



TEXAS PERFORMANCE STANDARDS PROJECT
Grade 4 Mathematics Unit
Math Around Town

This guide links the *Math Around Town* unit to the Texas Essential Knowledge and Skills (TEKS) for fourth graders. *Math Around Town* is a mathematics unit that allows students to discover the uses of math in the real world, using interviews with professionals who need math skills for their jobs. Though a mathematics unit, *Math Around Town* also leads students to practice skills in the other subject areas of English language arts, science, and social studies. For example, students use critical thinking and problem solving, which the science TEKS require, and writing and research skills, which the English Language Arts and Social Studies TEKS include. The following document includes the applicable TEKS and the details of the *Math Around Town* unit. The asterisks indicate that those TEKS are testable on the Texas Assessment of Knowledge and Skills (TAKS). The final section of this document presents the applicable Texas College Readiness Standards adopted by the Texas Higher Education Coordinating Board (THECB) on January 24, 2008.

Texas Essential Knowledge and Skills

This unit may address the following TEKS:

English Language Arts:

- 4.1 Reads grade-level text with fluency and comprehension
- 4.2 Understands new vocabulary and uses it when reading and writing
- 4.9 Reads independently for sustained periods of time and produces evidence of their reading
- 4.10 Analyzes, makes inferences, and draws conclusions about the author's purpose in cultural, historical, and contemporary contexts and provides evidence from the text to support their understanding
- 4.11 Analyzes, makes inferences, and draws conclusions about expository text and provide evidence from text to support their understanding
- 4.14 Uses comprehension skills to analyze how words, images, graphics, and sounds work together in various forms to impact meaning
- 4.18 Writes expository and procedural or work-related texts to communicate ideas and information to specific audiences for specific purposes
- 4.20 Understands the function of and uses the conventions of academic language when speaking and writing
- 4.21 Writes legibly and uses appropriate capitalization and punctuation conventions in their compositions
- 4.22 Spells correctly
- 4.23 Asks open-ended research questions and develops a plan for answering them
- 4.24 Determines, locates, and explores the full range of relevant sources addressing a research question and systematically records the information they gather
- 4.25 Clarifies research questions and evaluates and synthesizes collected information

- 4.27 Uses comprehension skills to listen attentively to others in formal and informal settings
- 4.28 Speaks clearly and to the point, using the conventions of language
- 4.29 Works productively with others in teams

Mathematics:

- 4.12 Applies measurement concepts* (Testable on the Grade 4 Mathematics TAKS, Objective 4)
- 4.13 Solves problems by collecting, organizing, displaying, and interpreting sets of data* (Testable on the Grade 4 Mathematics TAKS, Objective 5)
- 4.14 Solves problems connected to everyday experiences and activities in and outside of school* (Testable on the Grade 4 Mathematics TAKS, Objective 6)
- 4.16 Uses logical reasoning to make sense of his or her world
- 5.5 Makes generalizations based on observed patterns and relationships* (Testable on the Grade 5 Mathematics TAKS, Objective 2)
- 5.6 Describes relationships mathematically and selects from and uses diagrams and number sentences to represent real-life situations* (Testable on the Grade 5 Mathematics TAKS, Objective 2)
- 5.12 Describes and predicts the results of a probability experiment* (Testable on the Grade 5 Mathematics TAKS, Objective 5)
- 5.13 Solves problems by collecting, organizing, displaying, and interpreting sets of data* (Testable on the Grade 5 Mathematics TAKS, Objective 5)
- 5.14 Solves problems connected to everyday experiences and activities in and outside of school* (Testable on the Grade 5 Mathematics TAKS, Objective 6)
- 5.15 Communicates about mathematics using informal language* (Testable on the Grade 5 Mathematics TAKS, Objective 6)
- 5.16 Uses logical reasoning to make sense of his or her world

Science:

- 4.3 Uses critical thinking and scientific problem solving to make informed decisions* (Testable on the Grade 4 Science TAKS, Objective 1)
- 4.4 Knows how to use a variety of tools and methods to conduct science inquiry* (Testable on the Grade 4 Science TAKS, Objective 1)
- 4.5 Knows that complex systems may not work if some parts are removed* (Testable on the Grade 4 Science TAKS, Objective 2)
- 5.3 Uses critical thinking and scientific problem solving to make informed decisions

Social Studies:

- 4.13 Understands patterns of work and economic activities in Texas
- 4.21 Understands the impact of science and technology on life in Texas
- 4.22 Applies critical-thinking skills to organize and use information acquired from a variety of sources including electronic technology
- 4.23 Communicates in written, oral, and visual forms
- 4.24 Uses problem-solving and decision-making skills, working independently and with others, in a variety of settings

Description of Unit

Students will learn about real-life mathematics applications in the world around them.

Goals

Students will meet these goals in their explorations:

- Discover ways in which students use mathematics in and out of school
- Investigate ways in which professionals use mathematics in their work

- Create problems that illustrate how professionals use mathematics concepts in real-world problem situations

Phase I. Learning Experiences

1. Read *Math Curse*, by Jon Scieszka and Lane Smith, to students.
 - As a whole class, students brainstorm all of the examples of mathematics that they have encountered that day. Then in small groups, students categorize these examples according to mathematics concepts taught in fourth grade.
 - In partner teams of two or more, students work the problems in the book *Math Curse*. (Answer key provided—See Attachment #1.) Students classify each of the problems in the book as one of the following: basic math facts, basic math problem solving, higher-level math problem solving, you've-got-a-problem-but-it-isn't-math, or you-asked-the-wrong-question math problem (credit to Suzy Red in Lockhart, TX). Use *Math Curse* Problem Categorization—Attachment #2.
 - Using the *Math Curse* format, each student will spend a day recording in a journal how he/she uses mathematics in everyday activities at home and school. He/she then will create Parallel Problems based on journal entries similar to those in Attachment #3—Parallel Problems.
2. To demonstrate other applications of math skills in real life, students solve multi-step mathematics problems. (See Attachments #4 and #5—Pizza Party and Cover It Up.) You may wish to select various student examples that illustrate the diversity of solutions and follow up with a discussion. This will allow students to compare problem-solving strategies and understand that there are many ways to solve a problem.
3. To show how mathematics is used in careers, each student will complete one of the career-based mathematics problems attachments—Movie Mania, TV Show, or Golf Course Construction—and will write a brief summary of how they arrived at each answer. (See Attachments #10, #11, or #12.)

