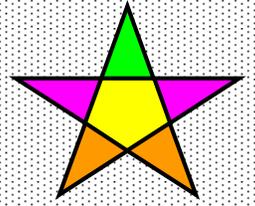
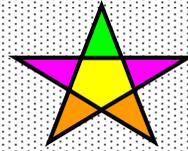
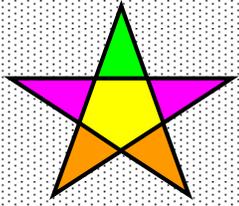


TEKSING TOWARD STAAR

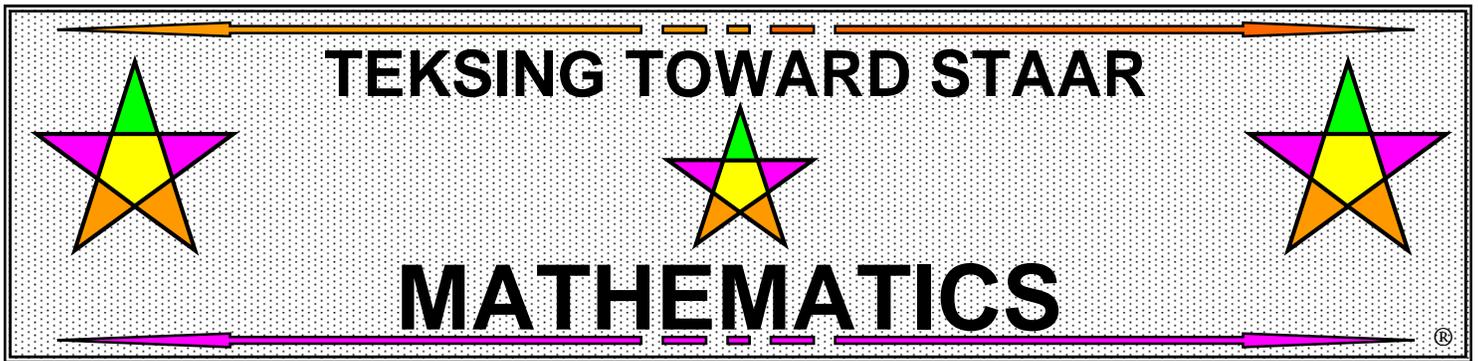


MATHEMATICS

GRADE 5

Open-Ended Problem-Solving Projections

**Organized by
TEKS Categories**



OVERVIEW

Grade 5 Open-Ended Problem-Solving Projections

The Open-Ended Problem-Solving Projections were created with all students in mind and provide teachers with large print projections for problem-solving questions that address all TEKS, including the Process Standards TEKS and the TEKS not assessed on STAAR. Each Problem-Solving Projection is correlated to a specific Category and TEKS.

The Open-Ended Problem-Solving Projections document includes a general set of questions that should be addressed by students as they solve the problems and during class discussion of the solution process for each problem. Teachers should make a copy of these questions and distribute for each student to keep in their math notebook.

The Problem-Solving Questions include the following:

1. What is the main idea of this problem?
2. What are the supporting details in this problem?
3. What skills, concepts and understanding of math vocabulary are needed to be able to answer this problem?
4. Did this problem involve mathematics arising in everyday life, society, or the work place?
5. What is a good problem solving strategy for this problem?
6. Can you explain how you used any math tools, mental math, estimation or number sense to solve this problem?
7. Did this problem involve using multiple representations (symbols, diagrams, graphs, language)?
8. Did you use any relationships to solve this problem?
9. How can you justify your solution?
10. How can you check for reasonableness of your solution to this problem?

These Open-Ended Problem-Solving Projections can be utilized for instruction, guided practice or independent practice. These materials can be utilized with a whole class, small groups and/or tutorial settings.

NOTE: There is no answer key provided for the Open-Ended Problem-Solving Projections as the author's philosophy is that each teacher should create a personalized Solutions Manual so the teacher becomes more familiar with the Revised TEKS and assessment of the Revised TEKS, as well as formulates various solution strategies for each question. Teachers are encouraged to communicate with the author regarding discussion of any question in this document.

