



MATH

Mathematics Content Standards



Introduction – Mathematics Content Standards and Benchmarks

Knowledge and use of mathematics are essential to function successfully in today's society. Due to advances in technology, the knowledge and skill demands of jobs are continually evolving. Mathematical knowledge is needed across a variety of industries, not only for advanced positions, but also for many entry-level jobs. Entry into these fields now requires a higher level of knowledge and skills than in prior generations. As mathematics continues to play a more integral role in our lives, it should no longer be considered a stand-alone content area consisting of individual courses and skills. Rather, mathematics should be presented and taught so that students may be successful problem solvers and use mathematics in daily life. Additionally, knowledge and skills in mathematics are necessary for successful participation in postsecondary education, training programs, and the workplace.

Standards 2.0 addresses procedural fluency and mathematical concepts that are intended to be connected through process skills across each subarea. The process skills standards describe ways in which students are expected to engage with the content. The process skills weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively.

The organization of the Mathematics Content Area follows the same structure as the other two content areas. There are eight subareas, each followed by specific content standards, benchmarks, detailed work activities from O*NET, and examples of industry-specific applications of the standards.

The content standards draw from both the *Texas College and Career Readiness Standards* and the *Texas Essential Knowledge and Skills (TEKS)* and are informed by the *Texas Success Initiative Assessment (TSIA)*, the Texas Certificate of High School Equivalency, and other relevant standards, assessment programs, and guiding documents. The work group, project staff, and consulting subject matter experts also examined the *College and Career Readiness Standards for Adult Education*, the *TEKS for Kindergarten–Algebra I Vertical Alignment Chart*, the *Texas Response to Curriculum Focal Points for Kindergarten Through Grade 8 Mathematics (Revised, 2013)*, and the *National Council of Teachers of Mathematics Principles and Standards for School Mathematics*.

Standards 2.0 also contains examples of how math skills are applied on the job. These examples are aligned to the standards and benchmarks by means of O*NET detailed work activities. The job-specific examples have been supplied either by employers in their respective industry sectors or by the selection of relevant O*NET task activities.

Math and Critical Thinking and Communication Skills

It is important to highlight the role of critical thinking and communication skills as they relate to mathematics. Both areas are identified in the O*NET research as essential elements across the four industry sectors. The skill of critical thinking is typically associated with any problem-solving activity. It also may be called for in the application of technology.

This correlation between critical thinking and communication skills involves:

- Using a problem-solving model that incorporates analysis of given information along with relevant data to formulate a plan or strategy for determining a solution;
- Communicating both orally and in writing mathematical concepts and reasoning and their associated implications, using multiple representations; and
- Developing, displaying, explaining, and justifying mathematical concepts and logical arguments using precise mathematical language in written and oral communication.

Math Content Area Overview

The *Texas Adult Education and Literacy Content Standards v. 4* are organized around six broad Content Areas. The Mathematics Contents Standards are Content Area II. Within each Content Area, there are Subareas that delineate the different topics within the Content Area. Subareas typically consist of several Content Standards and Benchmarks. This structure assists in breaking a broad Content Area into manageable groupings of information.

Content Area II – Mathematics

Subareas:

II.0 – General Mathematical Processes

II.1 – Numerical Representations and Relationships

Students understand numbers, ways of representing numbers, relationships among numbers, and number systems.

II.2 – Computations

Students compute fluently and make reasonable estimates.

II.3 – Geometry

Students analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships. They learn to specify locations and describe spatial relationships using coordinate geometry and other representational systems. Students apply transformations and use symmetry to analyze mathematical situations and use visualization, spatial reasoning, and geometric modeling to solve problems.

II.4 – Measurement including Geometry

Students understand measurable attributes of objects and the units, systems, and processes of measurement, and apply appropriate techniques, tools, and formulas to determine measurements.

Math Content Area Overview (cont.)

