Unit 1: The Foundational Skills/Building Blocks of Algebra

Essential Question(s):

-How can you represent patterns, quantities, and relationships?

-How are properties related to Algebra?

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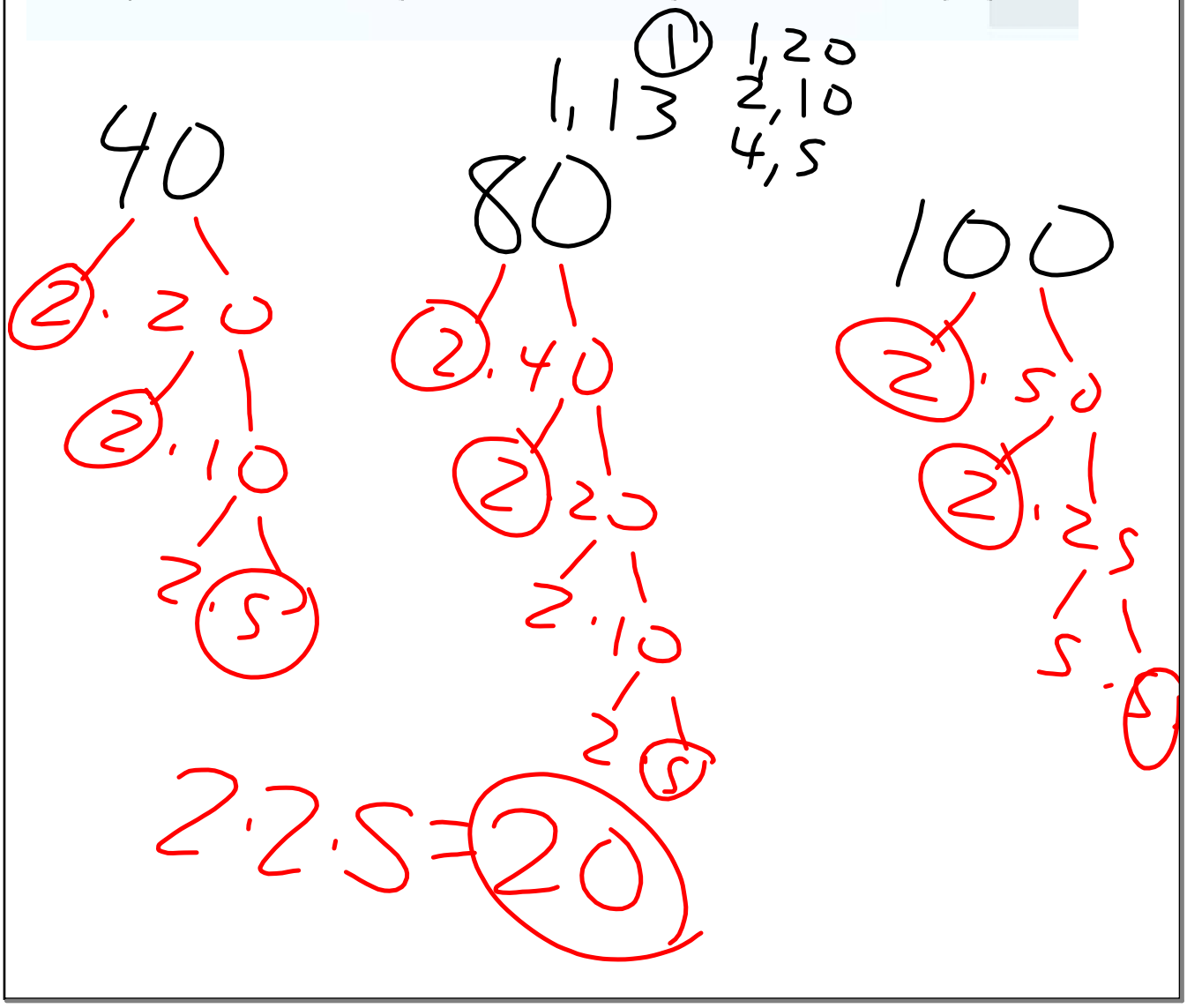
Get Ready!

Factors

Find the greatest common factor of each set of numbers.