Phase II. Independent Research

A. Research process

1. Each student will select a career to study. A primary focus is to find out how mathematics is used in that career, though the student may want to learn about other aspects of that career as well. To get started, give students a list of careers (Attachment #6—Occupations) that reflect the composition of the workforce in your community. Using the list or other resources, each student will choose a career in which professionals rely heavily upon mathematics skills. You may wish to use <http://www.bls.gov/k12/> to help students explore their own career interests.
2. Each student will prepare a set of interview questions and will conduct an interview with a person in the field of work identified for study. He/she should try to discover all of the mathematical applications used in that person's job.
 - Use Attachment #7—Interview Questions & Answers, to write questions and record answers.
 - Use Attachment #8—Job-related Math Skills, to identify which mathematical concepts interviewees use on their jobs on a regular basis.
 - Use Attachment #9—Interview Math Problems, with samples of math problems the interviewee encounters on the job.

B. The product

Each student will develop a board game or a learning center based on how math is used in the career studied.

- The game should include fair rules and nine mathematics concepts found in the fourth grade TEKS. (See Attachment #13.)
- A learning center for another grade level should show how mathematics is used in a particular career. Centers must include directions and manipulatives for each activity. (See Attachment #14.)

C. Communication

Each student will participate in a “job interview” in which he/she demonstrates knowledge of the role of mathematics in the career of study. The student may want to dress as a person in that career and discuss the different ways in which math is important to the jobs they studied. The interview should be audiotaped or videotaped.

The student should write questions for the interviewer. Some questions the interviewer may ask include the following:

- How has the way the people in that job use math changed over time?
- What math tools did they use in the past that they do not use now?
- What math tools do they use now that they did not use in the past?

D. Submission

- a. The cover sheet
- b. Attachment #7—Interview Questions & Answers
- c. Attachment #8—Job-related Math Skills
- d. Attachment #9—Interview Math Problems
- e. Product—Attachment #13 or #14
- f. Audiotape or videotape of job interview, including the Q&A session

THECB College Readiness Standards

This unit may address the following THECB College Readiness Standards:

English Language Arts:

- I.A.2 Generates ideas and gathers information relevant to the topic and purpose, keeping careful records of outside sources
- I.A.3 Evaluates relevance, quality, sufficiency, and depth of preliminary ideas and information, organizes material generated, and formulates thesis
- I.A.4 Recognizes the importance of revision as the key to effective writing
- II.A.1 Uses effective reading strategies to determine a written work’s purpose and intended audience
- II.A.2 Uses text features and graphics to form an overview of informational texts and to determine where to locate information
- II.A.4 Draws and supports complex inferences from text to summarize, draw conclusions, and distinguish facts from simple assertions and opinions
- II.A.5 Analyzes the presentation of information and the strength and quality of evidence used by the author, and judges the coherence and logic of the presentation and the credibility of an argument
- II.D.1 Describes insights gained about oneself, others, or the world from reading specific texts
- III.A.1 Understands how style and content of spoken language varies in different contexts and influences the listener’s understanding

- III.A.2 Adjusts presentation (delivery, vocabulary, length) to particular audiences and purposes
- III.B.1 Participates actively and effectively in one-on-one oral communication situations
- III.B.2 Participates actively and effectively in group discussions
- III.B.3 Plans and delivers focused and coherent presentations that convey clear and distinct perspectives and demonstrate solid reasoning
- IV.A.1 Analyzes and evaluates the effectiveness of a public presentation
- IV.A.2 Interprets a speaker's message; identifies the position taken and the evidence in support of that position
- IV.A.3 Uses a variety of strategies to enhance listening comprehension
- IV.B.1 Listens critically and responds appropriately to presentations
- IV.B.2 Listens actively and effectively in one-on-one communication situations
- IV.B.3 Listens actively and effectively in group discussions
- V.A.1 Formulates research questions
- V.A.2 Explores a research topic
- V.A.3 Refines research topic and devises a timeline for completing work
- V.B.1 Gathers relevant sources
- V.B.2 Evaluates the validity and reliability of sources
- V.B.3 Synthesizes and organizes information effectively
- V.B.4 Uses source material ethically
- V.C.1 Designs and presents an effective product

Mathematics:

- I.A.1 Compares real numbers
- I.B.1 Performs computations with real and complex numbers
- IV.D.2 Applies probabilistic measures to practical situations to make an informed decision
- VI.A.1 Plans a study
- VI.B.1 Determines types of data
- VI.B.2 Selects and applies appropriate visual representations of data
- VI.B.4 Describes patterns and departure from patterns in a set of data
- VIII.A.1 Analyzes given information
- VIII.A.2 Formulates a plan or strategy
- VIII.A.3 Determines a solution
- VIII.A.4 Justifies the solution
- VIII.A.5 Evaluates the problem-solving process
- VIII.B.1 Develops and evaluate convincing arguments
- VIII.B.2 Uses various types of reasoning
- VIII.C.1 Formulates a solution to a real-world situation based on the solution to a mathematic problem
- VIII.C.2 Uses a function to model a real-world situation
- VIII.C.3 Evaluates the problem-solving process
- IX.A.1 Uses mathematical symbols, terminology, and notation to represent given and unknown information in a problem
- IX.A.2 Uses mathematical language to represent and communicate the mathematical concepts in a problem
- IX.A.3 Uses mathematics as a language for reasoning, problem solving, making connections, and generalizing
- IX.B.1 Models and interprets mathematical ideas and concepts using multiple representations
- IX.B.2 Summarizes and interprets mathematical information provided orally, visually, or in written form within the given context
- IX.C.1 Communicates mathematical ideas, reasoning, and their implications using symbols, diagrams, graphs, and words