Content Area II – Mathematics

Subareas:

II.5 – Algebraic Relationships

Students understand patterns, relations, and functions. They represent and analyze mathematical situations and structures using algebraic symbols. Students use mathematical models to represent and understand quantitative relationships and analyze change in various contexts.

II.6 – Non-linear Equations, Functions, and Inequalities

Students understand and use patterns and relationships of non-linear functions. They represent and analyze mathematical situations and structures using non-linear equations, functions, and inequalities. Students use mathematical models to represent and understand quantitative relationships.

II.7 – Data Analysis

Students formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them. They select and use appropriate statistical methods to analyze data. Students develop and evaluate inferences and predictions that are based on data. They understand and apply concepts of probability.

II.8 – Financial Literacy

Students develop the knowledge and skills to make sound, informed financial decisions that will allow them to lead financially secure lifestyles and understand personal financial responsibility.

Subarea II.0 – General Mathematical Processes

Subarea Standard:

A. Integrate the following mathematical processes through all mathematical content.

1. Apply appropriate mathematics to problems arising in everyday life, society, and the workplace.
2. Use a problem-solving model that incorporates analysis of given information along with relevant data to formulate a plan or strategy for determining a solution, justifying the solution, and evaluating the reasonableness of the solution and the problem-solving process used.
3. Select tools (including real objects, manipulatives, and paper and pencil) and appropriate technology (such as software and graphing calculators) to solve problems.
4. Apply cognitive strategies (such as mental math, estimation, and number sense) to solve problems that include rational numbers and the four basic operations (addition, subtraction, multiplication, and division).
5. Communicate both orally and in writing mathematical concepts and reasoning and their associated implications, using multiple representations (including appropriate symbols, diagrams, charts, graphs, and language).
6. Analyze mathematical relationships to connect and communicate mathematical concepts.
7. Develop, display, explain, and justify mathematical concepts and logical arguments using precise mathematical language in written and oral communication.

Subarea II.1 – Numerical Representations and Relationships

Subarea Standards:

A. Recognizing Numbers and Counting. Develop an understanding of place value.

1. Count and represent quantities accurately, efficiently, and fluently.
2. Develop and apply an understanding of the base-10 place value system, and place value concepts using pictorial models, such as number lines and graphs.
3. Compare and order quantities accurately, efficiently, and fluently.

O*NET Detailed Work Activity	Industry Examples
Inventory medical supplies or equipment.	<p>Industry: Healthcare Sciences Position: Surgical Technician Example: Counts surgical tools (i.e., counting before surgery and after surgery to ensure the same number of tools are available).</p>
Inspect shipments to ensure correct order fulfillment.	<p>Industry: Transportation, Distribution, Logistics Position: Material Handler Example: Counts how many units need to be picked and put on a pallet for selection.</p>

Subarea II.1 – Numerical Representations and Relationships (cont.)

B. Apply knowledge of two-dimensional and three-dimensional shapes, including exploration of early fraction concepts.

1. Use attributes to compose and decompose two-dimensional shapes and three-dimensional solids.
2. Separate objects into equal parts to represent a fraction.
3. Demonstrate an understanding of equivalent fractions by representing a fraction in two ways of a uniform whole using objects or pictorial model such as $\frac{2}{3}$ represented as $\frac{2}{3}$ and $\frac{4}{6}$.
4. Equate fractions and decimals.

O*NET Detailed Work Activity	Industry Examples
Calculate dimensions of work pieces, products, or equipment.	Industry: Advanced Manufacturing Position: Computer Numerical Control (CNC) Operator Example: Uses basic math, converts fraction to decimals, and applies trigonometry, geometry, metrics.
Measure distances or dimensions.	Industry: Transportation, Distribution, Logistics Position: Bus Truck Mechanic Example: Inspects and verifies dimensions and clearances of parts to ensure conformance to factory specifications.
Measure the physical or physiological attributes of patients.	Industry: Healthcare Sciences Position: Licensed Vocational Nurse Example: Measures and records patients' vital signs, such as height, weight, temperature, blood pressure, or respiration.