1. 12, 18 **2.** 25, 35 **3.** 13, 20 **4.** 40, 80, 100



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Least Common Multiple

Find the least common multiple of each set of numbers.

5. 5, 15 **6.** 11, 44 **7.** 8, 9 **8.** 10, 15, 25

Using Estimation

Estimate each sum or difference.

9. 956 − 542 **10.** 1.259 + 5.312 + 1.7 **11.** $14.32 + $1.65 + $278.05

5
5·1=5
5·2=10
5·3=15
5·4=20
5·5=25
5·6=30

15
15·1=15
15·2=30
15·3=45

8
8
16
24
32
40

48
56
64
72
80

9
9
18
27
36
45
54

63
72
81
90

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Simplifying Fractions

$3x(2y+7)+4n(2y+7)$

Write in simplest form.

12. $\frac{12}{15} \div \frac{3}{3} = \frac{4}{5}$ 13. $\frac{20}{28} = \frac{5}{7}$ 14. $\frac{8}{56} = \frac{1}{7}$ 15. $\frac{48}{52} = \frac{12}{13}$

$(2y+7)(3x+4n)$

Fractions and Decimals

Write each fraction as a decimal.

16. $\frac{7}{10}$ 17. $\frac{3}{5}$ 18. $\frac{13}{20}$ 19. $\frac{93}{100}$ 20. $\frac{7}{15}$

.7 .6 .65 .93

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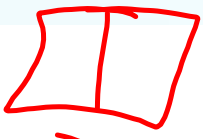
Adding and Subtracting Fractions

$\frac{4}{7}$ power root

Find the sum or difference.

21. $\frac{4}{7} + \frac{3}{14}$ 22. $6\frac{2}{3} + 3\frac{4}{5}$ 23. $\frac{9}{10} - \frac{4}{5}$ 24. $8\frac{3}{4} - 4\frac{5}{6}$



$\frac{2}{2} = 1$

$\frac{8}{14} + \frac{3}{14} = \frac{11}{14}$

Unit 1 Vocabulary Terms:

English:	Spanish:
Additive Inverse	inverso aditivo
Algebraic Expression	expresión algebraica
Coefficient	coeficiente
Equivalent Expressions	ecuaciones equivalentes
Evaluate	evaluar
Integers	números enteros
Like Terms	términos semejantes
Order of Operations	orden de las operaciones
Real Number	número real
Simplify	simplificar
Term	término
Variable	variable

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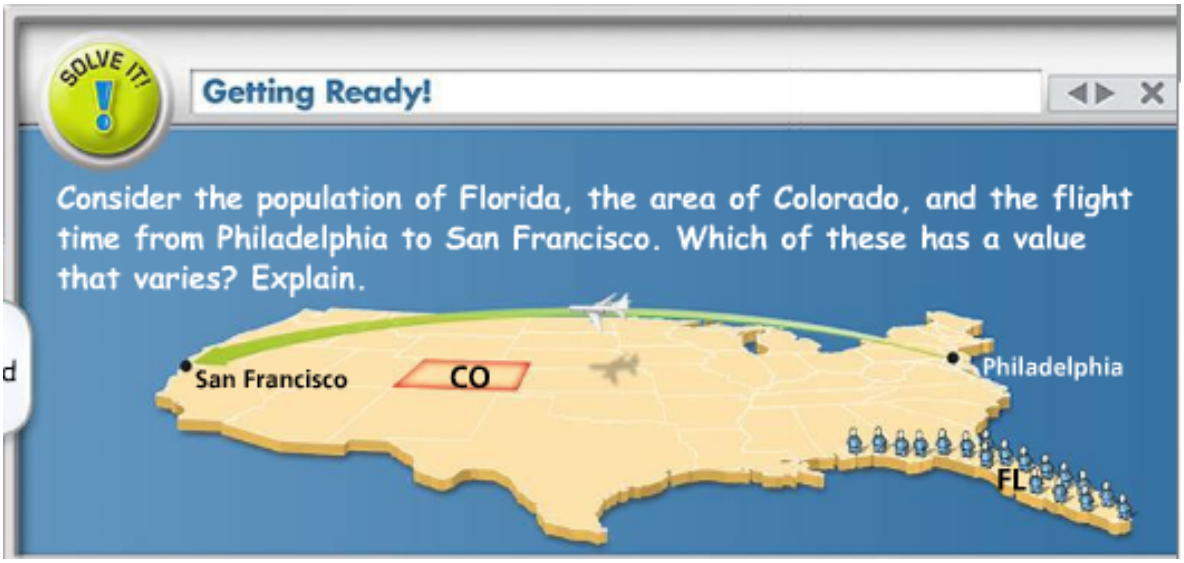
SOLVE IT!
Getting Ready!
Consider the population of Florida, the area of Colorado, and the flight time from Philadelphia to San Francisco. Which of these has a value that varies? Explain.
San Francisco
CO
Philadelphia
FL

