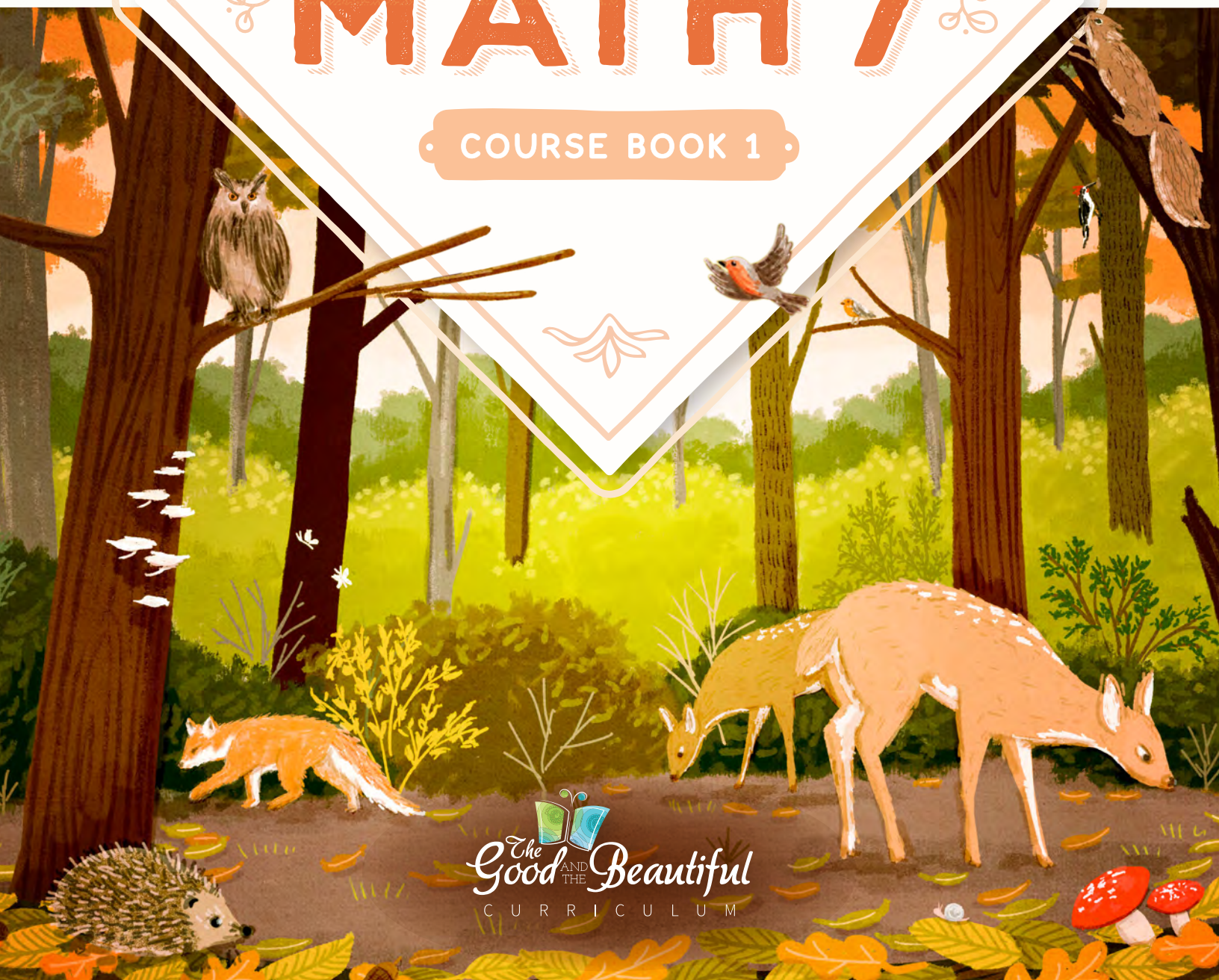
LESSONS
1–30

UNIT
1

Simply Good and Beautiful

MATH 7

COURSE BOOK 1



The Good and the Beautiful
CURRICULUM

COURSE BOOK 1

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About the Course

SUPPLIES NEEDED

- *Simply Good and Beautiful Math 7 Course Books 1, 2, 3,* and *4*
- *Simply Good and Beautiful Math 7 Answers and Solutions*
- *Simply Good and Beautiful Math Scratch Pad* or other scratch paper
- Device to access videos
- Scientific calculator
- 2 standard dice
- Colored pencils and/or crayons
- Highlighter and/or marker
- Tape or glue
- Ruler
- Protractor
- Compass
- Scissors
- String
- Coin
- Paper clip

COURSE OVERVIEW

Math 7 consists of Course Books 1, 2, 3, and 4. There are 120 total lessons divided into four units. Each unit ends with a unit review, assessment, and enrichment activity. The course is designed to be independently completed by the student, but the parent/teacher can choose to be as involved in the lessons as he or she would like.

GETTING STARTED

Simply open the first course book. The student may choose to watch the video lesson or just read the lesson overview if he or she feels confident in the lesson topic. Please note that videos may contain material not included in the written lesson overview. After completing the video and/or lesson overview, the student should complete the lesson practice and review sections.

The parent/teacher should check the student's work daily and provide immediate help and feedback. Students who struggle with the lesson practice should be encouraged to review the lesson overview or video for help.
Note: If printing at home, print pages at actual size.

LESSON DETAILS

Most lessons consist of a warm-up, video lesson, lesson overview, practice, and review.

WARM-UP: An activity that applies to the lesson topic or that reviews mental math skills.

VIDEO LESSON: Detailed teaching and interactive, guided practice of the lesson topic. Videos are about 12–15 minutes in length.

The Good and Beautiful Homeschool app can be used to access and watch the lesson videos. Use the QR code below to access app download information.

Alternatively, the videos can be accessed at goodandbeautiful.com/Math7.

LESSON OVERVIEW: A concise written lesson on the topic.

PRACTICE: Problems dedicated to the lesson topic.

REVIEW: Daily review of topics from previous lessons.

A Reference Chart can be found at the back of each book.

IMPORTANT SAFETY NOTICE

Adult supervision is recommended for all activities as some require sharp objects, heat sources, or small objects that could be a choking hazard for young children.

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Frequently Asked Questions

How many lessons should my student do each week?

- There are 120 lessons in the course. If the student completes four lessons per week, he or she will complete the course in a standard school year with typical breaks for vacation or sickness.

How long do lessons take?

- The average time to complete a lesson is 50–60 minutes. This includes time to watch the video and complete the course book sections.

What if my student does not do well on an assessment?

Each assessment question has a lesson number indicating where the content was first introduced. If your student misses an assessment question, he or she is encouraged to do one or more of the following:

- Reread the corresponding lesson overview.
- Rewatch the corresponding video.
- Complete the extra practice worksheet for the corresponding lesson (available for purchase).
- Rework the problem given the answer. It can be helpful to know the answer when reworking a problem so mistakes can be found.

Do you include any specific doctrine?

- No, the goal of our curriculum is not to teach doctrines specific to any particular Christian denomination but to teach general principles, such as honesty, hard work, and kindness. All Bible references in our curriculum are from the King James Version.

Does my student have to watch the videos?

- The videos contain the bulk of the teaching and are highly recommended. However, if your student feels confident in the topic being taught, he or she can skip the video and read the lesson overview instead. A student who struggles with the lesson practice should be encouraged to go back and watch the video.
- Some families prefer to have the parent/teacher facilitate the lesson using the lesson overview rather than have the student watch the video lesson independently.

Is Math 7 completed independently by the student?

- Yes, Math 7 is designed for your student to complete independently, though at times the student may need parent/teacher assistance to understand a concept. The parent/teacher will need to check the student's work and should do so on a daily basis when possible, providing immediate feedback.

Is Math 7 a spiral or mastery program?

- Math 7 is a spiral course, constantly reviewing concepts your student has learned to ensure understanding and retention of information.

What if there isn't room to complete the work?

- Math 7 is designed to give students room to work in their course book. At times, additional paper may be needed. Students should always keep scratch paper on hand while completing the lessons. The *Simply Good and Beautiful Math Scratch Pad* is available for purchase.

Is a calculator used in Math 7?