Subarea II.2 – Computations

Subarea Standards:

A. Adding and Subtracting Whole Numbers. Understand and apply place value and properties of operations to solve problems involving addition and subtraction of whole numbers.

1. Identify situations in which addition and subtraction are necessary to solve problems.
2. Use efficient, accurate, and generalizable methods based on the application of the principles of place value, the properties of operations, and the relationship between addition and subtraction to solve problems involving addition and subtraction of whole numbers.
3. Solve multi-step problems involving addition and subtraction with whole numbers that include equations with a letter standing for the unknown quantity.

O*NET Detailed Work Activity	Industry Examples
Calculate costs of goods or services.	<p>Industry: Advanced Manufacturing Positions: Material Planners, Cycle Counters, Production Planners Example: Calculates required amounts of labor materials, manufacturing costs, or wages using pricing schedules, adding machines, calculators, or computers.</p>
Calculate dimensions of work pieces, products, or equipment.	<p>Industry: Construction and Extraction Position: Welder Example: Uses tape measure, welding protractor, and formulas to determine area and materials needed to build a project in square feet and/or cubic feet.</p>

Subarea II.2 – Computations (cont.)

B. Multiplying Whole Numbers. Develop accuracy, efficiency, and flexibility in the use of mathematical operations (addition, subtraction, and multiplication) with whole numbers, and use this knowledge to solve problems.

1. Add, subtract, and multiply whole numbers accurately, efficiently, and fluently, and justify these procedures. Use these operations to solve problems, including using formulas for perimeter and area.

O*NET Detailed Work Activity	Industry Examples
Measure dimensions of completed products or work pieces to verify conformance to specifications.	<p>Industry: Advanced Manufacturing Positions: Warehouse Receiving/Shipping Clerk, Cycle Counters, Parts Pickers Example: Calculates square feet for raw material inventory (i.e., Length X Width calculations).</p>

C. Dividing Numbers. Use operations with positive rational numbers to solve problems.

1. Develop procedures for addition, subtraction, multiplication, and division of real numbers, including rational and irrational numbers, to solve real-world problems.
2. Relate multiplication and division as inverse operations.
3. Evaluate rational expressions by substituting whole numbers and decimals for unknown quantities.

O*NET Detailed Work Activity	Industry Examples
Calculate costs of goods or services.	<p>Industry: Transportation, Distribution, Logistics Position: Customer Service Representative Example: Resolves customers' billing complaints by performing activities such as refunding money or adjusting bills.</p>

Subarea II.2 – Computations (cont.)

D. Performing a Variety of Operations with Rational Numbers.

1. Accurately, efficiently, and fluently add, subtract, multiply, and divide rational numbers using the order of operations to solve problems in a variety of real-world contexts.

O*NET Detailed Work Activity	Industry Examples
Calculate specific material, equipment, or labor requirements for production.	<p>Industry: Transportation, Distribution, Logistics Position: Customer Service Representative (CSR) Example: Calculates the gross margin of products to determine the sales price (e.g.–product cost of \$12.50 plus gross margin of 10% equals sales price of \$13.75).</p>

Subarea II.2 – Computations (cont.)

E. Determining and Simplifying Numeric and Algebraic Expressions. Understand and generate expressions and equations to solve problems.

1. Demonstrate comprehension of the relationship between multiplication and division and use of the order of operations in solving problems with rational numbers.
2. Use or generate expressions and equations to solve problems involving the four mathematical operations (addition, subtraction, multiplication, and division).

O*NET Detailed Work Activity	Industry Examples
Analyze financial information.	<p>Industry: Healthcare Sciences Position: Patient Access Representative Example: Determines and accepts required payments, including co-pays and deductibles.</p>
Calculate shipping costs.	<p>Industry: Transportation, Distribution, Logistics Position: Shipping Receiving Clerk Example: Computes amounts of space available and shipping or storage charges using computer or price list.</p>

Subarea II.2 – Computations (cont.)

