

# Engaging Mathematics, Volume I: Grade 8

Engaging Mathematics,  
Volume I:  
Grade 8

Teacher Edition

Product ID  
407-2034

Region 4 Education Service Center supports student achievement by providing educational products and services that focus on excellence in service for children.

Published by  
Region 4 Education Service Center  
7145 West Tidwell Road  
Houston, Texas 77092-2096  
www.esc4.net

© 2023 by Region 4 Education Service Center. All rights reserved. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

ISBN-13: 978-1-950577-02-6

Printed in the United States of America

### **Digital Access**

Digital files are available by accessing the Region 4 Hub at <http://r4hub.esc4.net>.

Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without prior written permission of the publisher.

Copyright law prohibits the copying or sharing of these materials for any purpose outside of direct classroom instruction by the one teacher who owns the purchased copy of this digital book.

**Record your Region 4 Hub access information for future reference.**

Username:

Password Hint:

For instructions regarding online access, contact [shipping@esc4.net](mailto:shipping@esc4.net).

## ***Acknowledgments***

Region 4 Education Service Center would like to acknowledge the talent and expertise of those who contributed to the development of this book. Their dedication to our core values of excellence in service for children made possible the creation of this resource to assist educators in providing quality, effective instruction for all students.

### *Writing Team*

Sana Brennan  
Yvette Henry  
Kristen Meeks  
Sherry Olivares  
Shelley Bolen-Abbott  
Sharon Benson, Ed.D.

### *Design Team*

Dave Martinez

SAMPLE

# Table of Contents

<b>Introduction</b> .....	<b>i-iv</b>
What is <i>Engaging Mathematics, Volume I: Grade 8</i> ? .....	iii
What is found in an Engaging Mathematics TEKS-based activity? .....	iv
<b>Number and operations</b> .....	<b>2-11</b>
Sets of Real Numbers 8(2)(A).....	2
Irrational Numbers 8(2)(B).....	4
Scientific Notation, Activity 1 8(2)(C).....	6
Scientific Notation, Activity 2 8(2)(C).....	10
<b>Proportionality</b> .....	<b>12-85</b>
Proportionality and Similar Shapes 8(3)(A).....	12
Dilations on a Coordinate Plane, Activity 1 8(3)(B).....	14
Dilations on a Coordinate Plane, Activity 2 8(3)(B).....	16
Dilations on a Coordinate Plane, Activity 3 8(3)(C).....	20
Dilations on a Coordinate Plane, Activity 4 8(3)(C).....	22
Slope 8(4)(A).....	26
Rate of Change, Slope, and $y$ -intercept, Activity 1 8(4)(C).....	28
Rate of Change, Slope, and $y$ -intercept, Activity 2 8(4)(C).....	30
Rate of Change, Slope, and $y$ -intercept, Activity 3 8(4)(C).....	32
Rate of Change, Slope, and $y$ -intercept, Activity 4 8(4)(C).....	34
Representations of Proportional Situations, Activity 1 8(5)(A).....	36
Representations of Proportional Situations, Activity 2 8(5)(A).....	38
Representations of Proportional Situations, Activity 3 8(5)(A).....	42
Representations of Non-Proportional Situations, Activity 1 8(5)(B).....	44
Representations of Non-Proportional Situations, Activity 2 8(5)(B).....	48
Trend Lines, Activity 1 8(5)(D).....	50
Trend Lines, Activity 2 8(5)(D).....	52
Direct Variation 8(5)(E).....	54
Representations of Linear Relationships, Activity 1 8(5)(F).....	56
Representations of Linear Relationships, Activity 2 8(5)(F).....	58
Representations of Linear Relationships, Activity 3 8(5)(F).....	62
Representations of Linear Relationships, Activity 4 8(5)(F).....	64
Representations of Linear Relationships, Activity 5 8(5)(F).....	68
Functional Relationships, Activity 1 8(5)(G).....	72
Functional Relationships, Activity 2 8(5)(G).....	74
Proportional and Non-Proportional Relationships, Activity 1 8(5)(H).....	76
Proportional and Non-Proportional Relationships, Activity 2 8(5)(H).....	78
Equations that Model Linear Relationships, Activity 1 8(5)(I).....	80
Equations that Model Linear Relationships, Activity 2 8(5)(I).....	82
Equations that Model Linear Relationships, Activity 3 8(5)(I).....	84
<b>Expressions, equations, and relationships</b> .....	<b>86-137</b>
Volume of a Cylinder 8(6)(A).....	86
Modeling the Pythagorean Theorem, Activity 1 8(6)(C).....	88
Modeling the Pythagorean Theorem, Activity 2 8(6)(C).....	90
Volume of Cylinders, Activity 1 8(7)(A).....	92
Volume of Cylinders, Activity 2 8(7)(A).....	94
Volume of Cylinders, Activity 3 8(7)(A).....	96
Volume of Cones 8(7)(A).....	98
Volume of Spheres 1 8(7)(A).....	100
Surface Area, Activity 1 8(7)(B).....	102