- This course is designed to be completed with a scientific calculator on hand for specific problems. Problems that allow the use of a calculator are marked with the calculator icon shown to the left. Any brand of scientific calculator is acceptable. Please note that calculators may vary, and your student is encouraged to read the manual for the specific calculator to understand how it functions.

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Lesson Topics

UNIT 1

1 Writing Decimals, Estimating, and Rounding
2 Upside Down Division and Prime Factorization
3 Simplifying Fractions with Prime Factors
4 Multi-Digit Division
5 Converting Between Fractions and Decimals
6 Adding and Subtracting Integers
7 Multiplying and Dividing Integers
8 Multiplying and Dividing Fractions
9 Complex Fractions
10 Adding and Subtracting Fractions
11 Adding and Subtracting Decimals
12 Multiplying and Dividing Decimals
13 Positive Exponents
14 Negative Exponents
15 Logic Lesson 1
16 Properties of Real Numbers
17 Expanded Notation with Exponents
18 Scientific Notation
19 Operations with Numbers in Scientific Notation
20 Absolute Value and Coordinate Planes
21 Order of Operations: Part 1
22 Order of Operations: Part 2
23 Simplifying Expressions
24 Evaluating Expressions
25 Writing Expressions
26 Writing Equations
27 Solving One-Step Equations
28 Unit 1 Review
29 Unit 1 Assessment
30 Enrichment: Sequences and Series

UNIT 2

31 Set Notation
32 Evaluating Square Roots
33 Solving Two-Step Equations
34 Square Roots and Cube Roots
35 Multi-Step Equations with Negative Coefficients
36 Solving Equations Review
37 Solving for a Variable in Terms of Other Variables
38 Solving and Graphing One-Step Inequalities
39 Solving and Graphing Multi-Step Inequalities
40 Fractions of a Group
41 Ratios and Proportions
42 Solving Ratio Problems: Part 1
43 Solving Ratio Problems: Part 2
44 Rounding Fractions and Mixed Numbers
45 Logic Lesson 2
46 Percentages
47 Percent Increase
48 Percent Decrease
49 Simple Interest
50 Compound Interest
51 Identifying Unit Rates
52 Proportions Within Similar Triangles
53 Metric and US Customary Units
54 Unit Conversions
55 Converting Square Units
56 Operations with Mixed Measures
57 Mixed Review
58 Unit 2 Review
59 Unit 2 Assessment
60 Enrichment: Graph Theory

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UNIT 3

61 Scale Drawings
62 Direct Proportions
63 Inverse Proportions
64 Graphs of Direct Proportions
65 Graphing Using a T-Chart
66 Slope of a Line
67 Slope-Intercept Form
68 Graphing Linear Equations
69 Functions
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71 Triangles
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73 Constructing Angles
74 Constructing Triangles
75 Logic Lesson 3
76 Polygon Diagonals and Angles
77 Finding Polygon Angle Measures
78 Angle Relationships
79 Parallel Lines and Transversals
80 Missing Angles in a Circle
81 Pythagorean Theorem
82 Perimeter of Polygons
83 Area of Polygons
84 Area and Circumference of Circles
85 Composite Figures
86 Inscribed Shapes
87 Mixed Review
88 Unit 3 Review
89 Unit 3 Assessment
90 Enrichment: Circumference and Diameter

UNIT 4

91 Scale Factor with Area
92 Arcs and Sectors
93 Geometric Solids
94 Surface Area of Prisms and Pyramids
95 Surface Area of Cylinders, Cones, and Spheres
96 Surface Area of Composite Solids
97 Volume of Prisms and Cylinders
98 Volume of Other Geometric Solids
99 Polynomials
100 Multiplying Polynomials
101 Simplifying Rational Expressions
102 Factoring Polynomials
103 Populations and Sampling Methods
104 Data Displays: Part 1
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106 Measures of Central Tendency
107 Interpreting Measures of Central Tendency
108 Data Displays: Part 2
109 Scatter Plots
110 Interpreting Graphs
111 Simple Probability
112 Types of Events
113 Sample Space
114 Compound Probability
115 Probability Simulation
116 Unit 4 Review
117 Course Review
118 Course Assessment
119 Enrichment: Patterns with Divisibility
120 Fun with Graphing

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UNIT 1 OVERVIEW

LESSONS 1–30

CONCEPTS COVERED

- Adding and subtracting decimals
- Adding and subtracting fractions
- Adding and subtracting integers
- Applying reasoning to determine validity of answers
- Combining like terms
- Complex fractions
- Converting between fractions and decimals
- Converting between standard form and scientific notation
- Coordinate planes
- Equations with negative numbers
- Estimating and rounding
- Evaluating expressions
- Evaluating expressions with positive exponents
- Evaluating integers raised to negative exponents
- Expanded notation with exponents
- Expressions, constants, and coefficients
- Greatest common factor
- Identifying and writing equations
- Identifying solutions to equations
- Least common multiple
- Multiplying and dividing decimals
- Multiplying and dividing fractions
- Multiplying and dividing integers
- Multiplying and dividing numbers in scientific notation
- Operations with signed fractions and decimals
- Opposites and absolute value
- Prime factorization
- Prime factorization to simplify fractions
- Properties of real numbers
- Simplifying division problems
- Simplifying expressions using the order of operations
- Solving and checking one-step equations
- Terminating and repeating decimals
- Upside down division
- Using absolute value to find horizontal and vertical distances on coordinate planes
- Using calculators
- Writing expressions
- Writing large numbers with digits and words
- Zero as an exponent and base

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UNIT 1 | LESSON 1

Writing Decimals, Estimating, and Rounding

SUPPLIES: colored pencils

WARM-UP

Multiply or divide.

a. $45 \div 15$ b. $16 \bullet 4$ c. $56 \div 8$

LESSON

Use the app to watch the video lesson. Complete problems when instructed during the video in the Video Notes section. Optionally, read the Lesson Overview in place of the video or after the video if more instruction is needed.

App Video

VIDEO NOTES

VOCABULARY

- ***Terminating decimal:*** a decimal number with a _____ number of _____ after the decimal point

  Examples of terminating decimals:

- ***Repeating decimal:*** a decimal number with _____ or _____ digits after the _____ _____ that repeat forever

  Examples of repeating decimals:

Estimate: _____

Exact decimal answer: $4.8 \bullet 0.513 =$ _____

Rounded answer: $4.8 \bullet 0.513 \approx$ _____

Is the answer reasonable based on the estimate? _____

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LESSON OVERVIEW

Terminating and Repeating Decimals

Numbers used in real-world situations are often decimal numbers. There are different types of decimal numbers. Two kinds of decimal numbers are terminating decimals and repeating decimals.

Terminating Decimal

A ***terminating decimal*** is a decimal number with a limited number of digits after the decimal point.

Examples:

0.25, 6.1283, 4.8

Repeating Decimal

A ***repeating decimal*** is a decimal number with one or more digits after the decimal point that repeat forever.

Examples:

0.333..., 5.1919..., 0.111...

Repeating decimals are written with a bar over the repeating digit(s). 0.333... can be written as $0.\overline{3}$ with a bar over the repeating 3.

The following division has been completed using a calculator.

KEY INFORMATION

Calculators often round the last digit of a repeating decimal.

$7 \div 9 = 0.7777777778...$

The digit 7 repeats, so $7 \div 9 = 0.\overline{7}$

$1 \div 12 = 0.08333333333...$

The digit 3 repeats, so $1 \div 12 = 0.08\overline{3}$

Look for a pattern in the digits after the decimal point.

$27 \div 53 = 0.509433962264150943396226415...$

The digits 5094339622641 repeat, so $27 \div 53 = 0.\overline{5094339622641}$

Estimating and Rounding

It can be useful to estimate answers before performing calculations. This helps determine if a mistake was made during calculation and if the answer is reasonable.

Example 1: Estimate the answer to $13 \div 7$. Then divide and round the quotient to the nearest ten thousandth.

14 is a whole number close to 13 that is divisible by 7. → **Estimate:** $14 \div 7 = 2$

Use a calculator to divide: $13 \div 7 = 1.857142857142...$

Round to the nearest ten thousandth: $13 \div 7 \approx 1.8571$

This is close to the estimated answer of 2.