F. Build foundations and develop an understanding of addition, subtraction, multiplication, and division of fractions and decimals, and perform these operations accurately, efficiently, and fluently.

1. Recognize that equivalent fractions can have different denominators.
2. Apply understanding of representations of equivalent fractions (with like and unlike denominators) when using multiplication and division operations.
3. Demonstrate understanding of addition and subtraction to include adding and subtracting fractions and decimals.
4. Make reasonable estimates of fraction and decimal sums and differences using the four basic mathematical operations to solve real-world problems.
5. Apply an understanding of multiplication and division to fractions and decimals.

O*NET Detailed Work Activity	Industry Examples
Measure materials or objects for installation or assembly.	<p>Industry: Construction and Extraction Position: Carpenter Example: Measures and marks cutting lines on materials, using a ruler, pencil, chalk, and marking gauge; uses conversion tables to translate fractions into decimals.</p>
Estimate construction project cost.	<p>Industry: Construction and Extraction Position: Electrician Example: Calculates conduit fill. Determines the square inches of conductors being installed to determine appropriate size of conduit.</p>
Analyze laboratory findings.	<p>Industry: Health Care Sciences Position: Laboratory Technician Example: Analyzes test results to ensure conformity to specifications, using special mechanical or electrical devices.</p>

Subarea II.2 – Computations (cont.)

O*NET Detailed Work Activity	Industry Examples
<p>Calculate specific material, equipment, or labor requirements for production.</p>	<p>Industry: Transportation, Distribution, Logistics Position: Supervisor Example: Reconciles key metrics to report throughput (i.e.– the amount of raw material processed within a given period of time) (e.g.–cases per hour).</p>

Subarea II.3 – Geometry

Subarea Standards:

A. Identify, analyze, and use attributes of two-dimensional shapes and three-dimensional solids.

1. Identify, name, and create basic two-dimensional shapes and three-dimensional solids, and identify the attributes of each shape.
2. Use attributes to identify, classify, and sort components of two-dimensional shapes and three-dimensional solids, including measurable attributes.
3. Compose and decompose two-dimensional shapes and three-dimensional solids.
4. Construct and use drawings, models, and coordinate representations of plane and space figures in order to solve problems with and without technology.

O*NET Detailed Work Activity	Industry Examples
Assemble temporary equipment or structures.	Industry: Construction and Extraction Position: Roofer Example: Sets up scaffolding to provide safe access to roofs.
Stack cargo using pallets or cargo boards.	Industry: Transportation, Distribution, Logistics Position: Loader Example: Uses geometry and basic math – including dimensions and percentage of packing components – to load a trailer.

Subarea II.3 – Geometry (cont.)

B. Use right triangle relationships, including the Pythagorean Theorem, to describe relationships.

1. Select and use expressions and equations to represent and solve geometric problems involving rational numbers.
2. Use geometric concepts, including the Pythagorean Theorem, to solve problems.
3. Construct and use drawings, models, and coordinate representations of plane and space figures in order to solve problems with and without technology.

O*NET Detailed Work Activity	Industry Examples
Mark reference points on construction materials.	<p>Industry: Construction and Extraction Position: Construction Carpenter Example: Measures and marks cutting lines on materials using a ruler, pencil, chalk, and marking gauge.</p>
Compare physical characteristics of materials or products to specifications or standards.	<p>Industry: Construction and Extraction Position: Construction Carpenter Example: Uses the 3-4-5 rule (Pythagorean Theorem) to lay out or check right angles using a tape measure.</p>

Subarea II.3 – Geometry (cont.)

C. Represent, apply, and analyze proportional relationships by graphing on the coordinate plane.

1. Use knowledge of proportions to draw representations on a coordinate plane (such as the slope of a line) and solve real-life applications.
2. Compare and contrast proportional and non-proportional relationships.