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Dynamic Activity
Using Variable Expressions

A mathematical **quantity** is anything that can be measured or counted. Some quantities remain constant. Others change, or vary, and are called *variable quantities.*

Lesson Vocabulary
- quantity
- variable
- algebraic expression
- numerical expression

Essential Understanding Algebra uses symbols to represent quantities that are unknown or that vary. You can represent mathematical phrases and real-world relationships using symbols and operations.

A **variable** is a symbol, usually a letter, that represents the value(s) of a variable quantity. An **algebraic expression** is a mathematical phrase that includes one or more variables. A **numerical expression** is a mathematical phrase involving numbers and operation symbols, but no variables.

Problem 1: Writing Expressions with Addition and Subtraction:

What is an algebraic expression for the word phrase?

Plan
How can a diagram help you write an algebraic expression?
Models like the ones shown can help you to visualize the relationships described by the word phrases.

	Word Phrase	Model
A	32 more than a number n	? over n + 32
B	58 less a number n	58 over n ?

$n - 58$

Got It? 1. What is an algebraic expression for 18 more than a number n?

$n + 18$

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Problem 2 Writing Expressions With Multiplication and Division

What is an algebraic expression for the word phrase?

Think

Is there more than one way to write an algebraic expression with multiplication?
Yes. Multiplication can be represented using a dot or parentheses in addition to an ×.

Word Phrase	Model	Expression
A 8 times a number n	? n n n n n n n n 1+1+1+1+1+1+1+1	$8n$
B the quotient of a number n and 5	n ? ? ? ? ?	$\frac{n}{5}$ $n \div 5$

Got It? 2. What is an algebraic expression for each word phrase in parts (a) and (b)?

a. 6 times a number n $6n$

b. the quotient of 18 and a number n $\frac{18}{n}$

c. **Reasoning** Do the phrases *6 less a number y* and *6 less than a number y* mean the same thing? Explain.

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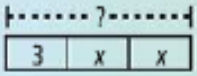
Problem 3 Writing Expressions With Two Operations

What is an algebraic expression for the word phrase?

Word Phrase	Expression
A 3 more than twice a number x	$3 + 2x$
B 9 less than the quotient of 6 and a number x	$\frac{6}{x} - 9$
C the product of 4 and the sum of a number x and 7	$4(x + 7)$

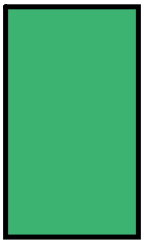
Plan

How can I represent the phrases visually?
Draw a diagram. You can represent the phrase in Problem 2, part (A), as shown below.



Got It? 3. What is an algebraic expression for each word phrase?

a. 8 less than the product of a number x and 4
b. twice the sum of a number x and 8
c. the quotient of 5 and the sum of 12 and a number x



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In Problems 1, 2, and 3, you were given word phrases and wrote algebraic expressions. You can also translate algebraic expressions into word phrases.

Problem 4 Using Words for an Expression

What word phrase can you use to represent the algebraic expression $3x$?

Think

Is there only one way to write the expression in words?
No. The operation performed on 3 and x can be described by different words like "multiply," "times," and "product."

Expression $3x$, $3 \cdot x$ — A number and a variable side by side indicate a product.

Words three times a number x or the product of 3 and a number x

Got It? 4. What word phrase can you use to represent the algebraic expression?