- IX.C.2 Creates and use representations to organize, record, and communicate mathematical ideas
- IX.C.3 Explains, displays, or justifies mathematical ideas and arguments using precise mathematical language in written or oral communications
- X.A.1 Connects and uses multiple strands of mathematics in situations and problems
- X.A.2 Connects mathematics to the study of other disciplines
- X.B.1 Uses multiple representations to demonstrate links between mathematical and real-world situations
- X.B.2 Understands and uses appropriate mathematical models in the natural, physical, and social sciences
- X.B.3 Knows and understands the use of mathematics in a variety of careers and professions

Science:

- I.A.4 Relies on reproducible observations of empirical evidence when constructing, analyzing, and evaluating explanations of natural events and processes
- I.B.1 Designs and conducts scientific investigations in which hypotheses are formulated and tested
- I.C.1 Collaborates on joint projects
- I.E.1 Uses several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic
- I.E.2 Uses essential vocabulary of the discipline being studied
- III.B.2 Sets up apparatuses, carries out procedures, and collects specified data from a given set of appropriate instructions
- III.B.3 Recognizes scientific and technical vocabulary in the field of study and use this vocabulary to enhance clarity of communication
- III.B.4 Lists, uses, and gives examples of specific strategies before, during, and after reading to improve comprehension
- III.C.1 Prepares and represents scientific/technical information in appropriate formats for various audiences
- III.D.1 Uses search engines, databases, and other digital electronic tools effectively to locate information
- III.D.2 Evaluates quality, accuracy, completeness, reliability, and currency of information from any source
- V.C.1 Recognizes patterns of change.
- V.E.1 Uses models to make predictions.

Social Studies:

- I.F.1 Uses a variety of research and analytical tools to explore questions or issues thoroughly and fairly
- I.A.3 Analyzes how physical and cultural processes have shaped human communities over time
- I.A.5 Analyzes how various cultural regions have changed over time
- III.B.1 Applies social science methodologies to compare societies and cultures
- IV.A.1 Identifies and analyze the main idea(s) and point(s) of view in sources
- IV.A.2 Situates an informational source in its appropriate contexts
- IV.A.3 Evaluates sources from multiple perspectives
- IV.A.4 Understands the differences between a primary and secondary source and use each appropriately to conduct research and construct arguments
- IV.A.5 Reads narrative texts critically
- IV.A.6 Reads research data critically
- IV.B.1 Uses established research methodologies
- IV.B.3 Gathers, organizes, and displays the results of data and research

- IV.B.4 Identifies and collects sources
- IV.C.1 Understands/interprets presentations critically
- IV.D.1 Constructs a thesis that is supported by evidence
- IV.D.2 Recognizes and evaluates counter-arguments
- V.A.1 Uses appropriate oral communication techniques, depending on the context or nature of the interaction
- V.A.2 Uses conventions of standard written English
- V.B.1 Attributes ideas and information to source materials and authors

Cross-Disciplinary Standards:

- I.A.1 Engages in scholarly inquiry and dialogue
- I.A.2 Accepts constructive criticism and revises personal views when valid evidence warrants
- I.B.1 Considers arguments and conclusions of self and others
- I.B.2 Constructs well-reasoned arguments to explain phenomena, validates conjectures, or supports positions
- I.B.3 Gathers evidence to support arguments, findings, or lines of reasoning
- I.B.4 Supports or modify claims based on the results of an inquiry
- I.D.1 Self-monitors learning needs and seeks assistance when needed
- I.D.2 Uses study habits necessary to manage academic pursuits and requirements
- I.D.3 Strives for accuracy and precision
- I.D.4 Perseveres to complete and master tasks
- I.E.1 Works independently
- I.E.2 Works collaboratively
- I.F.1 Attributes ideas and information to source materials and people
- I.F.2 Evaluates sources for quality of content, validity, credibility, and relevance
- I.F.3 Includes the ideas of others and the complexities of the debate, issue, or problem
- I.F.4 Understands and adheres to ethical codes of conduct
- II.A.1 Uses effective prereading strategies
- II.A.2 Uses a variety of strategies to understand the meanings of new words
- II.A.3 Identifies the intended purpose and audience of the text
- II.A.4 Identifies the key information and supporting details
- II.A.5 Analyzes textual information critically
- II.A.7 Adapts reading strategies according to structure of texts
- II.A.8 Connects reading to historical and current events and personal interest
- II.B.1 Writes clearly and coherently, using standard writing conventions
- II.B.2 Writes in a variety of forms for various audiences and purposes
- II.C.1 Understands which topics or questions are to be investigated
- II.C.2 Explores a research topic
- II.C.3 Refines research topic based on preliminary research and devise a timeline for completing work
- II.C.4 Evaluates the validity and reliability of sources
- II.C.5 Synthesizes and organize information effectively
- II.C.6 Designs and present an effective product
- II.C.7 Integrates source material
- II.C.8 Presents final product
- II.D.1 Identifies patterns or departures from patterns among data
- II.D.2 Uses statistical and probabilistic skills necessary for planning an investigation and collecting, analyzing, and interpreting data
- II.D.3 Presents analyzed data and communicate findings in a variety of formats
- II.E.1 Uses technology to gather information
- II.E.2 Uses technology to organize, manage, and analyze information