O*NET Detailed Work Activity	Industry Examples
Measure materials to mark reference points, cutting lines, or other indicators.	Industry: Advanced Manufacturing Position: Sheet Metal Worker Example: Lays out, measures, and marks dimensions and reference lines on material such as roofing panels using calculators, scribes, dividers, squares, or rulers.

Subarea II.4 – Measurement Including Geometry

Subarea Standards:

A. Understand units of measure and utilize measurement tools (i.e., tape measure).

1. Demonstrate ability to convert between different units of measure, such as standard to the metric system.

O*NET Detailed Work Activity	Industry Examples
Review blueprints, charts, tables, or graphs to determine work requirements.	<p>Industry: Construction and Extraction Position: Construction Laborer Example: Measures openings or distances to lay out areas where work will be performed.</p>
Disassemble equipment for maintenance or repair.	<p>Industry: Transportation, Distribution, Logistics Position: Maintenance and Repair Workers, General Example: Converts between metric and standard tools during routine repairs of machinery.</p>

Subarea II.4 – Measurement Including Geometry (cont.)

B. Measuring length, area, volume, and weight/mass in different measuring systems.

1. Identify length as an attribute that can be measured. List and use appropriate units to solve real-world problems related to length.
2. Identify area as an attribute that can be measured. List and use appropriate units to solve real-world problems related to area.
3. Identify volume as an attribute that can be measured. List and use appropriate units to solve real-world problems related to volume.
4. Identify weight and mass as attributes that can be measured. List and use appropriate units to solve real-world problems related to weight/mass.
5. When given the area or perimeter, use the appropriate formulas to calculate the missing side dimensions of triangles, rectangles, and other polygons.
6. Understand units of measure and utilize measurement tools, such as a tape measure.
7. Apply estimation in measuring, and use tools (e.g., rulers, tape measures, real objects, manipulatives, paper and pencil) and technology as appropriate.

O*NET Detailed Work Activity	Industry Examples
Measure ingredients or substances to be used in production processes.	<p>Industry: Advanced Manufacturing Position: Quality Assurance Technician Example: Calculates weights of products and pressure on valves. Performs equipment calibrations.</p>
Measure materials or objects for installation or assembly.	<p>Industry: Construction Extraction Position: Derrick Operator, Oil and Gas Example: Weighs clay and mix with water and chemicals to make drilling mud using portable mixers.</p>

Subarea II.4 – Measurement Including Geometry (cont.)

O*NET Detailed Work Activity	Industry Examples
Align equipment or machinery.	<p>Industry: Construction and Extraction Position: Millwright Example: Inserts shims, adjusts tension on nuts and bolts or positions parts, using hand tools and measuring instruments to set specified clearances between moving and stationary parts.</p>

C. Represent and solve problems with perimeter, area, and volume.

1. Apply understanding of measurement to select appropriate units when measuring perimeter, area, and volume in real-world contexts.
2. Use a variety of representations to build connections between the stated formulas and the direct measurement of perimeter, area, and volume.
3. Solve real-world mathematical problems involving surface area and volume of three-dimensional shapes such as right prisms, pyramids, cylinders, spheres, cones, and composite figures.

O*NET Detailed Work Activity	Industry Examples
Plan layout of construction, installation, or repairs.	<p>Industry: Advanced Manufacturing Position: Sheet Metal Worker Example: Develops or lays out patterns using computerized metalworking equipment.</p>

Subarea II.4 – Measurement Including Geometry (cont.)

O*NET Detailed Work Activity	Industry Examples
Interpret blueprints, specifications, or diagrams to inform installation, development, or operation activities.	<p>Industry: Construction and Extraction Position: HVAC Technician Example: Performs simple to complex math equations for load calculations and HVAC system design. Understands percentages in relationship to equipment selection and unit charging procedures.</p>

D. Describe characteristics of 2-D and 3-D geometric figures, including measurable attributes.

1. Use attributes to sort, classify, and measure two- and three-dimensional figures.
2. Use the decomposition of rectangles into rows of squares to determine that area can be found through multiplication.