Surface Area, Activity 2 8(7)(B) .....	104
Surface Area, Activity 3 8(7)(B) .....	106
Surface Area, Activity 4 8(7)(B) .....	108
Application Problems Involving the Pythagorean Theorem, Activity 1 8(7)(C).....	110
Application Problems Involving the Pythagorean Theorem, Activity 2 8(7)(C).....	112
Modeling and Solving Equations 8(8)(C).....	114
Solving Equations, Activity 1 8(8)(C) .....	118
Solving Equations, Activity 2 8(8)(C) .....	120
Exterior Angles of Triangles, Activity 1 8(8)(D) .....	122
Exterior Angles of Triangles, Activity 2 8(8)(D) .....	126
Exterior Angles of Triangles, Activity 3 8(8)(D) .....	128
Parallel Lines and Transversals, Activity 1 8(8)(D).....	130
Parallel Lines and Transversals, Activity 2 8(8)(D).....	132
Parallel Lines and Transversals, Activity 3 8(8)(D).....	134
Intersecting Lines on a Graph 8(9) .....	136
<b>Two-dimensional shapes .....</b>	<b>138–167</b>
Properties of Orientation and Congruence - Rotations 8(10)(A) .....	138
Rotations 8(10)(C) .....	140
Translations, Activity 1 8(10)(C) .....	142
Translations, Activity 2 8(10)(C) .....	144
Translations, Activity 3 8(10)(C) .....	146
Reflections, Activity 1 8(10)(C).....	148
Reflections, Activity 2 8(10)(C).....	150
Transformations 8(10)(C).....	154
Effects of Dilations on Perimeter, Activity 1 8(10)(D).....	156
Effects of Dilations on Perimeter, Activity 2 8(10)(D).....	158
Effects of Dilations on Area, Activity 1 8(10)(D).....	160
Effects of Dilations on Area, Activity 2 8(10)(D).....	162
Effects of Dilations on Area, Activity 3 8(10)(D).....	164
Effects of Dilations on Perimeter and Area 8(10)(D).....	166
<b>Measurement and data .....</b>	<b>168–175</b>
Scatterplots, Activity 1 8(11)(A) .....	168
Scatterplots, Activity 2 8(11)(A) .....	170
Scatterplots, Activity 3 8(11)(A) .....	172
Random Sampling 8(11)(C).....	174
<b>Personal financial literacy .....</b>	<b>176–177</b>
Compound Interest 8(12)(D).....	176

## What is *Engaging Mathematics, Volume I: Grade 8*?

1 An instructional resource featuring 77 Texas Essential Knowledge and Skills (TEKS)-based, classroom-ready mathematics activities that each take approximately 10 to 15 minutes to complete. We took the best activities of the original series, refreshing and revising them, and then added new activities where needed to create a complement for *Engaging Mathematics, Volume II*.