KEY INFORMATION

The symbol ≈ means "approximately equal to."

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Example 2: Estimate the answer to 3.81 • 9.25. Then multiply and round the product to the nearest thousandth.

3.81 is close to 4, and 9.25 is close to 9. → **Estimate:** 4 • 9 = 36
These are whole numbers that are easy to multiply.

Use a calculator to multiply: 3.81 • 9.25 = 35.2425

Round to the nearest thousandth: 3.81 • 9.25 ≈ 35.243

This is close to the estimated answer of 36.

Example 3: Estimate 6.98 • 4.43. Then multiply and round the product to the nearest tenth.

6.98 is close to 7, and 4.43 can be rounded down to 4. → **Estimate:** 7 • 4 = 28

Use a calculator to multiply: 6.98 • 4.43 = 30.9214

Round to the nearest tenth: 6.98 • 4.43 ≈ 30.9

This is close to the estimated answer of 28.

Example 4: Divide and round the quotient to the nearest hundredth.

a. **0.125 ÷ 0.8**

Use a calculator to divide: 0.125 ÷ 0.8 = 0.15625

Round to the nearest hundredth: 0.125 ÷ 0.8 ≈ 0.16

b. **37 ÷ 22**

Use a calculator to divide: 37 ÷ 22 = 1.68181818181...

Round to the nearest hundredth: 37 ÷ 22 ≈ 1.68

PRACTICE

A calculator may be used for problems with this symbol.

1. Estimate each quotient by using nearby numbers that divide evenly.

a. 19 ÷ 5 _____ b. 47 ÷ 15 _____

2. Determine whether the answer to each problem in the table is a terminating or a repeating decimal and place a check mark in the appropriate column.

Problem	Answer Terminates	Answer Repeats
8.52 • 4.09		
103 ÷ 3		
39 ÷ 3		
68.6868 • 4.44		
56 ÷ 3		

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3. Round each answer to the nearest ten thousandth.

a. $33 \div 13$ _____

b. $4.56 \bullet 2.6398$ _____

c. $8.623 \bullet 5.01$ _____

4. Write each answer as an exact decimal using a bar.

a. $98 \div 15$ _____

b. $65 \div 12$ _____

c. $134 \div 11$ _____

5. a. Estimate the quotient of $34 \div 5$ by rounding 34 to the closest multiple of 5.

_____

b. Will the quotient be greater than or less than the estimate?

Circle one: *greater than* / *less than*

6. Five friends evenly split a dinner bill that totaled $34. How much did each person pay?

$_____

7. Tammy is cutting a piece of poster board that is 34 cm wide into five equal strips. How wide will each strip be?

_____ cm

8. A total of 34 students are going on a field trip. Each car can hold five students. How many cars are needed?

_____ cars

9. Match each problem with its exact decimal answer by drawing the same pattern and/or using the same color. An example is given.

$65 \div 6$	$11.\overline{5}$	12.6
$63 \div 5$	$115 \div 10$	$38 \div 3$
$10.8\overline{3}$	$1266 \div 100$	$10.\overline{83}$
$11.\overline{56}$	12.66	12.7
$254 \div 20$	11.5	$1145 \div 99$
$104 \div 9$	$12.\overline{6}$	$1073 \div 99$



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REVIEW

Math Facts Review

In each triangle the bottom two numbers multiplied together equal the top number. Fill in the missing number on each triangle. Then write the fact family below each triangle. An example is given. If a box has a letter next to it, write the letter on the line above the corresponding answer at the bottom of the page to solve the riddle.

Example

Top: 32; bottom: 4, A 8

4	×	8	=	32
8	×	4	=	32
32	÷	4	=	8
32	÷	8	=	4

1.

Top: O ☐; bottom: 5, 6

	×		=	
	×		=	
	÷		=	
	÷		=	

2.

Top: 24 R; bottom: ☐ T, 6

	×		=	
	×		=	
	÷		=	
	÷		=	

3.

Top: 54 S; bottom: 6, E ☐

	×		=	
	×		=	
	÷		=	
	÷		=	

4.

Top: 63 I; bottom: ☐ D, 9

	×		=	
	×		=	
	÷		=	
	÷		=	

5.

Top: M ☐; bottom: 12, 3

	×		=	
	×		=	
	÷		=	
	÷		=	

6.

Top: H ☐; bottom: 11, 2

	×		=	
	×		=	
	÷		=	
	÷		=	

7.

Top: C ☐; bottom: 9, 8

	×		=	
	×		=	
	÷		=	
	÷		=	

8.

Top: N ☐; bottom: 7, 10

	×		=	
	×		=	
	÷		=	
	÷		=	

Why didn't the dime roll down the mountain with the nickel?

Because ___ ___ ___ A ___ ___ ___ ___ ___ ___ ___ ___ ___ ___!

63 4 22 8 7 36 30 24 9 72 9 70 4 54

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Five-in-a-Row

5. Roll two standard dice and add the values. Find ONE square containing the sum (orange numbers). Complete the problem in that square, and then color in the square. Continue until you have five squares in a row colored. The five squares in a row can be connected horizontally, vertically, or diagonally.

12 $-20 \div (-4)$	**2** $-3 \bullet 30$	**7** $-150 \div 15$	**4** $48 \div 8 \div (-3)$	**5** $90 \bullet (-7)$
7 $-1 \bullet 76$	**8** $-64 \div 8$	**9** $-84 \div (-7)$	**10** $-9 \bullet (-12)$	**11** $8 \bullet 7 \bullet (-1)$
6 $-5 \bullet 0$	**2** $10 \bullet (-1)$	**3** $-40 \div (-4)$	**4** $-72 \div 9 \div 2$	**5** $99 \div (-9)$
7 $32 \div (-4)$	**8** $42 \div 7$	**9** $12 \bullet 11$	**10** $-18 \div (-18)$	**11** $11 \bullet (-11)$
12 $54 \div (-6)$	**6** $-7 \bullet 7$	**3** $25 \bullet 6$	**4** $0 \bullet (-23)$	**5** $-66 \div 6$



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3. Add. Write answers as mixed numbers.

a. $3\frac{1}{3}+5\frac{5}{18}$ _____

b. $-3\frac{1}{3}+\left(-5\frac{5}{18}\right)$ _____

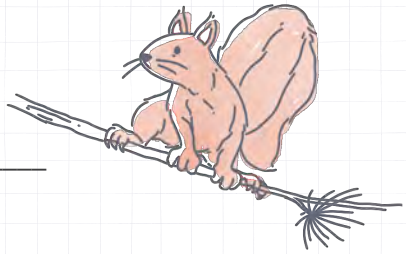
REMEMBER:

Change mixed numbers to improper fractions before adding or subtracting.

4. Add.

a. $\frac{21}{25}+\left(-\frac{3}{5}\right)$ _____

b. $\frac{3}{5}+\left(-\frac{21}{25}\right)$ _____



Aunt Laurie's Banana Chocolate Chip Cookies

Cream together in a large mixing bowl:

____ a. cup(s) sugar

____ b. cup(s) butter

____ c. egg(s)

Beat into mixture:

____ d. cup(s) mashed banana

____ e. tablespoon(s) baking powder

____ f. teaspoon(s) salt

Mix in:

____ g. cup(s) flour

Stir in:

____ h. cup(s) chocolate chips

Place balls of dough on a baking sheet. Bake at 350 °F for 8–10 minutes.

Be careful when using an oven, and ask an adult for help as needed.

5. Add or subtract. Write answers in the blanks to complete the recipe for banana chocolate chip cookies.

a. $10\frac{1}{6}-8\frac{2}{3}$ _____

b. $-3\frac{8}{9}+4\frac{24}{27}$ _____

c. $\frac{10}{4}+\frac{8}{16}$ _____

d. $6\frac{2}{5}+\left(-4\frac{9}{10}\right)$ _____

e. $\frac{1}{6}-\left(-1\frac{1}{3}\right)$ _____

f. $-\frac{3}{10}+\frac{11}{20}$ _____

g. $7\frac{5}{6}-\frac{49}{12}$ _____

h. $-\frac{3}{7}+2\frac{3}{7}$ _____

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Positive Exponents

SUPPLIES: ruler or straightedge

WARM-UP

Evaluate each expression.

a. $3+3+3+3$ b. $3 \cdot 3 \cdot 3 \cdot 3$ c. $5+5+5$ d. $5 \cdot 5 \cdot 5$

LESSON

Use the app to watch the video lesson. Complete problems when instructed during the video in the Video Notes section. Optionally, read the Lesson Overview in place of the video or after the video if more instruction is needed.

