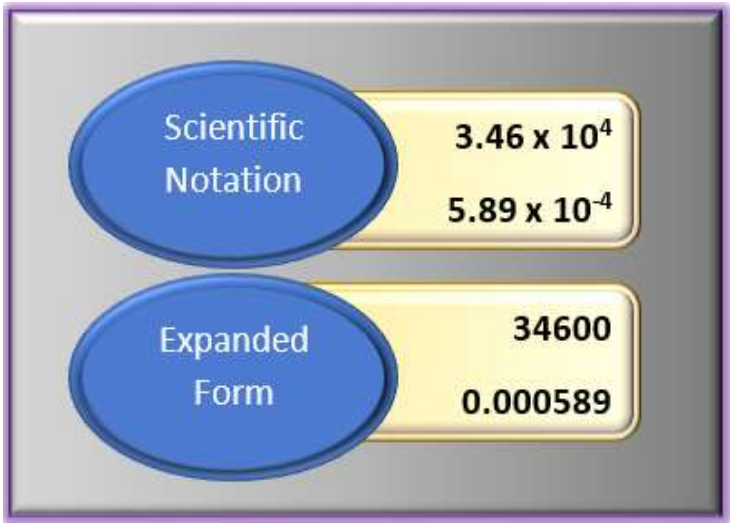
a. 5 – x **b.** 5 – x c. x - 5

You Try 2:

Which of the following is the verbal expression that represents 6x - $\frac{16}{x}$?

a. Six times a number reduced from sixteen and another number.
b. Six times a number reduced from sixteen and the same number.
c. Sixteen and another number reduced from six times a number.
d. Sixteen and the same number reduced from six times a number.

- Scientific notation starts with a numbers 1 – 9
- Has a 10^? To change the decimal place.



Example 3

Scientific Notation

A. Turn 362800.0 to scientific notation.

Step 1: Since scientific notation requires a number between 1-9, count from the decimal to in front of the 6 (5 places).

3.628×10^5

Notice the zeros at the end are not written.

***B.* Turn 0.000301 to scientific notation.**

Step 1: Since scientific notation requires a number between 1-9, count from the decimal to behind the 3, (4 places)

3.01×10^4

Notice the zeros are not written in front, but the zero between the 3 & 1 is kept.

You Try 3:

Change the following numbers into scientific notation.

1. 3,698,000
2. 0.00024

Example 4

Standard/Expanded Form

Positive exponent means move the decimal to the right, just like on a number line.

A. Change 8.3×10^5 to standard form (expanded form).

Step 1: Move the decimal five places to the right to make the number bigger.

$$8.3 \times 10^5 = 830000.$$

Negative exponent means move the decimal to the left.

B. Change 6.1×10^{-7} to standard form.

Step 1: Move the decimal seven places to the left to make the number smaller.

$$6.1 \times 10^{-7} = 0.00000061$$

You Try 4:

Write the scientific notation into standard form.

1. 2.9451×10^3
2. 1.9×10^{-5}

Family Activity

Drawing or computer drawing: Read Ezekiel 1: 4-28, select one of the creatures that are described in Ezekiel 1 and draw or create a computer drawing of what they think it looks like. Once they are finished watch the Bible Project for Ezekiel on YouTube.
https://www.youtube.com/watch?v=R-CIPu1nko8

Practice Problems 1.5 - Writing Expressions

Match the correct algebraic expression to the verbal expression

Algebraic Expressions	Verbal Expressions
1. 4x - 3	a. Four times the quantity of x and 3.
2. $\frac{x+4}{3}$	b. x and 4 divided by 3.
3. 3(x + 4)	c. three take away four times x.
4. 4(x – 3)	d. The quotient of x and 3 decreased by 4.
5. 3 – 4x	e. Four from three times x.
6. 3x - 4	f. X divided by four increased by 3.
7. $\frac{x}{4}+3$	g. Four decreased by three times x.
8. 4 – 3x	h. The product of 4 and x minus 3.
9. $\frac{x}{3}-4$	i. Four times x and -3.
10. 4(x + 3)	j. X increased by four times 3.