- II.E.3 Uses technology to communicate and display findings in a clear and coherent manner
- II.E.4 Uses technology appropriately

Attachment #1
Math Course Problem Solutions

A. nine nephews and six nieces

B.1. yes, you will have nineteen extra minutes

B.2. sixty minutes

B.3. 32 teeth

C.1. eight shirts

C.2. seven shirts

D.1. four quarts

D.2. two pints

D.3. twelve inches

D.4. three feet

E.1. April

E.2. June

F.1. four desks

F.2. three desks

F.3. eight desks

F.4. twelve desks

F.5. 240 fingers and thumbs, 192 fingers without thumbs

F.6. 48 ears

F.7. 24 tongues

G.1. C

G.2. B and C

H.1. 400 million M&Ms

I.3. >

J.1.a. 11, 12, 13, 14, 15

J.1.b. 12, 14, 16, 18, 20

J.1.c. 21, 34, 55, 89, 144

J.1.d. 11, 12, 13, 20, 21

J.1.e. 11, 100, 101, 110, 111

K.1. one quarter = 25 pennies

K.2. five \$1 = one \$5

K.3. one \$1 = one-hundred pennies

K.4. one \$5 = twenty quarters

Attachment #2
Math Course Problem Categorization

Partners: _____

Directions: Solve all of the problems found in *Math Course*. Classify each problem by putting a checkmark in the proper column.

Problem	Answer	Basic facts	Basic math problem solving	Higher-level math problem solving	You've got a problem, but it isn't math	You asked the wrong question math problem
If my bus leaves at 8:00, will I make it on time?						
How many minutes in one hour?						
How many teeth in one mouth?						
How many shirts is that altogether?						
How many shirts would I have if I threw away that awful plaid shirt?						
When will Uncle Zeno quit sending me such ugly shirts?						
How many quarts are in a gallon?						
How many pints are in a quart?						
How many inches are in a foot?						
How many feet are in a yard?						
How many yards are in a neighborhood?						

Problem	Answer	Basic facts	Basic math problem solving	Higher-level math problem solving	You've got a problem, but it isn't math	You asked the wrong question math problem
How many inches are in a pint?						
How many feet are in my shoes?						
True or false: what is the bus driver's name?						
Which month has the most birthdays?						
Which month has the fewest birthdays?						
Why doesn't February have a "w"?						
Don't you think this chart looks sort of like a row of buildings?						
Do you ever look at clouds and think they look like something else?						
What does this inkblot look like to you?						
What if Mrs. Fibonacci rearranges the desks to make six rows?						
Eight rows?						
Three rows?						
Two rows?						
How many fingers are in our class?						

Problem	Answer	Basic facts	Basic math problem solving	Higher-level math problem solving	You've got a problem, but it isn't math	You asked the wrong question math problem
How many tongues are in our class?						
If I want two slices of pizza, what should I ask for?						
What is another way to say half of an apple pie?						
Which tastes greater?						
Estimate how many M&Ms it would take to measure the length of the Mississippi River?						
Estimate how many M&Ms you would eat if you had to measure the Mississippi River with M&Ms.						
Can you spell Mississippi without any M&Ms?						
Does lipstick - stick = lip?						
Does tunafish + tunafish =ournafish?						
Circle the correct answer - < > =						
What are the next five numbers in each sequence below? 1, 2, 3, 4, 5, 6, 7, 8, 9, 10						

Problem	Answer	Basic facts	Basic math problem solving	Higher-level math problem solving	You've got a problem, but it isn't math	You asked the wrong question math problem
Molly - 2, 4, 6, 8, 10						
Mrs. Fibonacci - 1, 1, 2, 3, 5, 8, 13						
Tetra - 1, 2, 3, 10						
Binary - 1, 10						
Do you think Mrs. Fibonacci has been to the planet Tetra?						
How would you bowl if you lived on the planet binary?						
So which is true? a, b, c, d						
How do you think Thomas Jefferson feels about all of this?						

MATH COURSE

2 by Jon Scieszka and Lane Smith

9

Parallel Problems

Objective: ...generate and extend problems
© 1996, Suzy Red, Lockhart, Texas

1. Write a parallel math problem for the dedication. Use your aunts and uncles instead of nieces and nephews as Jon Scieszka did. If you had written the dedication, how many aunts and uncles would your dedication include?

2. Create a before-school math problem using YOUR routine, including times, and transportation.

4. Shake a new cereal box. Estimate the weight of the whole box in ounces. Weigh the box. Without emptying it out, figure out how much the empty box weighs. Estimate the number of flakes it takes to fill your bowl. How far from the exact

5. Estimate how much a school bus weighs. Research to discover how much it actually weighs. How far off were you?

6. Write another question about a school bus.

8. Look around at your classmates. Write a multiplication problem using something about them. Include some of their names.

10. Give the problems YOU wrote to a friend to see if your friend can work them! Give help if you need to.

9. At lunch, what do you cut into pieces? Write a math problem about it.

3. Look in YOUR closet. Classify your shirts into four categories. What categories will you use? Write two addition problems and two subtraction problems based on your categories

7. If you were to bring a bag of something to share with the class, what would you bring? How many would each kid get?

Attachment #4

Pizza Party

Directions to Student:

Your class has decided to have pizza for the end-of-school party. You have raised \$60. You must decide which pizza restaurant has the best price. Don't forget the 8.5% sales tax. The local pizza parlors are listed below.