AUTHOR'S VISION FOR IMPLEMENTATION - PROBLEM-SOLVING PROJECTIONS

Students work with partner pairs to answer the Open-Ended Problem-Solving Projections. Students record their work on notebooks paper.

The teacher projects the problem, then sets a time limit prior to students' beginning their work. Partner pairs are given specific "share" questions from 1-10 on the Problem-Solving Questions page. The process that should be followed by students for all Problem-Solving Projections is to answer questions 1-3, then complete the solution to the problem, and finally answer questions 4-10.

The teacher calls time and the partner pairs guide class discussion on their "share" assignments. Students who did not complete the solutions to the problem prior to the time limit must complete their recording in a different color.

Problem-Solving Model

Step	Description of Step
1	Analyze the given information. <ul style="list-style-type: none">• Summarize the problem in your own words.• Describe the main idea of the problem.• Identify information needed to solve the problem.
2	Formulate a plan or strategy. <ul style="list-style-type: none">• Draw a picture or a diagram.• Find a pattern.• Guess and check.• Act it out.• Create or use a chart or a table.• Work a simpler problem.• Work backwards.• Make an organized list.• Use logical reasoning.• Brainstorm.• Write a number sentence or an equation.
3	Determine a solution. <ul style="list-style-type: none">• Estimate the solution to the problem.• Solve the problem.
4	Justify the solution. <ul style="list-style-type: none">• Explain why your solution solves the problem.
5	Evaluate the process and the reasonableness of your solution. <ul style="list-style-type: none">• Make sure the solution matches the problem.• Solve the problem in a different way.

Grade 5 Problem-Solving Questions

Directions:

- **Work with a partner.**
- **Write your answers on notebook paper.**
- **Answer questions 1-3.**
- **Complete the solution to the problem.**
- **Answer questions 4-10.**

1. What is the main idea of this problem?
2. What are the supporting details in this problem?
3. What skills, concepts and understanding of math vocabulary are needed to be able to answer this problem?
4. Did this problem involve mathematics arising in everyday life, society, or the work place?
5. What is a good problem solving strategy for this problem?
6. Can you explain how you used any math tools, mental math, estimation or number sense to solve this problem?
7. Did this problem involve using multiple representations (symbols, diagrams, graphs, math language)?
8. Did you use any relationships to solve this problem?
9. How can you justify your solution to the problem?
10. How can you check for reasonableness of your solution to this problem?

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GRADE 5 PROBLEM-SOLVING PROJECTIONS
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TEKS Category 1: Mathematical Process Standards

These student expectations will not be listed under a separate TEKS category. Instead, they will be incorporated into questions across TEKS categories since the application of mathematical process standards is part of each knowledge statement.

(5.1) Mathematical Process Standards

The student uses mathematical processes to acquire and demonstrate mathematical understanding.

STAAR Standard	TEKS	STUDENT EXPECTATION
Incorporated into 1-4	5.1(A)	apply mathematics to problems arising in everyday life, society, and the workplace
Incorporated into 1-4	5.1(B)	use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution
Incorporated into 1-4	5.1(C)	select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems
Incorporated into 1-4	5.1(D)	communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate
Incorporated into 1-4	5.1(E)	create and use representations to organize, record, and communicate mathematical ideas
Incorporated into 1-4	5.1(F)	analyze mathematical relationships to connect and communicate mathematical ideas
Incorporated into 1-4	5.1(G)	display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication

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GRADE 5 PROBLEM-SOLVING PROJECTIONS
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TEKS Category 2: Number and Operations

(5.2) Number and Operations

The student applies mathematical process standards to represent, compare, and order positive rational numbers and understand relationships as related to place value.

STAAR Standard	TEKS	STUDENT EXPECTATION
Supporting	5.2(A)	represent the value of the digit in decimals through the thousandths using expanded notation and numerals
Readiness	5.2(B)	compare and order two decimals to thousandths and represent comparisons using the symbols $>$, $<$, or $=$
Supporting	5.2(C)	round decimals to tenths or hundredths

(5.3) Number and Operations

The student applies mathematical process standards to develop and use strategies and methods for positive rational number computations in order to solve problems with efficiency and accuracy.