Write the following in scientific notation or standard form.

11. 3.28×10^{3}
12. 6.89×10^{6}
13. 8.973×10^{-4}
14. 5.0129×10^{-8}
15. 2,630,000
16. 0.0000825

Review

Simplify the expressions.

17. $\frac{2}{3}+\frac{1}{2}+\frac{2}{4}$
18. $\frac{3}{5}+\frac{1}{2}+\frac{1}{10}$
19. $\frac{4}{11}-\frac{1}{2}+\frac{10}{11}$
20. $\frac{7}{10}\left(\frac{2}{5}\right)$
21. $\frac{3}{16}\left(\frac{4}{9}\right)$
22. $\frac{6}{7}\div\frac{2}{21}$

Lesson 1.6 – Math in Words Part 2

A God Moment

"Whenever Aaron enters the Holy Place, he will bear the names of the sons of Israel over his heart on the breast piece of decision as a continuing memorial before the Lord" Exodus 28:29

In part 1, we talked about how God wrote out His math problems to His people in the Bible. It is amazing how He is willing to communicate with us. He tells Moses and Aaron to make a breast piece for making decisions.

How? He is told to put precious stones on it to represent the 12 tribes of Israel. He is then given a detailed description of how to attach this breast piece to himself.

But why? It was made to remind Aaron when he went into the Holy of Holies of the 12 tribes. For he will always bear the meaning of making decisions and "as a continuing memorial before the Lord." Exodus 28:29 The children of Israel's names were written over his heart, just as Jesus remembers us always and has our names written on His heart.

We see how much God loves us through His Word, written out for us to interpret with the help of the Holy Spirit.

Objectives for this lesson:

I Can…

- Interpret parts of an expression, such as terms, factors and coefficients in terms of the context.

Vocabulary Terms

- **Equivalent** – Two expressions or terms that are equal.
- **Factor –** Any part of an expression that is divisible by the rest of the expression.
    - Example: 3x + 9, where 3 is a factor of this expression.
- **Square root -** A square root of a number is a value that, when multiplied by itself, gives the number.**[5]**
  Example: 4 × 4 = 16, so a square root of 16 is 4.
  Note: (−4) × (−4) = 16, too, so −4 is also a square root of 16.
    - Examples of square roots: $\sqrt{2}, \sqrt{4}$

Example 1

Mark started a business cleaning cars. He charges $2 to make an appointment and an additional $15 per hour.

a. Write an expression to represent how much it would cost after "h" hours.

Step 1: Decide which amount is changing and which amount is not changing.

$15 is per hour, and $2 is a one-time fee.

15h + 2

b. How much would it cost if it took Mark 2 hours to clean your car?

Step 2: Substitute h = 2 into the expression. 15(2) + 2 = **$32**

You Try 1:

Montana is going to the county fair! The admission to the fair is $7.50. She wants to pig out on French fries! A cup of French fries is $3.50.

a. Write an expression to represent how much money Montana will spend at the fair.

b. How much will she spend if she buys 3 cups of French fries?

My dear children, I write this to you so that you will not sin. But if anybody does sin, we have an advocate with the Father—Jesus Christ, the Righteous One.

1 John 2:1

Example 2

Alex has five boxes of candy. Each box has x amount of candy, and he let his five brothers and sisters each have two pieces of candy.

a. Write an expression to represent how many pieces of candy Alex has left.

Step 1: What is your unknown?
How many candies has he left?

Step 2: Determine how many pieces of candy Alex gave to his siblings.
Ten pieces total

Step 3: What operations will you use? Multiplication and subtraction.
5x – 10

b. Each box held eight pieces of candy. How many pieces does he have left?

Step 4: Substitute x = 8 and solve.

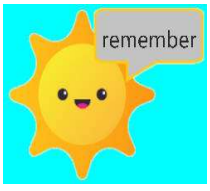
5(8) – 10 = **30**

You Try 2:

The temperature outside is t degrees. The predicted weather for tomorrow is 22 degrees warmer.

a. Write an expression for tomorrow's weather.

b. If today's temperature was 35°, what will tomorrow's temperature be?