Pizza Prices

	Small (one topping)	Medium (one topping)	Large (one topping)	Drinks	Delivery Charge
Pizza-a-Go-Go	\$6.25 Serves 6	\$7.49 Serves 8	\$8.50 Serves 10	One free bottle of soda with each pizza purchased	\$1/pizza
Pizza Palace	\$4.29 Serves 4	\$7.30 Serves 6	\$10.25 Serves 8 Special: Buy 1, Get 1 Free	\$2.50/ bottle	No delivery charge
Dough Town	\$4.99 Serves 4- 6	\$8.50 Serves 6-8	\$9.69 Serves 8-10	Buy 1 bottle at \$2.19, get 1 free	\$2.50

Assume that there are 25 students in your class and that each person (including your teacher) will eat two slices. Also assume that the slices of pizza are all the same size. Considering only the price, where should you buy the pizza? How many pizzas will you need? Assume each bottle of soda is 2 liters and will serve four people. How many bottles of soda will you need?

Please show all your work on the page that follows, and write a brief description of how you decided on your answer.

Mathematical knowledge and skills:

- Number, operation, and quantitative reasoning
- Patterns, relationships, and algebraic thinking
- Probability and statistics
- Underlying processes and mathematical tools

Adapted from Danielson, C., & Marquez, E. (1998). *A collection of performance tasks and rubrics: High school mathematics*. Larchmont, NY: Eye on Education.

Where would you buy your pizza? _____

How many pizzas will you need? _____

How many liters of soda will you need? _____

Write a description of how you decided on your answers.

Attachment #5 Cover It Up

Directions to Student:

You are going to paint your bedroom using two coats of paint. To select the color of paint you would like to use, visit one of the following websites:

- <http://www.behr.com/behrex/workbook/index.jsp>
- http://www.benjaminmoore.com/wrapper_pcv.asp?L=owner&K=intproj&N=intproj
- http://www.sherwin-williams.com/do_it_yourself/paint_colors/paint_color_palette/

Once you have selected your color, you need to determine the cost of the paint. Calculate the number of cans of paint that you will need and their cost from a store in your community.

To find the cost of the paint, you will need to:

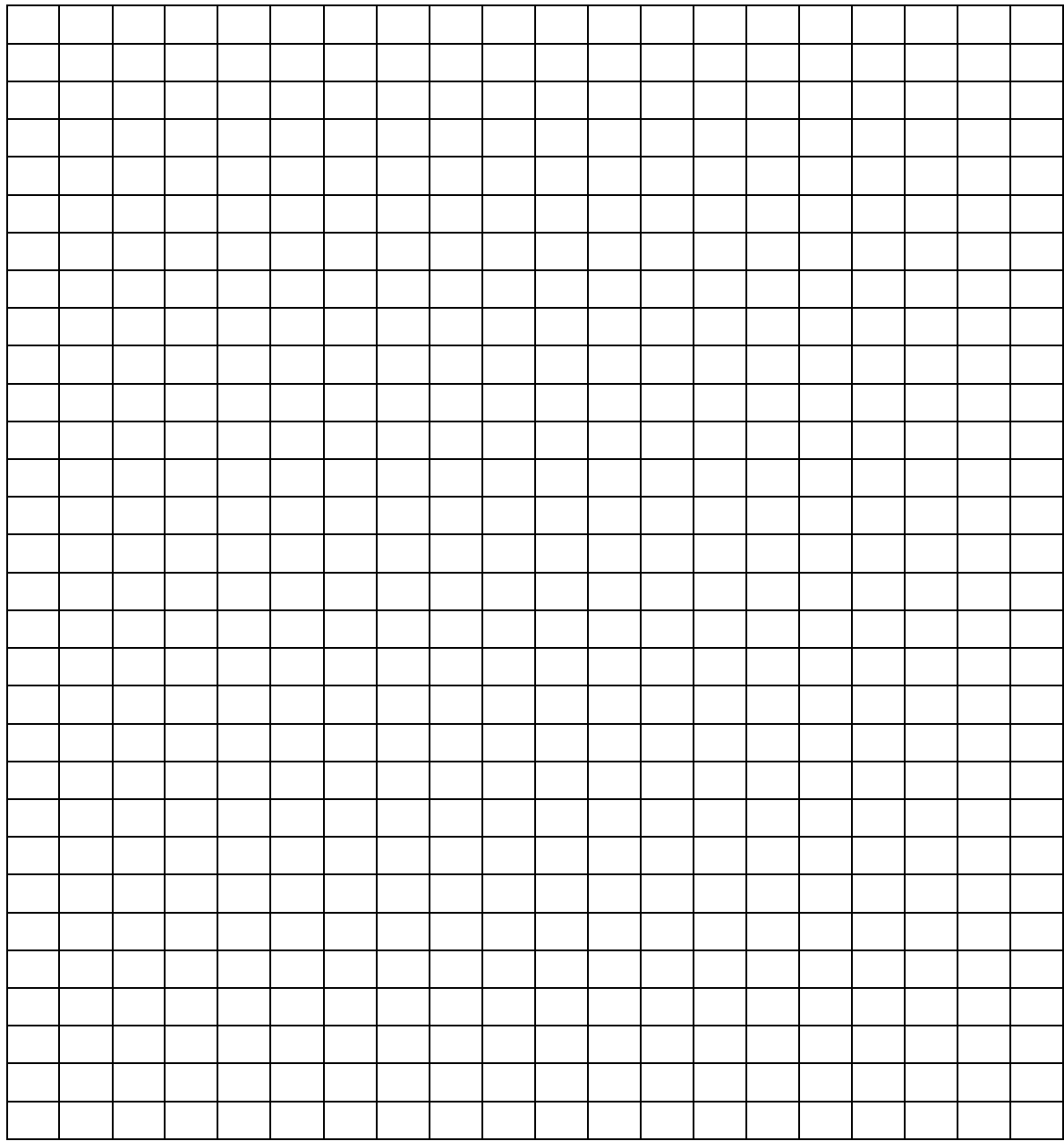
- Measure and calculate the area of the walls in your bedroom;
- Determine how much area a single can of paint will cover (usually stated on the can itself);
- Calculate the number of cans required for two coats of paint;
- Calculate the amount the paint will cost;
- Calculate the cost of other supplies (e.g., brushes, tape); and
- Describe in words how you found your solution.