STAAR Standard	TEKS	STUDENT EXPECTATION
Supporting	5.3(A)	estimate to determine solutions to mathematical and real-world problems involving addition, subtraction, multiplication, or division
Supporting	5.3(B)	multiply with fluency a three-digit number by a two-digit number using the standard algorithm
Supporting	5.3(C)	solve with proficiency for quotients of up to a four-digit dividend by a two-digit divisor using strategies and the standard algorithm
Supporting	5.3(D)	represent multiplication of decimals with products to the hundredths using objects and pictorial models, including area models
Readiness	5.3(E)	solve for products of decimals to the hundredths, including situations involving money, using strategies based on place-value understandings, properties of operations, and the relationship to the multiplication of whole numbers
Supporting	5.3(F)	represent quotients of decimals to the hundredths, up to four-digit dividends and two-digit whole number divisors, using objects and pictorial models, including area models
Readiness	5.3(G)	solve for quotients of decimals to the hundredths, up to four-digit dividends and two-digit whole number divisors, using strategies and algorithms, including the standard algorithm
Supporting	5.3(H)	represent and solve addition and subtraction of fractions with unequal denominators referring to the same whole using objects and pictorial models and properties of operations
Supporting	5.3(I)	represent and solve multiplication of a whole number and a fraction that refers to the same whole using objects and pictorial models, including area models
Supporting	5.3(J)	represent division of a unit fraction by a whole number and the division of a whole number by a unit fraction such as $1/3 \div 7$ and $7 \div 1/3$ using objects and pictorial models, including area models
Readiness	5.3(K)	add and subtract positive rational numbers fluently
Readiness	5.3(L)	divide whole numbers by unit fractions and unit fractions by whole numbers

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TEKS Category 3: Algebraic Reasoning

(5.4) Algebraic Reasoning

The student applies mathematical process standards to develop concepts of expressions and equations.

STAAR Standard	TEKS	STUDENT EXPECTATION
Supporting	5.4(A)	Identify prime and composite numbers
Readiness	5.4(B)	represent and solve multi-step problems involving the four operations with whole numbers using equations with a letter standing for the unknown quantity
Readiness	5.4(C)	generate a numerical pattern when given a rule in the form $y = ax$ or $y = x + a$ and graph
Supporting	5.4(D)	recognize the difference between additive and multiplicative numerical patterns given in a table or graph
Supporting	5.4(E)	describe the meaning of parentheses and brackets in a numeric expression
Readiness	5.4(F)	simplify numerical expressions that do not involve exponents, including up to two levels of grouping
Supporting	4.4(G)	round to the nearest 10, 100, or 1,000 or use compatible numbers to estimate solutions involving whole numbers
Readiness	5.4(H)	represent and solve problems related to perimeter and/or area and related to volume

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TEKS Category 4: Geometry and Measurement

(5.5) Geometry and Measurement

The student applies mathematical process standards to classify two-dimensional figures by attributes and properties.

STAAR Standard	TEKS	STUDENT EXPECTATION
Readiness	5.5(A)	classify two-dimensional figures in a hierarchy of sets and subsets using graphic organizers based on their attributes and properties

(5.6) Geometry and Measurement

The student applies mathematical process standards to understand, recognize, and quantify volume.

STAAR Standard	TEKS	STUDENT EXPECTATION
Supporting	5.6(A)	recognize a cube with side length of one unit as a unit cube having one cubic unit of volume and the volume of a three-dimensional figure as the number of unit cubes (n cubic units) needed to fill it with no gaps or overlaps if possible
Supporting	5.6(B)	determine the volume of a rectangular prism with whole number side lengths in problems related to the number of layers times the number of unit cubes in the area of the base

(5.7) Geometry and Measurement

The student applies mathematical process standards to select appropriate units, strategies, and tools to solve problems involving measurement.

STAAR Standard	TEKS	STUDENT EXPECTATION
Supporting	5.7(A)	solve problems by calculating conversions within a measurement system, customary or metric

(5.8) Geometry and Measurement

The student applies mathematical process standards to identify locations on a coordinate plane.