When solving expressions that deal with money to round to the nearest cent. $3.269 = $3.27

Example 3

Write the algebraic expression for the percent problem and solve it.

Mrs. Ebbing bought a shirt on sale for 20% off.

a. Write an expression to find out how much Mrs. Ebbing paid for the shirt with an original price of *p*.

Step 1: Turn the percent to a decimal.

20% = 0.2

Step 2: Take the original price and subtract it from the discounted price, then solve it.

1P – 0.2p = 0.8p

b. How much did Mrs. Ebbing pay for the shirt if it cost $15.00?

Step 3: Substitute p = 15 and solve.

0.8(15) = $12.00

You Try 3:

Cole found jeans on sale for 25% off.

a. **Write an expression to find out how much Cole paid for the shirt with an original price of *p*.**
b. **How much did Cole pay for the shirt if it cost $36.00?**

The Distance Formula

d = rt,

where d is distance, r is the rate or speed (per), and t is time.

Example 4

Write the algebraic expression for the percent problem.

Hayley bought bushes for her front yard with a 6.5% sales tax.

a. Write an expression for how much she paid.

Step 1: Change the percent to a decimal.

6.5% = 0.065

Step 2: Determine the operation and variable you will use.

B + 0.065b = 1.065b

b. If the bushes cost $62.21, how much is her total bill?

Step 3: Substitute b = $62.21, then solve. (round to the nearest cent)

1.065(62.21) = $66.25

You Try 4:

You put your money in a savings account that gives you 2.2% interest.

a. **Write an expression on how much you will make if you put in p amount.**

b. **If you put $3,000 into this account, how much will be in your account after the first year?**

Family Activity

Encourage creativity: Create a game (indoor or outdoor) with directions. Write out all the directions and have your family read it. See if they understand how to win. Explain how to play to your family and create any parts needed to play the game, then play the game. Were your directions thorough? Did you need to make up rules as you played? Discuss how it is not easy to write directions.

Practice Problems 1.6 – Math in Words Part 2

Write expressions and evaluate (solve).

1. Rhonda bought a pair of shoes that cost $35.00 and some pairs of socks that cost $8.00 a pair.
   a. Write an expression for the cost of Rhonda's purchases.
   b. If she bought four pairs of socks, how much money did Rhonda spend total?
2. John is saving for a new car. He has deposited $3.500 in a savings account so far. He continues to save $300.00 per month.
   a. Write an expression for the amount of money John saved for any given month.
   b. How much money will John have saved after seven months?
3. Priscilla is buying a new soccer ball. She will also pay a sales tax of 7.5%.
   a. Write an expression to solve for the total cost.
   b. If the ball costs $12.50, then what is Priscilla's total bill?
4. Alexandra traveled to her grandma's house. Her grandma lives 624 miles.
   a. Write an expression to solve for her average speed.
   b. If she drove 16 hours, what was her average speed?
5. Terri had three stringers of fish with x amount of fish on each string. She gave seven fish to her mother.
   a. Write an expression to show how many fish he had left.
   b. If Terri has 12 strings on each stringer, how many fish does she have left?
6. David had four pens of sheep gathered. Each pen held t amount of sheep. From his four pens, he gave sheep to a family in need.
   a. Write an expression to solve how many sheep David still had for his family after giving 12 away.
   b. How many sheep does he have left if each pen has 35 sheep?
7. Alyssa bought x amount of soft drinks that cost $3.00 each, and the other items in her cart cost $24.26.
   a. Write an expression for how much Alyssa spent total in her cart.
   b. How much did Alyssa spend total if she bought three soft drinks?
8. Several people in a classroom form a group with 5 in each group. Once the students formed groups, three remaining students formed 1 group.
   a. Write an expression for the total number of people in the classroom.
   b. If there are four groups, how many are in the classroom?