2 A TEKS-based resource that addresses the majority of the grade 8 mathematics TEKS. *Engaging Mathematics, Volume I* complements *Engaging Mathematics, Volume II*. Both volumes provide—

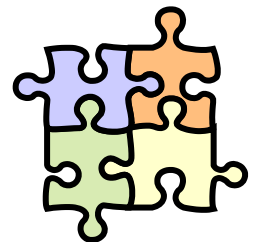
- Rigorous problem-solving tasks;
- Manipulative-based tasks;
- Vocabulary development tasks; and
- Sorting and classifying tasks.

3 A resource that supports high-quality, research-based practices by providing activities that can be used for various purposes, including—

- Engaging warm-ups and opening tasks that draw students into relevant and challenging mathematics;
- Instructional support for all students to help learners articulate, refine, and retain important mathematical concepts, processes, and skills;
- Short-cycle, formative assessments that provide immediate and ongoing feedback to guide instruction for the teacher and learning for the student; and
- Supplemental tasks to support intervention strategies.

4 A resource that incorporates the mathematical process standards by promoting—

- Reasoning, generalizing, and problem-solving in mathematical and real-world contexts;
- Modeling, using tools, and connecting representations;
- Analysis; and
- Communication.



# What is found in an Engaging Mathematics TEKS-based activity?

Each activity addresses a specific student expectation that is reflected in the content objective.

Common classroom materials are used for ease of preparation. Materials are listed 1-per-student unless otherwise noted. Page titles for student handouts are represented with bold font.

Students should have continuous access to graphing technology and STAAR® Reference Materials that will be made available for the assessment.

Facilitation questions are provided for teacher use when supporting student thinking and discourse.

## Irrational Numbers 8(2)(B)

### Activity Objective

The student will determine the approximate locations of rational and irrational numbers on a number line.

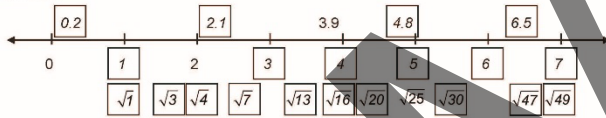
### Materials

- Number Line

### Facilitation Questions

- Which type of numbers would provide the best benchmarks for placing the remaining numbers? Why?  
*The whole numbers provide benchmarks for each position on the number line. I can follow the pattern established by the 0 and 2 on the number line and place 1, 3, 4, 5, 6, and 7.*
- How can you determine the placement of a decimal value on the number line?  
*I can determine between which two whole numbers the decimal value falls.*
- How can you determine where to place  $\sqrt{36}$  on the number line?  
*Since  $6^2 = 36$ , I can place  $\sqrt{36}$  aligned to the 6 on the number line.*
- How can you use the square roots of perfect squares to help you place  $\sqrt{20}$  on the number line?  
*Once the square roots of all of the perfect squares have been placed on the number line, I can determine the location of  $\sqrt{20}$  relative to the perfect square roots. The  $\sqrt{20}$  is between  $\sqrt{16}$  and  $\sqrt{25}$ .*

### Answers



Name: \_\_\_\_\_ Date: \_\_\_\_\_

### Number Line

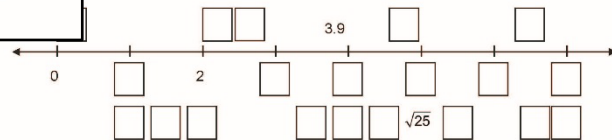
Place the approximate location for each of the following numbers on the number line. Rational values are included.

$\frac{47}{3}$	5	2.1	$\sqrt{16}$	7
$\frac{20}{13}$	0.2	$\sqrt{4}$	3	4.8
	$\sqrt{49}$	$\sqrt{1}$	6.5	4
	$\sqrt{7}$	$\sqrt{30}$	6	1

© 2023 Region 4 Education Service Center 4

An answer key is included for each activity.

Each activity includes an opportunity for students to articulate and summarize aspects of their learning.



### Communicating about Mathematics

How can you use the square roots of perfect squares to approximate the location of a square root of any number?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

5 © 2023 Region 4 Education Service Center





## Scientific Notation, Activity 1

### 8(2)(C)

#### Activity Objective

The student will convert between scientific notation and standard decimal notation.