Supporting	5.8(A)	describe the key attributes of the coordinate plane, including perpendicular number lines (axes) where the intersection (origin) of the two lines coincides with zero on each number line and the given point (0, 0); the x-coordinate, the first number in an ordered pair, indicates movement parallel to the x-axis starting at the origin; and the y-coordinate, the second number, indicates movement parallel to the y-axis starting at the origin
Supporting	5.8(B)	describe the process for graphing ordered pairs of numbers in the first quadrant of the coordinate plane
Readiness	5.8(C)	graph in the first quadrant of the coordinate plane ordered pairs of numbers arising from mathematical and real-world problems, including those generated by number patterns or found in an input-output table.

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GRADE 5 PROBLEM-SOLVING PROJECTIONS
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TEKS Category 5: Data Analysis

(5.9) Data Analysis

The student applies mathematical process standards to solve problems by collecting, organizing, displaying, and interpreting data.

STAAR Standard	TEKS	STUDENT EXPECTATION
Supporting	5.9(A)	represent categorical data with bar graphs or frequency tables and numerical data, including data sets of measurements in fractions or decimals, with dot plots or stem-and-leaf plots
Supporting	5.9(B)	represent discrete paired data on a scatterplot
Readiness	5.9(C)	Solve one- and two-step problems using data from a frequency table, cot plot, bar graph, stem-and-leaf plot, or scatterplot

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GRADE 5 PROBLEM-SOLVING PROJECTIONS
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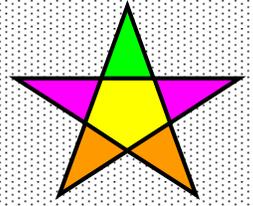
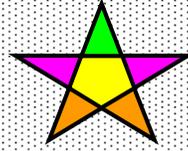
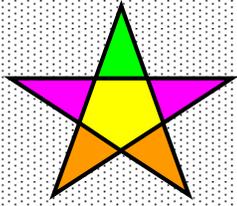
TEKS Category 6: Personal Financial Literacy

(5.10) Personal Financial Literacy

The student applies mathematical process standards to manage one's financial resources effectively for lifetime financial security.

STAAR Standard	TEKS	STUDENT EXPECTATION
Supporting	5.10(A)	define income tax, payroll tax, sales tax, and property
Supporting	5.10(B)	explain the difference between gross income and net
Not Tested	5.10(C)	Identify the advantages and disadvantages of different methods of payment, including check, credit card, debit card, and electronic payments
Not Tested	5.10(D)	develop a system for keeping and using financial records
Supporting	5.10(E)	describe actions that might be taken to balance a budget expenses exceed income
Supporting	5.10(F)	balance a simple budget

TEKSING TOWARD STAAR



MATHEMATICS

GRADE 5

**Open-Ended
Problem-Solving
Projections**

TEKS CATEGORY 2

Number and Operations

5.3A Problem-Solving 1

A dining and sight-seeing train at Royal Gorge in Colorado can take 158 passengers at a time. The train runs 26-33 times each month.

- 1.** What is the least number of passengers the train takes in one month? Show your work.
- 2.** Reverse the factors and find the product to prove your answer is correct.
- 3.** What is the greatest number of passengers the train takes in one month? Show your work.
- 4.** Reverse the factors and find the product to prove your answer is correct.
- 5.** What are three other reasonable numbers of passengers the train takes in one month? Show your work.
- 6.** Why is the first reasonable number correct?
- 7.** Why is the second reasonable number correct?
- 8.** Why is the third reasonable number correct?

- 9.** Copy and complete this sentence on your notebook paper.

The dining and sight-seeing train at Royal Gorge in Colorado takes less than _____, more than _____, and between _____ and _____ passengers each month.

5.3A Problem-Solving 2**PROBLEM 1**

Lorraine ran 2.85 miles on Monday, 3.5 miles on Tuesday, 2.75 miles on Wednesday and 4.2 miles on Thursday.