9. Brad needed a car loan to purchase the car he wanted. He will pay $296.32 each month. His last payment will be $250.30.
   a. Write an expression for how much Bradd will pay for the car.
   b. If Bradd's loan is for five years, how much did Bradd pay for his car?
10. Billy has some change in his pocket: quarters, dimes, and nickels.
   a. Write an expression for the total value of coins in dollars in Billy's pocket.
   b. If Billy has 15 quarters, 12 dimes, and 25 nickels, how much money is in Billy's pocket?
11. Patrick wants to save 15% of his income each week.
   a. Write an expression for the amount he will be saving each week.
   b. If he earns $535.00 per week, how much money will he be saving each week?
12. Daniel wants to buy a new Xbox and some games. The Xbox cost $299.00, and the games cost $19.99 each.
   a. Write an expression for how much he will spend.
   b. If he buys three games, how much will he spend?
   c. If he has to pay a 7.5% sales tax, what is his total bill?
13. The weatherman predicted the temperature would drop 12 degrees tonight.
   a. Write an expression for the predicted temperature for tonight.
   b. If the temperature outside is 10 degrees, what is the predicted temperature tonight?
14. Rachael and 3 of her friends went out to eat. They left a 20% tip.
   a. Write an expression for their total bill with tip.
   b. If their bill was $69.85 without tip, what was their total bill?
   c. If Rachael split the bill evenly between her friends (including tip), what did Rachael spend?

Review

Write a numeric expression for the number sentence, then solve it.

15. 65% of 268
16. 32% of 842
17. 125% of 158
18. 354% of 23

Match the properties to the expression

19. 3 + 8 = 8 + 3	**Identity**
20. 3(x – 2) = 3x – 6	**Commutative**
21. 4 + 0 = 4	**Associative**
22. (6 + x) – 4 = 6 + (x – 4)	**Distributive**

State wheter it is rational vs. irrational.

23. 33.265
24. $\sqrt{4}$
25. $\sqrt{28}$
26. $\frac{6}{7}$

Unit 1 - Check Point

Exponents and square roots

1. 4^2
2. 3^2
3. 15^2
4. $\sqrt{144}$
5. $\sqrt{81}$
6. $\sqrt{169}$

Combining Like terms

7. $3x^2 – 5x + 4x^2 – 7y + 2x$
8. $-6a – 5b^2 + 3 + 4b – 6a + 8b^2 - b$

Evaluate an expression for x = 5, y = -3, and z = -8

9. $3z^2 + 8x – 7y$
10. $6y^2 + 6z$
11. $-|3x| + |6z| - |-2y|$

Translating math sentences into algebraic expressions

12. Five times a number increased by 10.
13. The quantity of a number and 6 times 8.
14. 82% of 186
15. 96% of 652

Translating algebraic expressions into math sentences.

16. $3(x – 4)$
17. $26 – (x + 4)$
18. $\frac{(8-x)}{16}$

Write the following in scientific notation or standard form.

19. 9.5682×10^3
20. 8.0203×10^5
21. 1.73×10^{-4}
22. 4.657×10^{-5}
23. 36,892
24. 0.00004002

Translating real-world problems into algebraic expressions, especially distance = time x rate

25. Nate rode his bicycle to the store. He traveled 12 mph.
    a. Write an expression to solve for his distance traveled.
    b. If the store is 1.3 hours away, how far does he travel?
26. Melissa went to Florida for spring break. She drove 1,122 miles.
    a. Write an expression to solve for how fast she traveled.
    b. If she traveled for 20 hours, what was her speed?

Unit 1 Expressions Project – Ezra 2

Read Ezra 1 and 2 to prepare for this project.

In the first year of Cyrus king of Persia, the Israelites were released from a 70-year punishment that took them from Jerusalem to Babylon. King Cyrus issued a decree that allowed all Israelites to return to Jerusalem and rebuild the temple of God. In his decree (a king's order), he had given the Israelites large amounts of gold, silver, livestock, and many valuable gifts. In today's assignment, we are going to be learning about all the different descendants of the Israelites that returned to Jerusalem.

These are the descendants of the exiles who returned to Jerusalem. Each descendant group gave freewill offerings for rebuilding the temple according to their ability.

Write the expressions in math terms below of how much each descendant group gave to rebuild the temple.
You will need to create variables for each descendant; use the first letter of each descendant as the variable.