App Video

VIDEO NOTES

4^3 _____ _____ _____

$4^3 =$ ____ • ____ • ____ = ____

When multiplying an even amount of negative numbers, the product will be _____.

When multiplying an odd amount of negative numbers, the product will be _____.

$(-2.5)^3 =$ _____ • _____ • _____ = _____

Exponents and Zero

- Any nonzero base raised to the power of _____ is _____.
- Zero to any nonzero power is _____.
- Zero to the power of zero is _____.

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LESSON OVERVIEW

The expression 4^3 is called a power and is read as "4 to the third power." It has an exponent and a base. The ***base*** is the number that is multiplied by itself when using an exponent. The ***exponent*** is a number showing how many times to multiply the base number by itself. Note: The word "power" can be used to refer to the whole expression (e.g., a power of 4), or it can refer to the exponent itself (e.g., 4 to the power of 3).

4^3 ← exponent
base

4^3 can be written in factored form as $4 \cdot 4 \cdot 4$. It can also be evaluated. $4^3 = 4 \cdot 4 \cdot 4 = 64$

Exponents can be used to write prime factorizations. Here is the prime factorization of 56 in exponential form. $56 = 2 \cdot 2 \cdot 2 \cdot 7 = 2^3 \cdot 7$

A prime factorization with exponents can be written in factored form and evaluated. Here is a prime factorization evaluated. $2^4 \cdot 3 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 = 48$

REMEMBER: A number raised to the second power is referred to as *squared*. A number raised to the third power is referred to as *cubed*.

Fractional and Decimal Bases

The base can be any number or expression. To evaluate a power, write the expression in factored form and multiply.

Example 1: $\left(\frac{1}{2}\right)^4$

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

$= \frac{1}{16}$

Example 2: $\left(\frac{9}{5}\right)^2$

$= \frac{9}{5} \cdot \frac{9}{5}$

$= \frac{81}{25} = 3\frac{6}{25}$

Example 3: $\left(1\frac{2}{3}\right)^3$

$= \left(\frac{5}{3}\right)^3$

$= \frac{5}{3} \cdot \frac{5}{3} \cdot \frac{5}{3}$

$= \frac{125}{27} = 4\frac{17}{27}$

Example 4: $\frac{5^2}{11}$ ← Only the numerator is squared.

$= \frac{5 \cdot 5}{11}$

$= \frac{25}{11} = 2\frac{3}{11}$

Example 5: $\frac{7}{3^3}$ ← Only the denominator is cubed.

$= \frac{7}{3 \cdot 3 \cdot 3}$

$\frac{7}{27}$

Example 6: 6.5^3

$= 6.5 \cdot 6.5 \cdot 6.5$

$= 274.625$

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2. Rewrite each power as a fraction with a positive exponent. Do not evaluate the power.

a. 5^{-13} _____ b. 8^{-9} _____

c. 11^{-10} _____ d. $(-6)^{-3}$ _____

e. -12^{-10} _____ f. $(-7)^{-4}$ _____

3. Evaluate. Write each answer as a simplified fraction.

a. $(-2)^{-6}$ _____ b. 12^{-2} _____

c. -4^{-4} _____ d. $(-10)^{-3}$ _____

4. Rewrite each power of 10 as a decimal number.

a. 10^{-1} _____

b. 10^{-2} _____

c. 10^{-8} _____

5. Rewrite each decimal number as a power of 10.

a. 0.00001 _____

b. 0.001 _____

c. 0.0000000001 _____

6. Preposterous Preferences

Read the two options and decide which one you would prefer. Rewrite the value in that box in the form specified. For extra practice, complete both problems in each part.

a. Swim in a pool of . . .

Vanilla pudding	Root beer
$\frac{1}{10000}$ → power of 10	$\frac{1}{100000}$ → power of 10

Vanilla pudding: _____ OR Root beer: _____

b. Sleep in a bed of . . .

Sand	Harmless snakes
5^{-3} → simplified fraction	2^{-5} → simplified fraction

Sand: _____ OR Harmless snakes: _____

c. Eat a raw . . .

Potato	Onion
0.1 → power of 10	0.000001 → power of 10

Potato: _____ OR Onion: _____

d. Have four . . .

Arms	Legs
$\frac{1}{27}$ → power of 3	$\frac{1}{36}$ → power of 6

Arms: _____ OR Legs: _____

e. Time travel to the . . .

Past	Future
7^{-3} → simplified fraction	4^{-3} → simplified fraction

Past: _____ OR Future: _____

f. Have a . . .

Nose like a platypus	Neck like a giraffe
$\frac{1}{16}$ → power of 2	$\frac{1}{81}$ → power of 3

Nose like a platypus: _____
OR Neck like a giraffe: _____

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Logic Lesson 1

Nine-Hole Golf

A standard golf course has 18 holes, but a nine-hole game can also be played. Solve the following nine puzzles that each involve the number 9. There is no video or review for this lesson.

Hole 1

Use the digits 1 through 9 exactly once each to create an addition problem with a sum of 99.

✦ Hint: Use one 2-digit addend.

____ + ____ + ____ + ____ +

____ + ____ + ____ + ____ = 99

Hole 2

Using the digits 1 through 9 exactly once, place three numbers in each hole so that the sum of the numbers in each hole is the same.

Sum of each hole: ____

Hole 3

If you multiply Cory's age by $5\frac{1}{2}$, you get his great-grandfather's age, which is 99. How old is Cory?

____ years old

Hole 4

Fill in each of the four holes with a different digit between 1 and 9 to create a true statement. The fraction must result in an exact decimal that ends in the tenths place.

$\frac{\square}{\square\square}$ = 0.$\square$

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Hole 9

Four families went golfing. Each family went to a different course and played a different number of holes. Use the clues to figure out which course and what number of holes each family played.

- Hint: Once you know something for certain, put a ✓ in that box and fill in the rest of the row and column of that 4 × 4 box with Xs. You may need to go through the clues more than once.
- Hint: Golfers don't have to play an entire course. For example, if a course has 18 holes, golfers can play *fewer* than 18 holes but not *more* than 18 holes.

		Course				Number of Holes Played			
		Greenfield Golf	Putter's Paradise	Par for the Course	The Cart Club	9	18	27	36
Family	Stewart								
	Lin								
	Miller								
	O'Brien								
Number of Holes Played	9								
	18								
	27								
	36								

1. The Miller family played more holes than the Stewart family, but fewer holes than the O'Brien family.
2. Putter's Paradise has 27 holes. This means the family who played this course played 9, 18, or 27 holes.
3. The family who played at Par for the Course played 27 holes.
4. The O'Brien family played more than 18 holes.
5. The Lin family played four times the number of holes as the Stewart family.
6. The Miller family did not play at Putter's Paradise.
7. Greenfield Golf has 18 holes. This means the family who played this course played 9 or 18 holes.
8. The Lin family played at The Cart Club.
9. The Miller family played a course that does not start with the letter P.