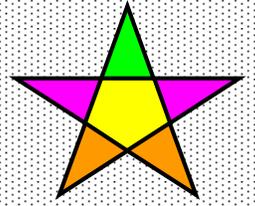
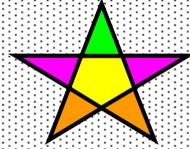
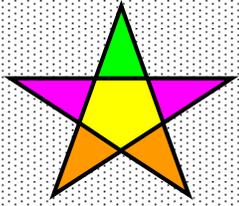
- 1.** About how many miles did Lorraine run during the four days?
- 2.** Explain how you know your answer is a good estimate for the number of miles Lorraine ran during the four days.

PROBLEM 2

Mrs. Sachs has a triangular flowerbed. One side is 4.2 feet long. Another side is 5.6 feet long and the third side is 7.3 feet long.

- 3.** What is a reasonable estimate for the perimeter of the flowerbed?
- 4.** Explain why your estimate is reasonable.

TEKSING TOWARD STAAR



MATHEMATICS

GRADE 5

**Open-Ended
Problem-Solving
Projections**

TEKS CATEGORY 3

Algebraic Reasoning

Teacher Notes: 5.4B Problem-Solving 1

Materials: (per pair of students) 1 pan balance and a zipper baggie with 25 linking cubes

5.4B Problem-Solving 1

Your teacher will give you and your partner a pan balance and linking cubes. Use the materials to solve these problems.

PROBLEM 1

Model and solve the equation $13 = 9 + x$.

1. Use linking cubes in the left pan to represent the expression on the left side of the equation.
2. Use linking cubes in the right pan to represent the expression on the right side of the equation.
3. Are the pans balanced?

Use the pan balance to find the value of x in the equation $13 = 9 + x$.

4. Add cubes to the right pan, one at a time, until the pans are balanced. What is the number of cubes you added to the right pan?
5. What does the number of cubes you added to the right pan represent?
6. What is the value of x in $13 = 9 + x$?
7. Explain how you know the value of x is correct.

PROBLEM 2

Model the equation $4 + 2 \times 3 = 7 + y$.

8. First, use the order of operations to simplify the equation. Show your work.

Use linking cubes to model the simplified equation on the pan balance.

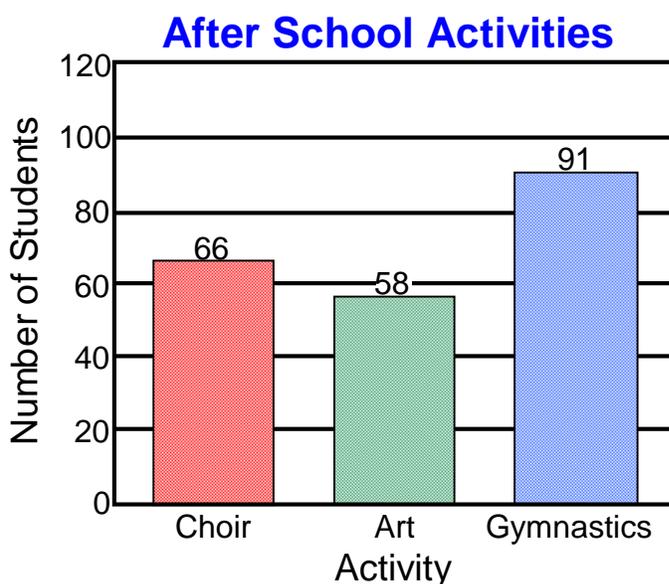
- 9.** What is the number of cubes you put in the left pan to represent the left side of the simplified equation?
- 10.** What is the number of cubes you put in the right pan to represent the right side of the simplified equation?
- 11.** Are the pans balanced?

Use the pan balance to find the value of y in the simplified equation.

- 12.** Add cubes to the right pan, one at a time, until the pans are balanced. What is the number of cubes you added to the right pan?
- 13.** What does the number of cubes you added to the right pan represent?
- 14.** What is the value of y in the simplified equation?
- 15.** Explain how you know the value of y is correct.

5.4B Problem-Solving 2

Students at an elementary school can participate in after school activities. Each student participates in only one activity. The graph shows the students who participate in choir, art and gymnastics. The remaining students participate in square dance.