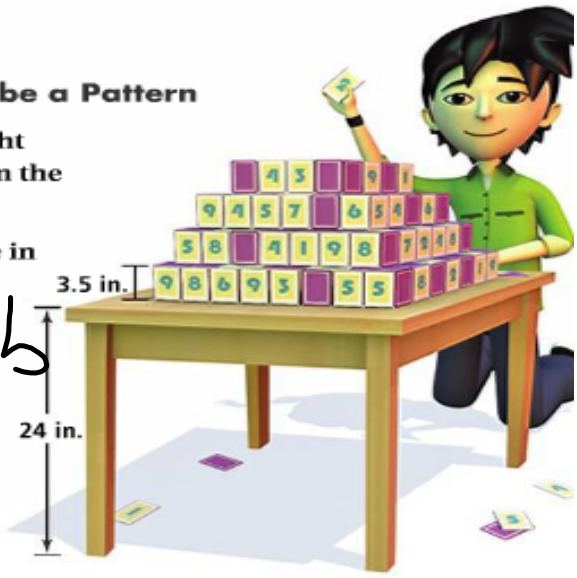
a. $x + 8.1$ **b.** $10x + 9$ **c.** $\frac{n}{3}$ **d.** $5x - 1$

You can use words or an algebraic expression to write a mathematical rule that describes a real-life pattern.

Problem 5 Writing a Rule to Describe a Pattern

Hobbies The table below shows how the height above the floor of a house of cards depends on the number of levels.

A What is a rule for the height? Give the rule in words and as an algebraic expression.



House of Cards

$y = mx + b$

Number of Levels	Height (in.)
2	$(3.5 \cdot 2) + 24$
3	$(3.5 \cdot 3) + 24$
4	$(3.5 \cdot 4) + 24$
n	?

Know
Numerical expressions for the height given several different numbers of levels

Need
A rule for finding the height given a house with n levels

Plan
Look for a pattern in the table. Describe the pattern in words. Then use the words to write an algebraic expression.

Rule in Words
Multiply the number of levels by 3.5 and add 24.

Rule as an Algebraic Expression
The variable n represents the number of levels in the house of cards.

$3.5n + 24$ — This expression lets you find the height for n levels.

B **A group of students built another house of cards that had 10 levels. Each card was 4 inches tall, and the height from the floor to the top of the house of cards was 70 inches. How tall would the house of cards be if they built an 11th level?**

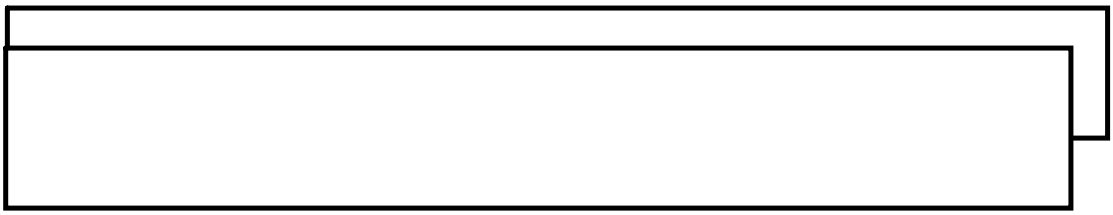
Since each card was 4 inches tall, adding 1 more level would increase the total height of the house of cards by 4 inches.

The house of cards would be 70 + 4, or 74 inches tall if the 11th level were added.

C **Another group of students built a third house of cards with n levels. Each card was 5 inches tall, and the height from the floor to the top of the house of cards was $34 + 5n$ inches. How tall would the house of cards be if the group added 1 more level of cards?**

Since each card was 5 inches tall, adding 1 more level would increase the total height of the house of cards by 5 inches.

The house of cards would be $34 + 5n + 5$ in. tall if the next level were added.



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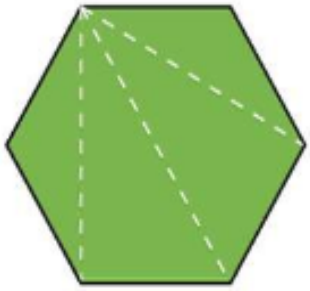
Got It? **5.** Suppose you draw a segment from any one vertex of a regular polygon to the other vertices. A sample for a regular hexagon is shown below. Use the table to find a pattern. What is a rule for the number of nonoverlapping triangles formed? Give the rule in words and as an algebraic expression.



Triangles in Polygons

Number of Sides of Polygon	Number of Triangles
4	4 – 2
5	5 – 2
6	6 – 2
n	■