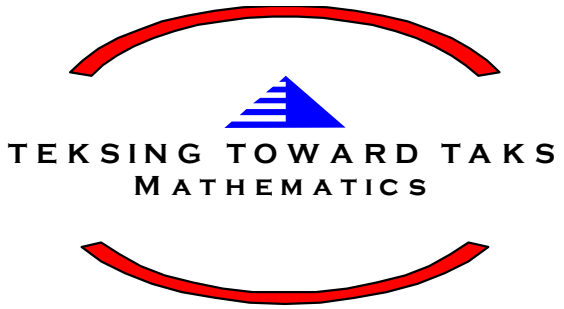


# MATHEMATICS
# Grade 9

# TEKS/TAKS
## Open-Ended Problem Sets

# Organized by TEKS

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**GRADE 9 OPEN-ENDED**

# AUTHORS' VISION FOR IMPLEMENTATION

- The Open-Ended problem sets are designed for whole class instruction. Teachers may choose to use an Open Ended as an introduction to a TEKS concept, to increase student understanding of a TEKS concept, to close instruction for a TEKS concept before an assessment in given, etc.

- The smaller font page is the student page. Make one copy per student. .

- The larger font page is a transparency master of problems at the top of the student page. Make 1 copy of each transparency page.

- The teacher sets a time limit prior to students' beginning the Open-Ended. Partner pairs are given specific "share" portions of the Open-Ended. The process that should be followed by all partner pairs is to complete the questions at the bottom of the page first (except for the **Extension)**, then complete the solution(s) to the problem(s) at the top of the page, then complete the **Extension** at the bottom of the page. (NOTE: the **Extension** is designed to spiral into the same TEKS or to spiral into a closely related TEKS.)

- Students work in partner pairs to complete the Open Ended problem set and record on their individual copies.

- Assign parts of the Open Ended to various partner pairs. These partner pairs become "share pairs" and share their responses to their assigned part. Partner pairs use a blank transparency and an overhead pen to record responses for the parts they are assigned to share. The share pairs must SHOW all work on the transparency – the teacher should monitor the share pairs closely and answer any questions they have about the problem.

- The teacher calls time and the partner pairs guide class discussion on their "share pair" assignments. Students who did not complete the Open-Ended prior to the time limit may record on their individual papers during the discussion time but must record in a different color.

- The Open-Ended is designed to be recorded as a portion of a classwork grade. A holistic score should be recorded for each student. A scale of 1-4 is appropriate as follows:
    - 1 = no understanding evident
    - 2 = minimal understanding evident
    - 3 = mostly understood or slight mathematical errors
    - 4 = complete understanding evident and no mathematical errors

  Scores may be recorded and periodically combined and recorded as a classwork grade in a gradebook.

**SUGGESTION:** Record overall class success with each Open Ended (TEKS are indicated at the bottom of each page) in a Class Profile Booklet for later reference as a guide to decision-making regarding instructional time later in the school year – especially prior to TAKS testing date.

# GRADE 9 TEKS/TAKS OPEN ENDED PROBLEM SETS
## Table of Contents and TEKS/TAKS Correlation

| TAKS OBJ | OPEN-ENDED PROBLEM SET-TEKS | STUDENT EXPECTATION |
|---|---|---|
| **1** | 01-A.1A | Describe independent and dependent quantities in relationships |
| **1** | 02-A.1B | Gather and record data ns use data sets to determine functional relationships |
| **1** | 03-A.1C | Describe functional relationships using equations and inequalities |
| **1** | 04-A.1D | Represents relationships among quantities using models, tables, graphs, diagrams, verbal descriptions, equations and inequalities. |
| **1** | 05-A.1E | Interpret and make inferences from functional relationships |
| | | |
| **2** | 01-A.2A | Identify the general forms of the linear and quadratic parent functions |
| **2** | 02-A.2B | Identify mathematical domains and ranges |
| **2** | 03-A.2C | Interpret situations in terms of graphs |
| **2** | 04-A.2D | Interpret scatterplots and models and predict and make decisions |
| **2** | 05-A.3A | Use symbols to represent unknowns |
| **2** | 06-A.3B | Look for patterns and represent generalizations algebraically |
| **2** | 07-A.4A | Find specific function values , simplify polynomial expressions, solve equations and factor |
| **2** | 08-A.4B | Use commutative, associative and distributive properties |
| **2** | 09-A.4C | Connect equation notation with function notation |
| | | |
| **3** | 01-A.5A | Determine if situations can be represented by linear functions |
| **3** | 02-A.5C | Translate among and use tabular, graphical, or verbal descriptions |
| **3** | 03-A.6A | Develop concept of slope and determine slope from graphs, tables and algebraic representations |
| **3** | 04-A.6B | Interpret the meaning of slope and intercepts using data, symbolic representation and graphs |
| **3** | 05-A.6C | Investigate the effects of changes in $m$ and $b$ on the graph of $y = mx + b$ |
| **3** | 06-A.6D | Graph and write equations of lines given two points, a point and a slope or the slope and the $y$-intercept |
| **3** | 07-A.6E | Determine intercepts from graphs, tables, or algebraic representation |
| **3** | 08-A.6F | Interpret and predict the effects of changing slope and $y$-intercept |
| **3** | 09-A.6G | Relate direct variation and solve problems involving proportional change |
| | | |
| **4** | 01-A.7A | Analyze situations involving linear functions and formulate linear equations and inequalities |
| **4** | 02-A.7B | Investigate methods for solving linear functions |
| **4** | 03-A.7C | Determine the reasonableness of solutions |
| **4** | 04-A.8A | Formulate system of linear equations to solve problems |
| | | |
| **5** | 01-A.9C | Investigate, describe, and predict the effects of changes of $c$ on the graph of $y = ax^2 + c$ |