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6. Multiply or divide. Perform operations inside parentheses first.

a. $(2 \cdot 5) \cdot 6$ ____ b. $2 \cdot (5 \cdot 6)$ ____ c. $(24 \div 12) \div 2$ ____ d. $24 \div (12 \div 2)$ ____

7. For Parts A, B, and C, find the number that makes a true statement. For Parts D, E, and F, simplify the expression. Then locate all the boxes containing each answer on the grid and shade in the sections in that box according to the design listed next to the problem.

a.  $11 \cdot 8 = ____ \cdot 11$

b.  $\frac{1}{23} \cdot ____ = 1$

c.  $28 + ____ = 0$

d.  $7(40 - 1)$

e.  $7 \cdot (4 \cdot 3)$

f.  $3(80 + 1)$

a. _____ b. _____ c. _____

d. _____ e. _____ f. _____

84	273	8	23	23	273	8	243
273	84	243	8	273	84	243	8
243	8	273	84	243	8	273	84
–28	243	84	273	8	243	84	–28
–28	273	8	243	84	273	8	–28
273	84	243	8	273	84	243	8
243	8	273	84	243	8	273	84
8	243	84	23	23	243	84	273

REVIEW

1. Evaluate each power. L13, L14

a. 11^{-2} ____ b. 8^{-2} ____ c. $\left(\frac{5}{9}\right)^2$ ____ d. $\left(\frac{3}{4}\right)^4$ ____

2. Add or subtract. L10

a. $2\frac{3}{16} - 7\frac{5}{6}$ _____ b. $9\frac{1}{27} + \left(-8\frac{2}{9}\right)$ _____

3. Multiply or divide. L12

a. $15.9 \cdot (-6.1)$ _____

b. $-20 \div (-3.6)$ _____



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d. 50.74

Expanded form: _____

Expanded notation: _____

Expanded notation with exponents: _____

4. **Error Detective**

Look closely at the expanded form, expanded notation, or expanded notation with exponents for each number. Find and highlight the error(s). Then rewrite the part(s) of the expression containing errors correctly on the line.

a. $50265 = 50000 + 2000 + 60 + 5$

Correction(s): _____

b. $9166.3 = 9100 + 60 + 6 + 0.3$

Correction(s): _____

c. $0.97 = (9 \bullet 10^{1}) + (7 \bullet 10^{2})$

Correction(s): _____

d. $0.15 = (1 \bullet 10^{0}) + (5 \bullet 10^{-1})$

Correction(s): _____

e. $26.039 = (2 \bullet 10) + (6 \bullet 1) + (3 \bullet 0.1) + (9 \bullet 0.01)$

Correction(s): _____

f. $7.602 = (7 \bullet 1) + (6 \bullet 0.1) + (0.01) + (2 \bullet 0.001)$

Correction(s): _____

g. $64.78 = (6 \bullet 10^{2}) + (4 \bullet 10^{1}) + (7 \bullet 10^{-1}) + (8 \bullet 10^{-2})$

Correction(s): _____

h. $0.409 = (4^{-1}) + (9^{-3})$

Correction(s): _____

REVIEW

1. Multiply or divide.

a. $7.64 \bullet 10000$ _____

b. $8.23 \div 1000$ _____

2. Use the distributive property to simplify each expression. L16

a. $-6(7x - 9)$ _____

b. $18(-2y - 1)$ _____

3. Evaluate each power. L13

a. $(-5)^{6}$ _____

b. -12^{4} _____

4. Write the prime factorization of each number using exponents. L2, L13

a. 147 _____

b. 216 _____

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3. The approximate populations of three nations in 2020 are given in standard form. Rewrite each number in scientific notation.

   a. China:
   1,440,000,000 _____

   b. United States of America:
   331,000,000 _____

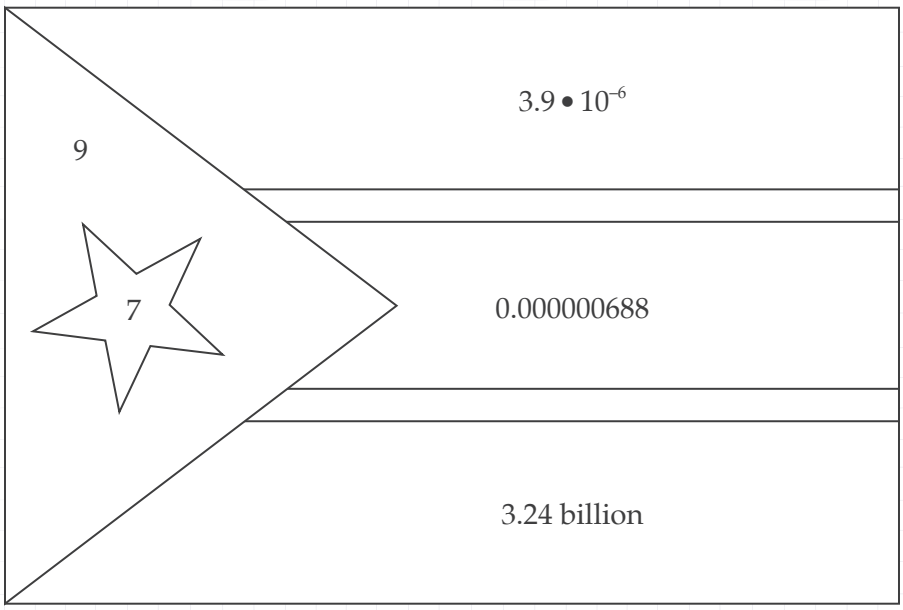
   c. Sweden:
   10,380,000 _____

4. The atomic radius of an iron atom is approximately 1.4×10^{-10} meters. Rewrite this number in standard form.

   _____

5. The atomic radius of a hydrogen atom is approximately 0.000000000023 meters. Rewrite this number in scientific notation.

   _____



6. The Flag of South Sudan

Formally established in 2011, South Sudan is one of the newest countries in the world.

For Parts A and B, determine the value of the missing exponent. For Parts C–H, complete the problem given. If the answer appears on the flag, color that section of the flag the color specified in the problem.

a. Yellow: The population of South Sudan in 2020 was about 11,200,000. In scientific notation this number is $1.12 \times 10^{?}$.

   _____

b. Blue: In 2020 the population of Africa was about 1,300,000,000. In scientific notation this number is $1.3 \times 10^{?}$.

   _____

c. Red: Write 6.88×10^{-7} in standard form.

   _____

d. Purple: Write 6.88×10^{-9} in standard form.

   _____

e. Green: Write 3,240,000,000 using a combination of numbers and words.

   _____

f. White: Write 32,400,000 using a combination of numbers and words.

   _____

g. Orange: Write 0.000039 in scientific notation.

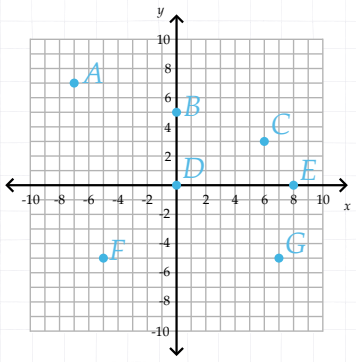
   _____

h. Black: Write 0.0000039 in scientific notation.

   _____

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3. Write the coordinates of the points shown below.



A: _____ *B*: _____ *C*: _____

D: _____ *E*: _____ *F*: _____

G: _____

4. Find the absolute value of each number.

a. 5 ____ b. –7 ____ c. $-\frac{5}{9}$ ____

d. 12.7 ____ e. 0 ____

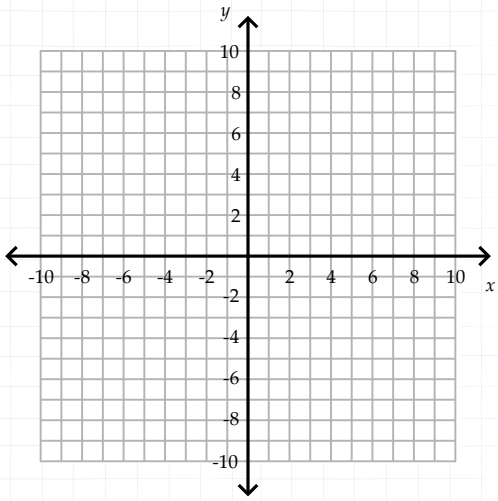
5. Using absolute values, find the distance between the following pairs of points.

a. $(1,4)$ and $(7,4)$ _____

b. $(-2,3)$ and $(-2,-7)$ _____

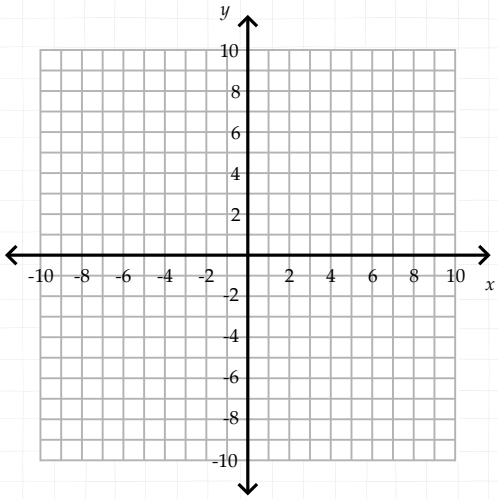
c. $(0,0)$ and $(-5,0)$ _____

6. Plot the pairs of points in Problem 5 using a different color for each pair. Draw a line connecting each pair. Verify that the distance between each pair matches your answers for Problem 5.