Use the grid on the page that follows to draw a scaled floor plan of your room. Show all your work, and present it in a form that is neat and easy to read.

Mathematical knowledge and skills:

- Number, operation, and quantitative reasoning
- Geometry and spatial reasoning
- Measurement
- Underlying processes and mathematical tools

Adapted from Danielson, C., & Marquez, E. (1998). *A collection of performance tasks and rubrics: High school mathematics*. Larchmont, NY: Eye on Education.



Attachment #6 Occupations

Accountant	Engineer (Civil)	Oceanographer (Biological)
Accounting System Analyst	Engineer (Electrical)	Optician
Administrator: Shopping Mall	Engineer (Industrial)	Orthopedic Surgeon
Advertising Agent	Engineer (Petroleum)	Painting Contractor
Airline Passenger Service Agent	Environmental Analyst	Payroll Supervisor
Airplane Mechanic	Farm Advisor	Personnel Administrator
Airplane Pilot	Fire Prevention Officer	Pharmacist
Air Traffic Controller	Fire Fighter	Photographer
Appraiser (Land)	Forestry Land Manager	Physical Therapist
Architect	Forestry Recreation Manager	Plumber
Artist (Graphic)	Geologist (Environmental)	Police Officer
Attorney	Highway Patrol Officer	Political Campaign Manager
Auditor	Hydrologist	Printer
Auto Mechanic	Income Tax Preparer	Psychologist (Experimental)
Bank Teller	Insurance Agent	Publishing: Production Manager
Biologist (Environmental)	Insurance Claims Supervisor	Purchasing Agent
Carpenter	Interior Decorator	Radio Technician
Carpet Cleaner	Investment Counselor	Real Estate Agent
Cartographer	Landscape Architect	Roofer
Chiropractor	Librarian	Savings Counselor
Computer Programmer	Machinist	Sheet Metal/Heating Specialist
Computer Systems Engineer	Manager: Appliance Store	Statistician
Contractor (General)	Manager: Temp. Employment Service	Stock Broker
Controller (Hospital)	Marketing Rep. (Computers)	Surveyor
Counter Clerk (Building Materials)	Masonry Contractor	Technical Researcher
Data Processor	Medical Lab Technician	Title Insurance Officer
Dentist	Meteorologist	Travel Agent
Dietician	Motorcycle Sales and Repair	T.V. Repair Technician
Doctor (G.P.)	Navigator	Urban Planner
Drafter	Newspaper: Circulation	Veterinarian
Economist	Newspaper: Production	Waitress/Waiter
Electrician	Newspaper: Reporter	Wastewater Treatment Operator
Electrical Engineer	Nurse	
Electronics Technician		

Attachment #7
Interview Questions & Answers

Name of person being interviewed: _____

Occupation: _____

Date and time of interview: _____

What do you do during a typical day?

What services do you provide?

How do you use math on your job?

How has the way a _____ uses math changed over time?

What math tools did a _____ use in the past that are no longer used?

What math tools does a _____ use now that were not used in the past?

Question: _____

Answer: _____

Question: _____

Answer: _____

Question: _____

Answer: _____

Question: _____

Answer: _____

Question: _____

Answer: _____

Attachment #8
Job-related Math Skills

Below is a simplified list of the Texas Essential Knowledge and Skills (TEKS) for grades 3-8. Please check all skills that the professional uses in his/her job.

Numbers, Operations, and Quantitative Reasoning

	Addition	Subtraction	Multiplication	Division	Powers	Roots
Whole						
Fractions						
Decimals						
Percents						
Negatives						

- _____ Read and write numbers
- _____ Compare and/or order numbers
- _____ Convert between fractions, decimals, and percents
- _____ Use factors and/or multiples
- _____ Use scientific notation
- _____ Round to estimate
- _____ Use reasonableness of answers to check for accuracy

Patterns, Relationships, Algebraic Thinking

- _____ Use formulas
- _____ Use ratios/proportional relationships
- _____ Use patterns and/or sequences
- _____ Use rates

Geometry and Spatial Reasoning

Use geometric shapes to:

- _____ Draw solids from different perspectives (top, side, front, etc.)
- _____ Make models
- _____ Solve problems

Use geometric terms (check all the apply):

Angles

Acute Obtuse Supplementary
 Right Complementary

Polygons

Triangle Square Rectangle Quadrilateral
 Pentagon Hexagon

Solids

Vertices Edges Faces Pyramid
 Cone Prism Cylinder Rectangular prism

Lines

Parallel Perpendicular

Circle

Diameter Radius Circumference
 Translations Reflections Coordinate plane
 Rotations Symmetry

Attachment #9
Interview Math Problems

Name of person being interviewed: _____

Occupation: _____

Samples of math problems that the interviewee encounters on the job:

1.	2.
3.	4.

Attachment #10
Career-based Mathematics Problems
Movie Mania

Directions to Student:

You have just been promoted to manager of a movie theatre. Figure out how many employees you would need to schedule based on a one-to-fifty employee-to-moviegoer ratio—that is, for every fifty moviegoers there is one employee. You have twelve employees, and no one can work over eight hours per day. Develop a weekend schedule for your employees based on this information. Some employees have some restrictions on when they can work. Employee A cannot work after 6:00 PM. Employees B and D have to work the same shift as they carpool. Employee F cannot come in before 3:00 PM on Saturday. Employee G cannot work on Sunday.