O*NET Detailed Work Activity	Industry Examples
Calculate dimensions of workpieces, products, or equipment.	<p>Industry: Construction and Extraction Position: Pipefitter Example: Finds the volume of a pipe section to measure and mark pipes for cutting or threading by reading graphs, tables, or charts using knowledge of spatial relationships.</p>

Subarea II.4 – Measurement Including Geometry (cont.)

E. Measuring Angles and Using Angle Relationships.

1. Measure an angle.
2. Recognize, identify, describe, and reason about intersecting and parallel lines and the associated angles in two dimensions.
3. Analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe, and compare geometric models and their transformations. Use geometric relations and patterns to solve real-world problems.

O*NET Detailed Work Activity	Industry Examples
Lay out work according to specifications.	<p>Industry: Advanced Manufacturing Position: Maintenance Mechanic Example: Plans and lays out repair work, uses diagrams, drawings, blueprints, maintenance manuals, or schematic diagrams.</p>
Calculate requirements for equipment installation or repair projects.	<p>Industry: Construction and Extraction Position: Brick Mason Example: Measures distance from reference points and marks guidelines to lay out work using plumb bobs and levels.</p>

Subarea II.4 – Measurement Including Geometry (cont.)

F. Use relationships between measures to analyze rates of change.

1. Interpret, calculate, and apply rates including those involving time, such as velocity (e.g., mi/hr, ft/sec, and m/sec), frequency (e.g., calls/hr), consumption (e.g., cal/day and kw/hr), flow (e.g., gal/min), and change (e.g., degrees/min and inches/year).

O*NET Detailed Work Activity	Industry Examples
Mix substances or compounds needed for work activities.	<p>Industry: Construction and Extraction Position: Derrick Operator Example: Controls the viscosity and weight of drilling fluid.</p>
Choose optimal transportation routes or speeds.	<p>Industry: Transportation, Distribution, Logistics Position: Heavy Tractor Trailer Driver Example: Plans or adjusts routes based on changing conditions. Uses computer equipment, global positioning systems (GPS) equipment, or other navigation devices to minimize fuel consumption and carbon emissions.</p>

Subarea II.5 – Algebraic Relationships

Subarea Standards:

A. Represent and use algebra to solve problems for the unknown.

1. Identify properties of real numbers for addition, subtraction, multiplication, division, and exponents.
2. Use mathematical symbols to represent linear relationships and formulas.
3. Use words, tables, and graphs as well as algebraic expressions and equations to model the mathematical relationships (particularly functional relationships) found in real-world problems.
4. Simplify expressions.
5. Solve one-step linear equations using addition, subtraction, multiplication, and division properties of equality including proportions.
6. Solve two- and three-step linear equations.
7. Solve linear equations involving fractions and decimals by clearing them from the problem.
8. Solve application problems involving linear equations to include percent, interest, sales and sales tax, distance, and geometrical problems.
9. Solve systems of equations in real-world applications.
10. Solve application problems involving systems of equations.
11. Solve and graph absolute value equations.

O*NET Detailed Work Activity	Industry Examples
Estimate construction project costs.	<p>Industry: Construction and Extraction Position: Supervisor Example: Finds the cost of materials needed based on price per linear foot, the dimensions provided in a floor plan, and applying supplier discount.</p>

Subarea II.5 – Algebraic Relationships (cont.)