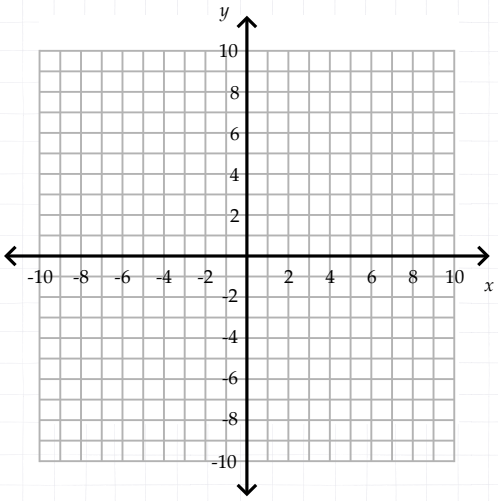
7. Write the coordinates of two points that are on the *x*-axis and are each a distance of four units from the origin. Plot the points on the coordinate plane.

_____ and _____

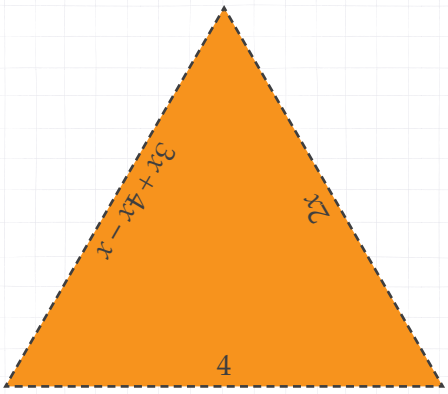


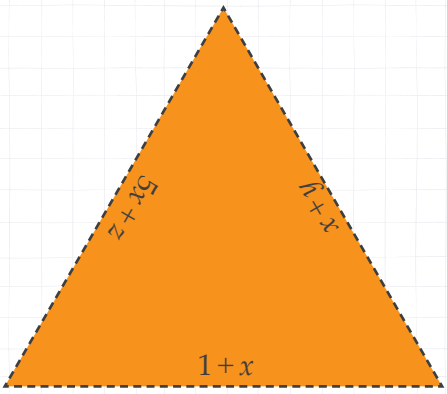
8. Write the coordinates of a point located in Quadrant II that is a distance of three units from $(0,5)$. Plot the point on the coordinate plane.

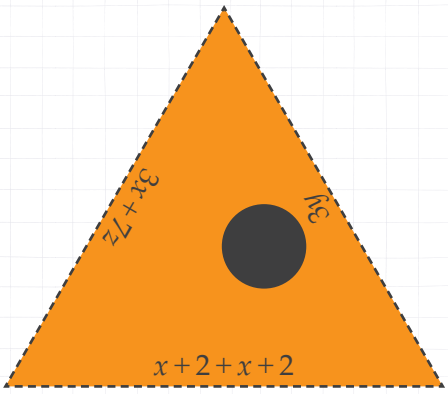
_____

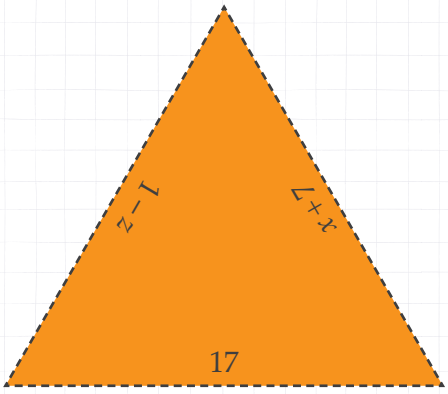


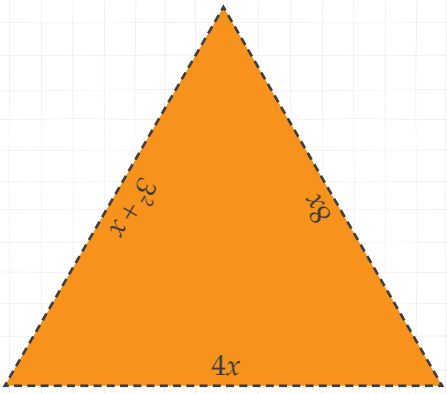
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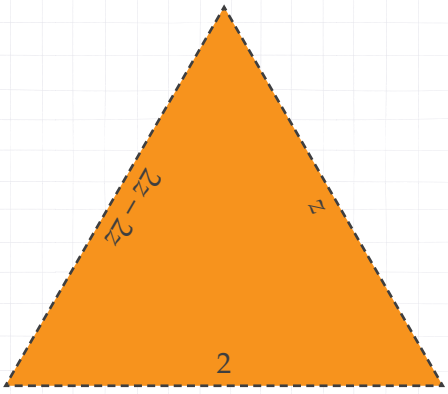


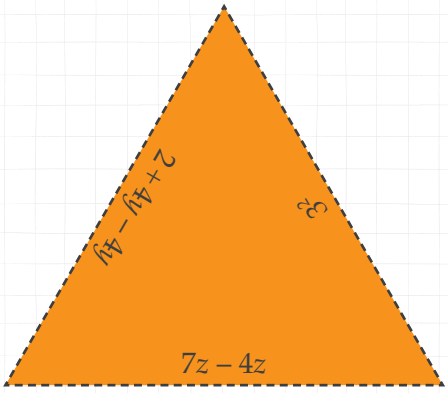


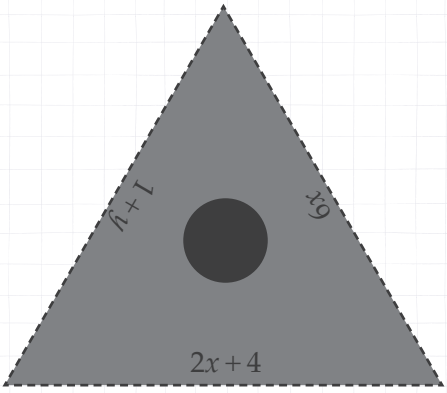


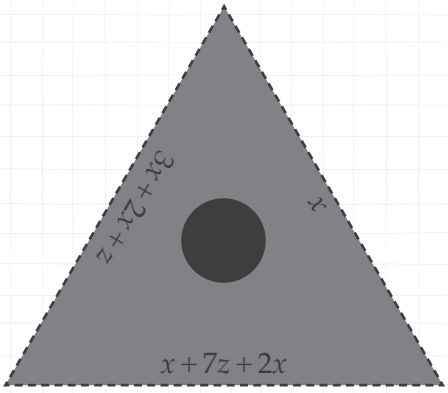


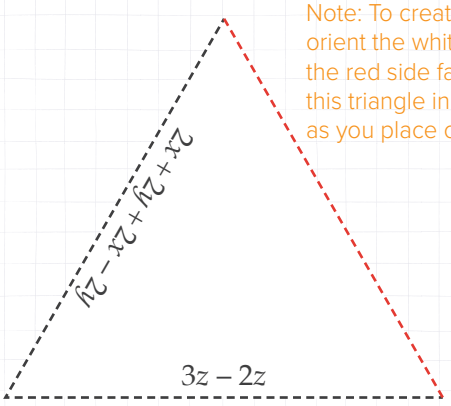




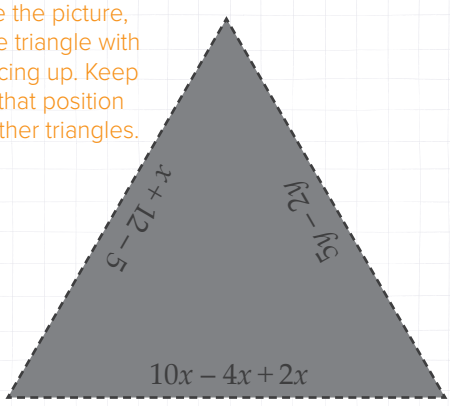


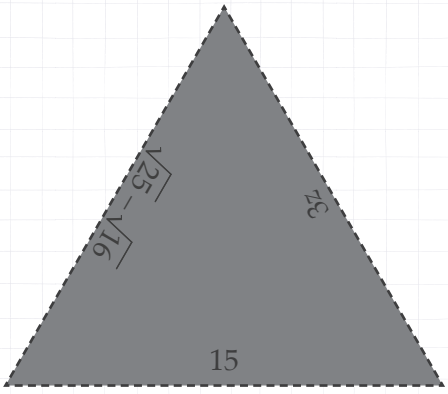






Note: To create the picture, orient the white triangle with the red side facing up. Keep this triangle in that position as you place other triangles.