1. Thirteen less than the total of students that participate in choir and gymnastics participate in square dance. Draw a strip diagram to represent the number of students that participate in square dance.
2. Write an equation to represent the number of students that participate in square dance. Let s represent the number of students who participate in square dance.
3. How many students participate in square dance?
4. Why is your answer to question 3 correct?

5.4B Problem-Solving 3

Stella sorted seashells she found on the beach in Galveston into boxes. She has 3 boxes with 15 clam shells in each box. She has 2 boxes with 7 silver dollar shells in each box. She gave her sister 10 shells. How many shells does she have now?

1. Draw a strip diagram to represent the number of clam shells Stella put into boxes.
2. Use the strip diagram to write an equation that represents the number of clam shells Stella put into boxes. Let c represent the number of clam shells.
3. What is the number of clam shells Stella put into boxes?
4. Draw a strip diagram to represent the number of silver dollar shells Stella put into boxes.
5. Use the strip diagram to write an equation that represents the number of silver dollar shells Stella put into boxes. Let s represent the number of silver dollar shells.
6. What is the number of silver dollar shells Stella put into boxes?
7. Draw a strip diagram to represent the total number of shells Stella put into boxes.

- 8.** Use the strip diagram to write an equation to represent the total number of shells Stella put into boxes. Let t represent the total number of shells.
- 9.** What is the total number of shells Stella put into boxes?
- 10.** Draw a strip diagram to represent the number of shells Stella had left after she gave her sister 10 shells.
- 11.** Use the strip diagram to write an equation to represent the number of shells Stella had left after she gave her sister 10 shells.
- 12.** What is the number of shells Stella had left after she gave her sister 10 shells?

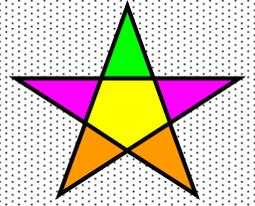
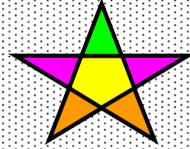
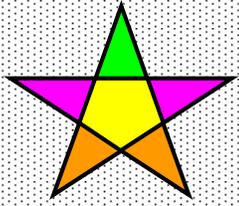
5.4B Problem-Solving 3

Prices at a movie theater snack bar are shown.

Snack Bar	
Item	Price
Family Combo Pack	\$18
Medium Drink	\$5
Large Popcorn	\$8
Yogurt Bar	\$3
Fruit Snack	\$4

1. On Friday the snack bar made \$992 selling large buckets of popcorn. Write an equation that can be used to find how many large buckets of popcorn were sold on Friday. Let p represent the number of large buckets of popcorn sold.
2. What is the number of large buckets of popcorn sold on Friday?
3. Explain why your answer to question 2 is correct.
4. On Saturday the snack bar made a total of \$340 in medium drink sales and a total of \$216 in yogurt bar sales. Which of these two items did the snack bar sell more of on Saturday?
5. Explain why your answer to question 4 is correct.

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MATHEMATICS

GRADE 5

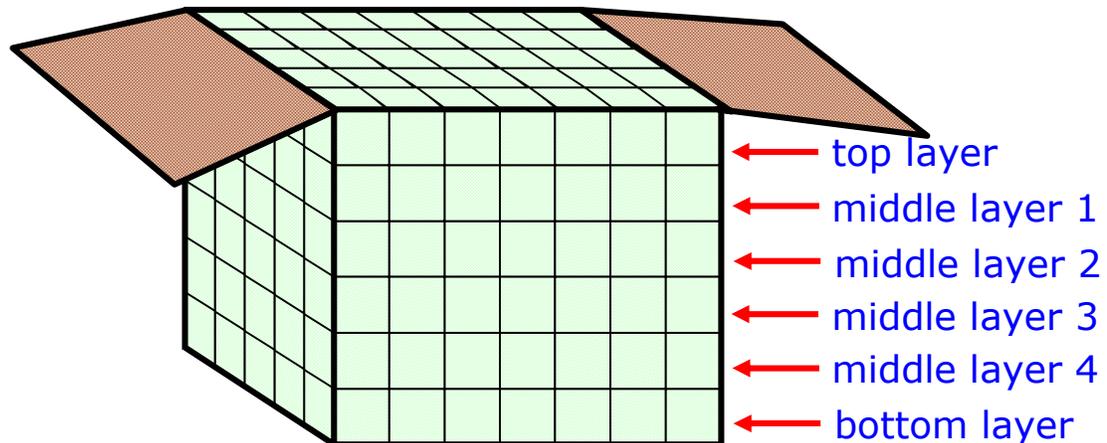
**Open-Ended
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TEKS CATEGORY 4