O*NET Detailed Work Activity	Industry Examples
Process medical billing information.	<p>Industry: Healthcare Sciences Position: Admissions Clerk Example: Keeps financial records or performs other bookkeeping duties such as handling credit, collections, or mailing monthly statements to patients.</p>
Calculate specific material, equipment, or labor requirements for production.	<p>Industry: Transportation, Distribution, Logistics Position: Billing Cost Rate Clerk Example: Tracks accumulated hours and dollar amounts charged for professional services such as legal or accounting services to calculate client fees.</p>

B. Linear Inequalities

1. Solve linear inequalities in one variable using the addition, subtraction, multiplication, and division properties.
2. Graph linear inequalities on a number line.
3. Solve and graph compound inequalities on a number line.
4. Use set builder notation and interval notation with linear inequalities.
5. Solve and graph absolute value inequalities.

Subarea II.5 – Algebraic Relationships (cont.)

C. Graphing

1. Select and use expressions and equations to represent and solve problems involving rational numbers.
2. Use properties of addition, subtraction, multiplication, and division with radicals.
3. Understand and use a rectangular coordinate system to interpret a graph, plot points, and determine coordinates of points from a graph.
4. Graph linear functions by plotting points, including vertical and horizontal lines.
5. Understand and use x- and y-intercepts to graph a linear function.
6. Identify and calculate the slope of a line from both a graph and given coordinates, including vertical and horizontal functions.
7. Determine if two lines are parallel or perpendicular.
8. Write linear functions with information given for slope and a point on a line.
9. Graph linear inequalities in two dimensions.
10. Graph systems of linear functions.
11. Use linear equations and inequalities to model or solve problems using real-world data.
12. Solve linear functions, with and without technology, and evaluate the reasonableness of their solutions.

O*NET Detailed Work Activity	Industry Examples
Create graphical representations of industrial production systems.	<p>Industry: Advanced Manufacturing Position: Robotics Technician Example: Develops robotic path motions to maximize efficiency, safety, and quality.</p>
Create graphical representations of industrial production systems.	<p>Industry: Transportation, Distribution, Logistics Position: Industrial Engineering Technician Example: Prepares charts, graphs, or diagrams to illustrate workflow, routing, floor layouts, material handling, or machine utilization.</p>

Subarea II.5 – Algebraic Relationships (cont.)

D. Use numeric and algebraic methods.

1. Identify functions using sets of ordered pairs, tables, mappings, and graphs, including using the vertical line test.
2. Solve quadratic equations using the quadratic formula.
3. Apply algebraic methods to define, solve, analyze, split into parts, and evaluate equations, relations, and functions, including finding the domain and range.

E. Understand and apply ratios and rates by using equivalent ratios to represent percentages and proportional relationships.

1. Use knowledge of fractions to develop procedures for modeling and solving real-world ratio and rate problems.
2. Extend knowledge of equivalent fractions to create equivalent ratios that describe real-world situations that involve proportionality.
3. Use various representations (e.g., graphs, tables, and equations) to solve real-world problems, involving proportional relationships.
4. Use knowledge of both direct and inverse variations to solve real-world problems.
5. Use reasoning to solve real-world problems, including proportions, and percentages (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, and percent error).

O*NET Detailed Work Activity	Industry Examples
Analyze financial information.	Industry: Healthcare Sciences Position: Patient Access Representative Example: Analyzes patients' abilities to pay to determine charges on a sliding scale.
Process medical billing information.	Industry: Healthcare Sciences Position: Pharmacy Technician Example: Computes charges for medication or equipment dispensed to hospital patients and enters data in computer.

Subarea II.5 – Algebraic Relationships (cont.)

O*NET Detailed Work Activity	Industry Examples
Process medical billing information.	<p>Industry: Healthcare Sciences Position: Pharmacy Technician Example: Computes charges for medication or equipment dispensed to hospital patients and enters data in computer.</p>

F. Polynomials and properties of exponents.

1. Use properties of exponents to simplify expressions.
2. Use the properties of addition, subtraction, multiplication, and division to simplify polynomials.
3. Use various representations (e.g., graphs, tables, and equations) to solve real-world problems involving polynomial relationships.