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Evaluating Expressions

WARM-UP

Evaluate the expressions.

a. $(-8)^2 - 6^2$

b. $\sqrt[3]{27}$

LESSON

Use the app to watch the video lesson. Complete problems when instructed during the video in the Video Notes section. Optionally, read the Lesson Overview in place of the video or after the video if more instruction is needed.

App Video

VIDEO NOTES

1. $\dfrac{6x^2}{xy-8}$ $x =$ _____ $y =$ _____

2. $= \dfrac{6(\quad)^2}{(\quad)(\quad)-8}$

3. $= \dfrac{6(\quad)}{-8}$

4. $=$ ____

5. $= -$ ____

6. $= -$ ____

$f + \dfrac{60}{d} - \sqrt{e}$

$d =$ _____, $e =$ _____, $f =$ _____

$8\left(n - \sqrt{p}\right) \div m$

$m =$ _____, $n =$ _____, $p =$ _____

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LESSON OVERVIEW

To evaluate an expression means to find the value of an expression when the variable is replaced by a given number. When evaluating expressions, substitute the value of the variable or variables into the expression. Parentheses may be needed around the substituted value(s) when substituting a negative number or to indicate multiplication. Use the order of operations when evaluating expressions. The number substituted into an expression is referred to as the *input*, and the resulting value is referred to as the *output*.

Here are three different expressions evaluated when $a=-2$. In each expression, a is replaced with -2, and then the expression is evaluated. Notice that parentheses are needed around -2 because it is a negative number.

$$3a+5$$
$$3(-2)+5$$
$$=-6+5$$
$$=-1$$

$$a^3-7$$
$$(-2)^3-7$$
$$=-8-7$$
$$=-15$$

$$16+a\div 2$$
$$16+(-2)\div 2$$
$$=16-1$$
$$=15$$

The three expressions below have more than one variable. Each expression is evaluated when $r=8$, $s=-5$, and $t=9$. Parentheses are only used for substitutions when needed.

$$2\left(s-\sqrt{t}\right)\div r$$
$$2\left(-5-\sqrt{9}\right)\div 8$$
$$=2(-5-3)\div 8$$
$$=2(-8)\div 8$$
$$=-16\div 8$$
$$=-2$$

$$10t-r\bullet s$$
$$10(9)-8\bullet(-5)$$
$$=90-(-40)$$
$$=130$$

$$t(6+s)+\sqrt[3]{r}$$
$$9(6+(-5))+\sqrt[3]{8}$$
$$=9(1)+\sqrt[3]{8}$$
$$=9(1)+2$$
$$=9+2$$
$$=11$$

Example 1:

Evaluate $\dfrac{6x^2}{xy-8}$ when $x=5$ and $y=-1$.

$$\frac{6(5)^2}{(5)(-1)-8}$$
$$=\frac{6(25)}{-5-8}$$
$$=\frac{150}{-13}$$
$$=-11\frac{7}{13}$$

KEY INFORMATION

The value substituted into an expression is called the input. The result, once the expression is simplified, is called the output.

Example 2:

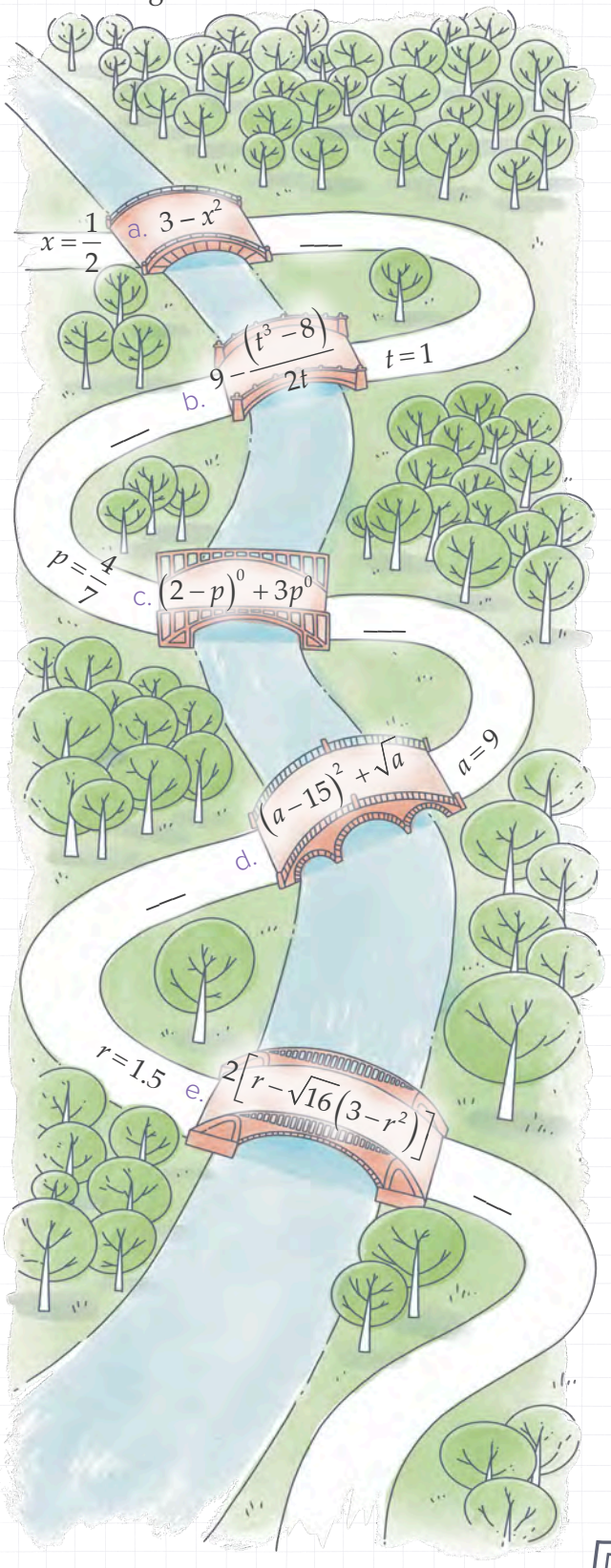
Evaluate $\dfrac{6x^2}{xy-8}$ when $x=\dfrac{1}{3}$ and $y=12$.

$$\frac{6\left(\frac{1}{3}\right)^2}{\left(\frac{1}{3}\right)(12)-8}$$
$$=\frac{6\left(\frac{1}{9}\right)}{4-8}$$
$$=\frac{\frac{2}{3}}{-4}$$
$$=-\frac{1}{6}$$

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PRACTICE

1. Each bridge has an expression at the top. Using the input values at the start of each bridge, determine the output and write it at the end of each bridge.



2. Fill in the table by evaluating the expressions using the given values.

✦ Hint: Replace *y* and *z* in each expression with the values given at the top of each column.