**Geometry
and
Measurement**

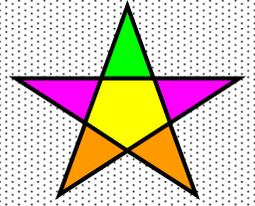
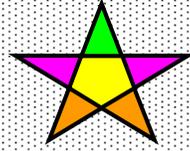
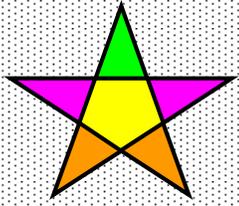
5.6B Problem-Solving 1

The picture below shows a box that is filled with 1-inch cubes.



1. How many cubes are in the top layer?
2. How many cubes are in middle layer 1?
3. How many cubes are in middle layer 2?
4. How many cubes are in middle layer 3?
5. How many cubes are in middle layer 4?
6. How many cubes are in bottom layer?
7. Write an equation that represents the total number of cubes in the box.
8. Explain why the equation is correct
9. What is volume of the box?
10. Explain how you know the volume of the box is correct.

TEKSING TOWARD STAAR



MATHEMATICS

GRADE 5

**Open-Ended
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TEKS CATEGORY 5

Data Analysis

5.9B Problem-Solving 1

Jerrod's baseball team is having a car wash to raise money for new uniforms. The team coach recorded the number of team members washing cars and the time it took to wash each car.

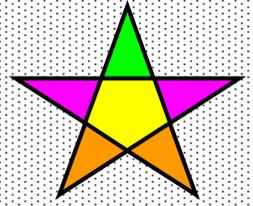
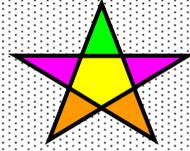
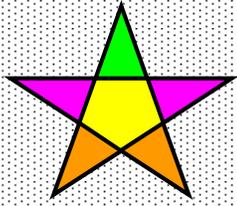
Number of Team Members	5	2	8	1	6	5
Amount of Time (min)	8	10	4	10	5	7

The coach decided to create a scatterplot to display the data.

- 1.** What should he title the scatterplot?
- 2.** What label should he use for the x -axis of the scatterplot?
- 3.** What scale should he use for the x -axis of the scatterplot?
- 4.** Explain how you used the data to decide what scale he should use for the x -axis.
- 5.** What label should he use for the y -axis of the scatterplot?

6. What scale should he use for the y -axis of the scatterplot?
7. Explain how you used the data to decide what scale he should use for the y -axis.
8. List the coordinates for the six points he will plot on the scatterplot.

TEKSING TOWARD STAAR



MATHEMATICS

GRADE 5

**Open-Ended
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TEKS CATEGORY 6

**Personal Financial
Literacy**

5.10B Problem-Solving 1

Keith worked for 45 hours last week. His pay is \$14 per hour for 40 hours and \$16 per hour for any time over 40 hours. This is Keith's only source of income for last week.

- 1.** What was Keith's pay for the 40 hours he worked last week?
- 2.** Why is your answer to question 1 correct?
- 3.** What was Keith's pay for the hours he worked over 40 hours last week?
- 4.** Why is your answer to question 3 correct?
- 5.** What was Keith's gross pay for the hours he worked last week?
- 6.** Why is your answer to question 5 correct?
- 7.** Keith's payroll tax for last week was \$99.63. What was his net income for last week?
- 8.** Why is your answer to question 7 correct?
- 9.** What was the final amount on Keith's pay check for last week?
- 10.** Why is your answer to question 9 correct?