# GRADE 9 TEKS/TAKS OPEN ENDED PROBLEM SETS
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| TAKS OBJ | OPEN-ENDED PROBLEM SET-TEKS | STUDENT EXPECTATION |
|---|---|---|
| **5** | 02-A.11A | Use patterns to generate the laws of exponents and apply them |
| | | |
| **6** | 01-8.6A | Generate similar shapes using dilations including enlargements and reductions |
| **6** | 02-8.6B | Graph dilatations, reflections, and translations on a coordinate plane |
| **6** | 03-8.7D | Locate and name points on a coordinate plane |
| | | |
| **7** | 01-8.7A | Draw solids from different perspectives |
| **7** | 02-8.7B | Uses geometric concepts and properties to solve problems |
| **7** | 03-8.7C | Use pictures and models to demonstrate Pythagorean Theorem |
| | | |
| **8** | 01-8.8A | Find surface area using models and nets for prisms and cylinders |
| **8** | 02-8.8B<br>03-8.8B | Connect models to formulas for volumes of prisms and cylinders<br>Connect models to formulas for volumes of pyramids, spheres and cones |
| **8** | 04-8.8C | Estimate and use formulas to find lateral and total surface area and volume |
| **8** | 05-8.9A | Use Pythagorean Theorem to solve problems |
| **8** | 06-8.9B | Find missing measurements in similar figures |
| **8** | 07-8.10A | Describe the resulting effects on perimeter and area when dimensions are changed proportionally |
| **8** | 08-8.10B | Describe the resulting effects on volume when dimensions are changed proportionally |
| | | |
| **9** | 01-8.1B | Select and use appropriate forms of rational numbers to solve real-life problems including those involving proportional relationships |
| **9** | 02-8.3B | Estimate and find solutions to problems involving percent and proportional relationships |
| **9** | 03-8.11A | Find probabilities of dependent and independent events |
| **9** | 04-8.11B | Use probabilities to make predictions and decisions |
| **9** | 05-8.12A | Select appropriate measure of central tendency or range |
| **9** | 06-8.12C<br>07-8.12C<br>08-8.12C<br>09-8.12C<br>10-8.12C | Select and use appropriate representation of collected data including line plots, circle graphs, and bar graphs<br>Select and use appropriate representation of collected data including Venn diagrams<br>Select and use appropriate representation of collected data including histograms<br>Select and use appropriate representation of collected data including stem and leaf plots and box and whisker plots<br>Select and use appropriate representation of collected data including line graphs |
| **9** | 11-8.13B | Recognize misuses of information and evaluate predictions and conclusions |

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| TAKS OBJ | OPEN-ENDED PROBLEM SET-TEKS | STUDENT EXPECTATION |
|---|---|---|
| **10** | 01-8.14A | Identify and apply mathematics in everyday experiences |
| **10** | 02-8.14B | Use a problem solving model |
| **10** | 03-8.14C | Select or develop appropriate problem-solving strategies |
| **10** | 04-8.15A | Communicate mathematical ideas |
| **10** | 05-8.16A | Make conjectures from patterns or sets of examples and nonexamples |
| **10** | 06-8.16B | Validate conclusions using mathematical properties and relationships |

# TOTAL GRADE 9 OPEN ENDED PROBLEM SETS = 59

**Problem #1**: In traveling to see her grandmother, Laura drove 55 miles per hour for 6 hours and 5 hours at *x* miles per hour. Write an equation that describes the relationship between *r*, the average rate she traveled for the entire trip, and *x*.

**Problem #2:** The area of a triangle must be at least 100 square units. If the height of the triangle is 10 units, write an inequality could be used to find the possible values of the base, *b*, of the triangle.

1. What concepts and vocabulary must I understand to answer these problems?

2. Is a calculator of benefit to me on these problems? If so, how?

3. Will the Grade 9 Mathematics Formula chart be of benefit to me on these problems? If so, how?

4. What problem-solving strategy or strategies do I perceive I might use to solve these problems?

5. **Extension** A.7B: Solve the inequality you wrote for Problem #2. Give 3 possible integral solutions for the base of the triangle.

**Problem #1**: In traveling to see her grandmother, Laura drove 55 miles per hour for 6 hours and 5 hours at *x* miles per hour. Write an equation that describes the relationship between *r*, the average rate she traveled for the entire trip, and *x*.

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**Problem #1**: An architect drew a blueprint of a rectangular room for the Luce family. He used a scale of 1 centimeter to represent 6 feet. His drawing was 2.8 centimeters by 4.2 centimeters. Determine the dimensions of the room in feet and feet and inches. Show your work to support your answer.

**Problem #2**: A photographer took a photo of a house and a storage building. The photo is $\frac{1}{16}$ the size of the actual house and storage building. The highest point on the house is 13 feet and the storage building is 9 feet tall. How tall in inches is the storage building in the photo? Show your work to support your answer.

1. What concepts and vocabulary must I understand to answer these problems?

2. Is a calculator of benefit to me on these problems? If so, how?

3. Is a picture or diagram of benefit to me on these problems? If so, how?

4. Will the Grade 9 Mathematics Formula chart be of benefit to me on these problems? If so, how?

5. What problem solving strategy or strategies will I use on these problems?

6. **Extension 8.8C**: Determine the area of the room in Problem #1 in square feet. Show your work.

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