Use Table 1 to help you complete Table 2 for Saturday. Then complete Table 3 for Sunday when 10% fewer people attend the movies than on Saturday.

Time Periods	Number of Moviegoers on a Typical Saturday	Number of Employees Needed on Saturday	Number of Moviegoers on a Typical Sunday	Number of Employees Needed on Sunday
12 noon to 2:00 PM	205			
2:00 PM to 4:00 PM	277			
4:00 PM to 6:00 PM	353			
6:00 PM to 8:00 PM	409			
8:00 PM to 10:00 PM	351			
10:00 PM to 12 midnight	245			

Table 1. Employee-to-moviegoer ratio.

Employee	Start Time	End Time
A		
B		
C		
D		
E		
F		
G		
H		
I		
J		
K		
L		

Table 2. Employee schedule for Saturday.

Employee	Start Time	End Time
A		
B		
C		
D		
E		
F		

Table 3. Employee schedule for Sunday.

The average moviegoer spends \$5.00 or less on snacks. Using the price chart, determine how many movie meals of three items each could be offered. No more than one from each category (e.g., beverages, popcorn, candy, other food items) can be used.

Item	Cost
Hot dog	\$2.50
Pickle	\$1.00
Nachos	\$2.25
Small unbuttered popcorn	\$1.75
Small buttered popcorn	\$2.00
Large unbuttered popcorn	\$2.75
Large buttered popcorn	\$3.00
Small candy	\$1.50
Large candy	\$2.25
Small drink	\$1.00
Medium drink	\$1.25
Large drink	\$1.50
Bottled water	\$1.50

Table 4. Itemized cost of snacks.

Use Movie Meals to determine all the possibilities.

<table border="1"> <thead> <tr> <th><u>Items</u></th> <th><u>Costs</u></th> </tr> </thead> <tbody> <tr> <td>1. _____</td> <td>_____</td> </tr> <tr> <td>2. _____</td> <td>_____</td> </tr> <tr> <td>3. _____</td> <td>_____</td> </tr> <tr> <td>Total</td> <td>_____</td> </tr> </tbody> </table>	<u>Items</u>	<u>Costs</u>	1. _____	_____	2. _____	_____	3. _____	_____	Total	_____	<table border="1"> <thead> <tr> <th><u>Items</u></th> <th><u>Costs</u></th> </tr> </thead> <tbody> <tr> <td>1. _____</td> <td>_____</td> </tr> <tr> <td>2. _____</td> <td>_____</td> </tr> <tr> <td>3. _____</td> <td>_____</td> </tr> <tr> <td>Total</td> <td>_____</td> </tr> </tbody> </table>	<u>Items</u>	<u>Costs</u>	1. _____	_____	2. _____	_____	3. _____	_____	Total	_____	<table border="1"> <thead> <tr> <th><u>Items</u></th> <th><u>Costs</u></th> </tr> </thead> <tbody> <tr> <td>1. _____</td> <td>_____</td> </tr> <tr> <td>2. _____</td> <td>_____</td> </tr> <tr> <td>3. _____</td> <td>_____</td> </tr> <tr> <td>Total</td> <td>_____</td> </tr> </tbody> </table>	<u>Items</u>	<u>Costs</u>	1. _____	_____	2. _____	_____	3. _____	_____	Total	_____
<u>Items</u>	<u>Costs</u>																															
1. _____	_____																															
2. _____	_____																															
3. _____	_____																															
Total	_____																															
<u>Items</u>	<u>Costs</u>																															
1. _____	_____																															
2. _____	_____																															
3. _____	_____																															
Total	_____																															
<u>Items</u>	<u>Costs</u>																															
1. _____	_____																															
2. _____	_____																															
3. _____	_____																															
Total	_____																															
<table border="1"> <thead> <tr> <th><u>Items</u></th> <th><u>Costs</u></th> </tr> </thead> <tbody> <tr> <td>1. _____</td> <td>_____</td> </tr> <tr> <td>2. _____</td> <td>_____</td> </tr> <tr> <td>3. _____</td> <td>_____</td> </tr> <tr> <td>Total</td> <td>_____</td> </tr> </tbody> </table>	<u>Items</u>	<u>Costs</u>	1. _____	_____	2. _____	_____	3. _____	_____	Total	_____	<table border="1"> <thead> <tr> <th><u>Items</u></th> <th><u>Costs</u></th> </tr> </thead> <tbody> <tr> <td>1. _____</td> <td>_____</td> </tr> <tr> <td>2. _____</td> <td>_____</td> </tr> <tr> <td>3. _____</td> <td>_____</td> </tr> <tr> <td>Total</td> <td>_____</td> </tr> </tbody> </table>	<u>Items</u>	<u>Costs</u>	1. _____	_____	2. _____	_____	3. _____	_____	Total	_____	<table border="1"> <thead> <tr> <th><u>Items</u></th> <th><u>Costs</u></th> </tr> </thead> <tbody> <tr> <td>1. _____</td> <td>_____</td> </tr> <tr> <td>2. _____</td> <td>_____</td> </tr> <tr> <td>3. _____</td> <td>_____</td> </tr> <tr> <td>Total</td> <td>_____</td> </tr> </tbody> </table>	<u>Items</u>	<u>Costs</u>	1. _____	_____	2. _____	_____	3. _____	_____	Total	_____
<u>Items</u>	<u>Costs</u>																															
1. _____	_____																															
2. _____	_____																															
3. _____	_____																															
Total	_____																															
<u>Items</u>	<u>Costs</u>																															
1. _____	_____																															
2. _____	_____																															
3. _____	_____																															
Total	_____																															
<u>Items</u>	<u>Costs</u>																															
1. _____	_____																															
2. _____	_____																															
3. _____	_____																															
Total	_____																															