#### Materials

- Scientific Notation Match
- Scientific Notation Cards

#### Facilitation Question

- **How can you determine if your representations match?**  
*Numbers between zero and one will have negative exponents when written in scientific notation. Numbers greater than 10 will have positive exponents when written in scientific notation.*

#### Answers

Scientific Notation	Standard Decimal Notation
$2.53 \times 10^5$	253,000
$2.53 \times 10^{-5}$	0.0000253
$2.53 \times 10^7$	25,300,000
$2.53 \times 10^{-6}$	0.00000253
$2.53 \times 10^{-4}$	0.000253
$2.53 \times 10^4$	25,300
$2.53 \times 10^{-3}$	0.00253



Student Name: \_\_\_\_\_ Date: \_\_\_\_\_

### Scientific Notation Match

- Match the **Scientific Notation Cards**. Two cards will not have a match.
- Record the values that do not have a match in the table below.
- Complete the missing representation.

Scientific Notation	Standard Decimal Notation

### Communicating about Mathematics

How does scientific notation connect to what you know about place value?



---

---

---

---

---



## Scientific Notation Cards

Cut along the bold dashed line. Two sets of cards are provided.

$2.53 \times 10^5$	$2.53 \times 10^4$	$2.53 \times 10^7$
$2.53 \times 10^{-5}$	$2.53 \times 10^{-4}$	0.00253
$2.53 \times 10^{-6}$	0.0000253	0.00000253
25,300,000	0.000253	253,000
<hr style="border-top: 2px dashed black;"/>		
$2.53 \times 10^5$	$2.53 \times 10^4$	$2.53 \times 10^7$
$2.53 \times 10^{-5}$	$2.53 \times 10^{-4}$	0.00253
$2.53 \times 10^{-6}$	0.0000253	0.00000253
25,300,000	0.000253	253,000



## Surface Area, Activity 2

### 8(7)(B)

### Activity Objective

The student will make connections to the formulas for lateral and total surface area using previous knowledge of surface area.

### Materials

- **Lateral and Total Surface Area: Fact First**

### Facilitation Question

- **What resources are available to reference lateral and total surface area formulas?**  
Possible answers: STAAR® Reference Materials, anchor charts, mathematics journal, notebook, etc.

### Answers

Possible answers:

	Fact	Verification
1.	The total surface area of a figure is the same as the composite area of the net of the same figure.	The statement is true because . . . <i>when I determine the area of each face of a figure's net and add them together, the sum represents the total surface area of the figure.</i>
2.	For any figure, the lateral surface area is less than the total surface area of the same figure.	The statement is true because . . . <i>the formula for total surface area represents the sum of the lateral surface area and the area of the base(s). It is not reasonable to have a base with a negative value.</i>
3.	The formulas used to determine the total surface area of a cylinder or prism include expressions representing the lateral surface area of the same figure.	The statement is true because . . . <i>the formula for total surface area of a cylinder includes the expression <math>2\pi rh</math>, which represents the lateral surface area of the cylinder. The formula for total surface area of a prism includes the expression <math>Ph</math>, which represents the lateral surface area of the prism.</i>
4.	The formulas used to determine the lateral surface area of a cylinder or prism represent multiplication of the distance around the base of the figure by its height.	The statement is true because . . . <i>in the formula used to determine the lateral surface area of a prism, the capital P represents the perimeter of the base. In the formula used to determine lateral surface area of a cylinder, <math>2\pi r</math> represents the circumference of the base.</i>



### Lateral and Total Surface Area: Fact First

Provide a verification for each given fact.

Fact	Verification
1. The total surface area of a figure is the same as the composite area of the net of the same figure.	The statement is true because . . .
2. For any figure, the lateral surface area is less than the total surface area of the same figure.	The statement is true because . . .
3. The formulas used to determine the total surface area of a cylinder or prism include expressions representing the lateral surface area of the same figure.	The statement is true because . . .
4. The formulas used to determine the lateral surface area of a cylinder or prism represent multiplication of the distance around the base of the figure by its height.	The statement is true because . . .

#### Communicating about Mathematics

What differentiates the lateral surface area from the total surface area of a prism?




---



---



---



---



---