	$y = 0$, $z = 0$	$y = 5$, $z = 0$	$y = -10$, $z = -3$
$\frac{y-5}{y+5} + z$			
$yz - (1 + y)$			
$(y - z)(y + z)$			

3. A part of each expression is missing. Fill in the box with a number so that the given input and output values work in the expression. An example is given.

a. Expression: $b + \boxed{4} - 2(b + 1)$

Input: $b = 5$ Output: -3

Substitute 5 in place of b. $5 + \boxed{} - 2(5 + 1)$

The missing value must be 4 for the expression to equal -3.

b. Expression: $\frac{s(-1 + \boxed{})}{2}$

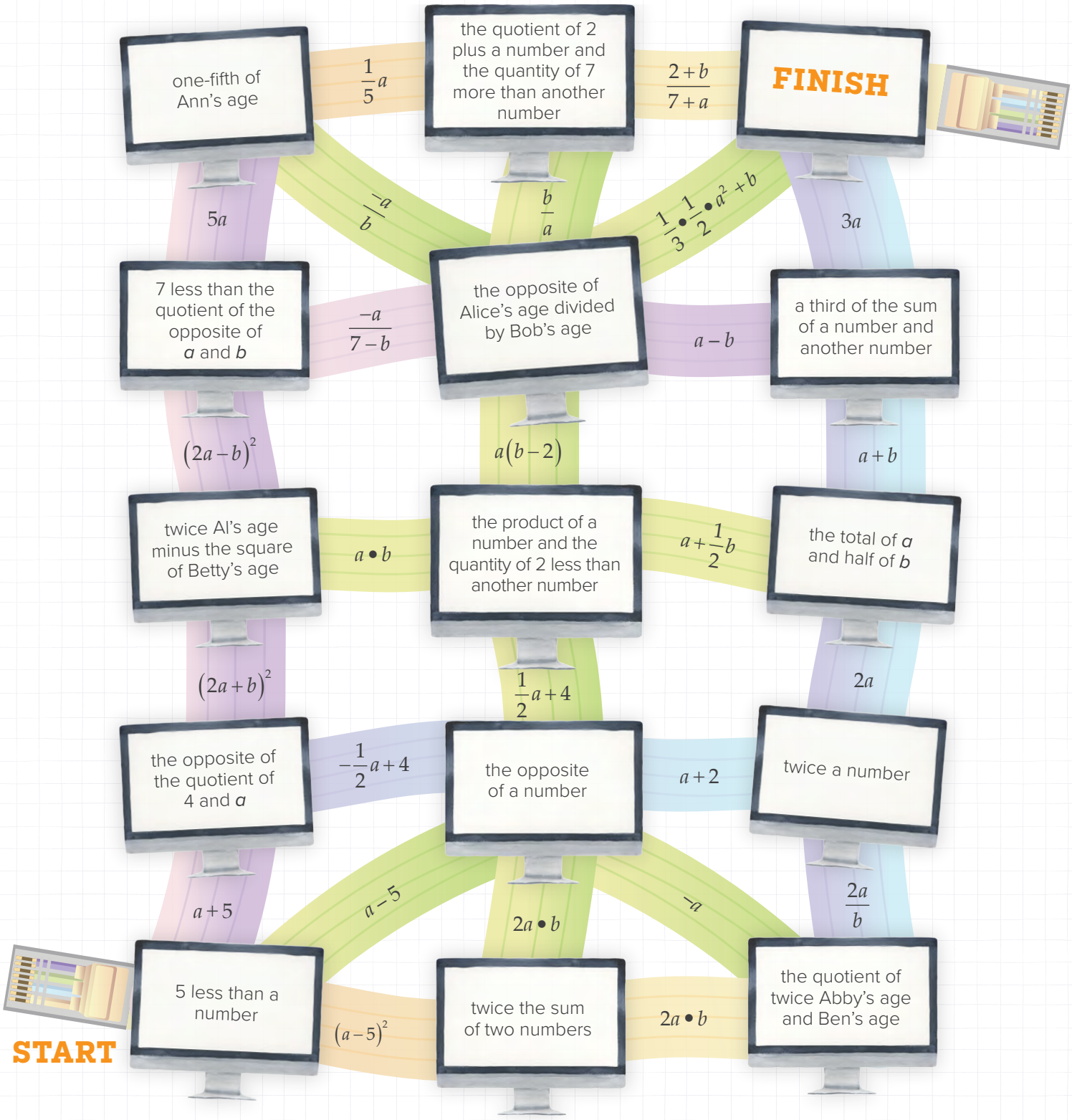
Input: $s = 12$ Output: 66

c. Expression: $2t^2 + \sqrt[3]{\boxed{}} - r$

Input: $t = -2$, $r = 5$ Output: 5

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6. Complete the maze by following the paths with the correct expression for the situation given.



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Complete this Unit Review to prepare for the Unit Assessment. There is no video, lesson, or practice. Because Unit Reviews include practice for an entire unit, they may take longer than regular lessons, and students may decide to take two days to finish.

UNIT 1 | LESSON 28

Unit 1 Review

ESCAPE ROOM

To get out of the Escape Room, you must solve the following riddle:

How can the number four be half of five?

Complete these 10 challenges to find the keys you need to solve the riddle and escape!

Challenge #1: Decimals and Fractions

Lessons 1, 4–5

1. There are 241 keys in a basket. It takes you 3.7412 seconds to try each key in the keyhole. Estimate how long it will take you to try all the keys. Then use a calculator to find the exact time and round the answer to the nearest thousandth.

   Estimate: _____

   Rounded: _____



2. Divide. Write the answer as an exact decimal.

   $632 \div 48$

   _____



3. Fill in the table to convert between fractions and decimals.

Fraction	Decimal
	0.6
$\frac{2}{3}$	
$4\frac{5}{8}$	



Challenge #2: Prime Numbers and Simplifying

Lessons 2–3

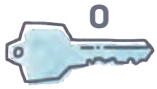
Your next challenge is to simplify fractions with impossibly large numerators and denominators. Simplify using upside down division and prime factorization to make the impossible possible!

4. $\frac{420}{600}$

   _____

5. $\frac{248}{1240}$

   _____



Challenge #3: Adding and Subtracting Signed Numbers

Lessons 6, 10–11

6. Fill in each table by evaluating the given expressions. The value that does NOT match the others in each table gets the key! Be careful: you may have to convert between fractions and decimals to figure out which one is different.



Expression	Value
$4-10+2+7-1$	
$-3+5-7+4-2$	
$-1+4-2-(-1)$	

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Riddle Solution

Use all capital letters when filling in the riddle!

___ ($\frac{3}{25}$) ___ (901.629) ___ (21)   ___ (-6.5) ___ ($\frac{1}{5}$) ___ ($2\frac{1}{2}$) ___ ($-9\frac{3}{25}$) ___ ($0.\overline{6}$)   ___ ($0.\overline{6}$) ___ (-3.5) ___ ($2\frac{1}{2}$) ___ (21) ___ (-6.5) ___ ($-9\frac{3}{25}$) ___ (5×10^2)

___ (-6.5) ___ (21) P ___ (-6.5) ___ (21) ___ (-3) ___ (21) ___ ($0.\overline{6}$) ___ ($\frac{3}{25}$) ___ (4.23×10^{-8}) ___ ($0.\overline{6}$) G   ___ ($\frac{3}{25}$) ___ (901.629) ___ (21)

___ ($0.\overline{6}$) ___ (-3.5) ___ ($2\frac{1}{2}$) ___ (3) ___ (21) ___ (-6.5)   ___ (12) ___ ($\frac{1}{5}$) ___ (-3.5) ___ (-6.5)   ___ (4.23×10^{-8}) ___ (-3)   ___ (4.23×10^{-8}) ___ (-4.08),

___ ($\frac{1}{2}$) ___ (901.629) ___ (4.23×10^{-8}) ___ (2) ___ (901.629)   ___ (4.23×10^{-8}) ___ (-3)   ___ (21) X ___ ($-9\frac{3}{25}$) ___ (2) ___ ($\frac{3}{25}$) ___ (5×10^2) ___ ($13.1\overline{6}$)

___ (901.629) ___ ($-9\frac{3}{25}$) ___ (5×10^2) ___ (12)   ___ ($\frac{1}{5}$) ___ (12)   ___ ($\frac{3}{25}$) ___ (901.629) ___ (21)   ___ (5×10^2) ___ (21) ___ ($\frac{3}{25}$) ___ ($\frac{3}{25}$) ___ (21) ___ (-6.5) ___ (-3)

___ (4.23×10^{-8}) ___ ($0.\overline{6}$)   ___ ($\frac{3}{25}$) ___ (901.629) ___ (21)   ___ ($\frac{1}{2}$) ___ ($\frac{1}{5}$) ___ (-6.5) D   ___ (12) ___ (4.23×10^{-8}) ___ (-4.08) ___ (21).

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