<u>Items</u> <u>Costs</u> 1. _____ 2. _____ 3. _____ Total _____	<u>Items</u> <u>Costs</u> 1. _____ 2. _____ 3. _____ Total _____	<u>Items</u> <u>Costs</u> 1. _____ 2. _____ 3. _____ Total _____
<u>Items</u> <u>Costs</u> 1. _____ 2. _____ 3. _____ Total _____	<u>Items</u> <u>Costs</u> 1. _____ 2. _____ 3. _____ Total _____	<u>Items</u> <u>Costs</u> 1. _____ 2. _____ 3. _____ Total _____
<u>Items</u> <u>Costs</u> 1. _____ 2. _____ 3. _____ Total _____	<u>Items</u> <u>Costs</u> 1. _____ 2. _____ 3. _____ Total _____	<u>Items</u> <u>Costs</u> 1. _____ 2. _____ 3. _____ Total _____

Develop a movie schedule so that six movies show three times a day in four theatres with fifteen-minute intervals. Stagger the times so that long lines will not build in front. Name the movies showing at your theatre.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

On a separate sheet of paper, develop a table to show the schedule. Include the name of the movie, the screen on which it will appear, and starting and ending times.

Attachment #11
Career-based Mathematics Problems
TV Show

Directions to Student:

A TV/radio/movie producer has asked you to make recommendations about a new production. The producer wants to create a weekly show that will appeal to a certain age group, and she needs your help. What types of shows do you think people in various age groups like? What types of shows do you think they would watch or listen to?

Devise a method to answering these questions, and then write a letter to the producer with your recommendations. You should:

- Select a sample of people to survey. This sample could be your own class, another class in your school, a group of people in your neighborhood, an athletic team, or any other group. Think about how large a group of people you will need to draw a sufficient conclusion.
- Design and conduct a survey of people in that age group.
- Organize and analyze the information you receive from the surveys.
- Determine whether the preferences you found in your survey seem to be typical of the population of that age group as a whole.
- Prepare a visual representation of the information in a table, graph, or chart.
- Draw conclusions from the types of shows your survey respondents like and make your recommendations to the producer.

Mathematical knowledge and skills:

- Number, operation, and quantitative reasoning
- Probability and statistics
- Underlying processes and mathematical tools

Adapted from Danielson, C., & Marquez, E. (1998). *A collection of performance tasks and rubrics: High school mathematics*. Larchmont, NY: Eye on Education.

Group surveyed: _____

Number in group: _____

Age and other characteristics of group: _____

Survey Question	Responses

Survey findings:

Now that you have investigated the age group's preferences, write a report to the producer that includes your findings and recommendations.

Attachment #12
Career-based Mathematics Problems
Golf Course Construction

Directions to Student:

Construct an operational miniature golf course using reusable and recyclable materials. In order to meet course regulations, use the following criteria:

- Each hole, from tee to fairway, green, and cup, must be designed within an area of nine-to-ten square feet. Submit a scale drawing of the hole for review.
- Each hole must have barriers to keep the ball contained while in play. Barrier designs should include parallel and perpendicular lines and a right, obtuse, or acute angle.
- Using translations, reflections, and rotations, show other possibilities of how the hole could appear on the golf course.
- The hole must be constructed from reusable and recyclable items. The total construction cost of each hole must not exceed \$1.00. Document the cost by completing a budget sheet listing the fair market value of each item used in construction. (For example, \$.05 is fair market value for each aluminum can.)
- The ball must change elevation while in play.
- Each hole must include a cup on the green that will contain the ball.
- Each hole should be decorated to reflect a theme.

Mathematical knowledge and skills:

- Number, operation, and quantitative reasoning
- Geometry and spatial reasoning
- Measurement
- Underlying processes and mathematical tools

Use two pages or more to provide details about the construction of your golf course, including an in-depth explanation of one of the holes.

Adapted from Berti Kingore.

Golf Course Construction

Name: _____

Hole Number: _____

Theme: _____

Front Elevation (view)

Aerial View

Side Elevation (view)

Attachment #13
Math Careers Board Game

Name of game: _____

Description: _____

Materials: _____

Math Concepts Used:

1. _____ 5. _____

2. _____ 6. _____

3. _____ 7. _____

4. _____ 8. _____

Rules:

1. _____

2. _____

3. _____

4. _____

Sketch the design of the board on a separate piece of paper.

Attachment #14
Math Careers Learning Center

Name of learning center: _____ Grade level: _____

Materials:

Math Concepts Used:

1. _____
2. _____
3. _____
4. _____

Activities and directions:

1. _____

2. _____

3. _____

4. _____

Sketch the design of the learning center on a separate piece of paper.

COVER SHEET

Name: _____

District: _____ School: _____

Project I.D. Number: _____ Topic: *Math Around Town*

Items submitted:

_____ Cover sheet

Research process:

_____ Attachment #7—Interview Questions & Answers

_____ Attachment #8—Job-related Math Skills

_____ Attachment #9—Interview Math Problems

Product:

_____ Product, select one of the following and include references:

_____ Attachment #13—Math Careers Board Game

_____ Attachment #14—Math Careers Learning Center

Communication:

_____ Videotape or audiotape of job interview, including the Q&A session.

For the Student:

I certify that all work submitted is totally my work and that I have credited others for any contributions.

Student Signature: _____ Date: _____

For the Teacher:

I certify that all the work submitted is totally that of this student.

Teacher Signature: _____ Date: _____