Example: What the descendants of Bani gave times three plus six.
3b + 6

1. What the Descendants of Jorah gave increased by ten.
2. Twice what the descendants of Anathoth gave decreased by five.
3. The sum of what the descendants of Bezai and Nebo gave times three.
4. Eighteen from what the descendants of Bigvai gave.
5. The quotient of what the descendants of Harim gave and 8.
6. What the descendants of Jericho gave, squared.
7. Fifteen increased by the square root of what the descendants of Elam gave.

Write the following expressions in words and evaluate the expressions.
Use the descendants in the previous questions to write it in words or use your Bible to find new ones in Ezra 2.

Example: Solve: 6b + 4, if b = 5, then write the expression in words.

Six times what the descendants of Bigvai gave increased by 4

6(5) + 4 = 34

Suggestions:

The descendants of …. gave…
Elam, Jorah, Jaala, Zattu, Zakkai, Hagabah, Hagab, & Harim.

1. Solve 5e, if e = 25, then write the expression in words.
2. Solve 8j-4, if j = 15, then write the expression in words.
3. Solve: 2(z + 5), if z = 7, then write the expression in words. (Look up Ezra 2 to find a descendent that starts with the letter z)
4. Solve h^2, if h = 12, then write the expression in words.
5. If the Israelites traveled 120 days with an average of 7.5 miles per day, about how many miles did they travel?

The tribes returning to Jerusalem were in large numbers and can be written in scientific notation or standard form.
The descendants of the tribe of Parosh numbered 2,172
2.172×10^3

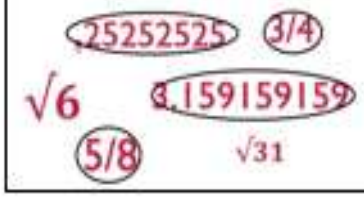
6. The descendants of the tribe of Jorah numbered 112
7. The descendants of the tribe of Hashum numbered 223
8. The male and female slaves numbered 7,337
9. The descendants of the tribe of Immar numbered 1.052×10^3
10. The descendants of the tribe of Nebo numbered 5.2×10^1
11. The donkeys numbered 6.72×10^3
12. The descendants of the tribe of Jedaiah numbered 9.73×10^2

Read all of Ezra to understand the entire project. A great resource is
The Bible Project video on Ezra and Nehemiah
https://www.youtube.com/watch?v=MkETkRv9tG8

Unit 1 You Try Answers.

Lesson 1 – Rational vs. Irrational

You Try 1:



Lesson 2– Combining Like Terms

You Try 1	You try 2
1. 48xyz	1. $7x^2 + 3x$
2. 0.2646xy	2. $6m^2 - k - 8$
3. 6abc	3. $3y^2 + 3x^2$
4. 4/3y	4. -6x + 20y + 1818

Lesson 3 – Evaluating Expressions

You Try 1	You try 2	You try 3	You Try 4	You Try 5
1. 69a – 10	1. 19x – 9	1. $3x^2 + 7x$	1. 59	1. 232
2. 8n – 9	2. -11a – 20	2. 43r – 25	2. 29.5	
3. -45n + 55	3. 45r – 88	3. 8x – 9	3. 55	
4. 20x + 15	4. 0.15y – 2.2	4. 3.325x – 6.145	4. 70	
	5. 2x – 2/3			
	6. 24w - 35			

Lesson 4 – Math in Words Part 1

You Try 1	You try 2
3x	155
2x	55
5/x	1
x - 13	20

Lesson 5 – Writing Expressions & Scientific Notation

You Try 1 (answers may vary)	You try 2	You try 3	You Try 4
1. Ten from six times a number.	d	3.698×10^6	62945.1
2. Nine times the quantity of the opposite of a number plus nine.		2.4×10^{-4}	0.000019
3. The square root of a number reduced by fifteen.			
4. The square of a number divided by five.			

Lesson 6 – Math in Words Part 2

You Try 1	You try 2	You try 3	You Try 4
a. 3.5x + 7.5	a. T + 22	a. P – 0.25p = 0.75p	a. P + 0.022p = 1.022p
b. $18	b. 57°	b. $27	b. $3066