Subarea II.6 – Non-Linear Equations, Functions, and Inequalities

Subarea Standards:

A. Use Quadratic Functions and Equations.

1. Factor polynomials by identifying the greatest common factor.
2. Factor polynomials, including the use of grouping, trial and error method, difference of squares and sum, and difference of two cubes.
3. Solve quadratic equations, with and without technology, by using the zero-product rule, including applications to model situations, solve problems, and make predictions.

Subarea II.6 – Non-Linear Equations, Functions, and Inequalities (cont.)

B. Rational Expressions

1. Use properties of addition, subtraction, multiplication, and division to simplify rational expressions.
2. Solve rational equations.
3. Use properties of rational equations to solve real-world problems.
4. Select and justify appropriate symbolic representations to solve problems in varied contexts, including use of geometric formulas for triangles and pyramids as well as the equation of a circle.
5. Write a representative quadratic equation based on a graph or other given attributes.

O*NET Detailed Work Activity	Industry Examples
Weigh materials to ensure compliance with specifications.	<p>Industry: Advanced Manufacturing Position: Inspector Tester Weigher Example: Records inspection or test data such as weights, temperatures, grades, or moisture content, and quantities inspected or graded.</p>
Assess physical conditions of patients to aid in diagnosis or treatment.	<p>Industry: Healthcare Sciences Position: Physical Therapist Example: Measures patients' range-of-joint motion, body parts, or vital signs to determine effects of treatments or for patient evaluations.</p>

Subarea II.6 – Non-Linear Equations, Functions, and Inequalities (cont.)

C. Radicals

1. Apply properties of radicals to simplify radical exponents and expressions.
2. Use properties of addition, subtraction, multiplication, and division with radicals.
3. Solve radical equations involving one radical.
4. Solve radical equations involving more than one radical.
5. Use properties of complex numbers to simplify expressions.

D. Use quadratic and square-root functions, equations, and inequalities.

1. Solve quadratic equations using completing-the-square and square-root property.
2. Solve quadratic equations using the quadratic formula.
3. Apply quadratic and square-root equations and quadratic inequalities to model situations, solve problems, and make predictions.
4. Understand that quadratic and square-root equations and quadratic inequalities can be used to model situations, solve problems, and make predictions.

E. Use cubic, cube root, absolute value, and rational functions, equations, and inequalities.

1. Use cubic, cube root, absolute value, and rational functions, equations, and inequalities to model situations, solve problems, and make predictions.
2. Perform computations and write numerical expressions with cubes and cube roots of non-zero rational numbers.

F. Use exponential functions and equations.

1. Use the properties of exponential functions and their related transformations to represent exponential functions graphically, in a table, and as equation—with and without technology.
2. Use exponential functions to model or solve problems using real-world data. Evaluate the reasonableness of the solutions, with and without technology.

Subarea II.7 – Data Analysis

Subarea Standards:

A. Organizing, Representing, and Interpreting Sets of Data. Select and apply appropriate visual representations of data.

1. Organize and construct graphical displays of data (e.g., line plots, bar graphs, histograms, box plots, scatter plots, and coordinate planes) to describe data based on the attributes of a given data set.

O*NET Detailed Work Activity	Industry Examples
Adjust temperature controls of ovens or other heating equipment.	<p>Industry: Advanced Manufacturing Position: Operator Example: Uses and applies percentages, speed per inch, conversions for Fahrenheit to centigrade degrees, ramp rate (up & down), and calibration measurements.</p>

Subarea II.7 – Data Analysis (cont.)

B. Read, analyze, interpret, and draw conclusions from data.

1. Understand the relevance and importance of reliable data sampling techniques to ensure more accurate statistical results.
2. Use and understand the meaning of representative and non-representative samples.
3. Understand and use descriptions of center, spread, and shape to summarize and compare data sets.
4. Make predictions and draw inferences using summary statistics.
5. Analyze data sets using graphs and summary statistics.
6. Analyze relationships between paired data using spreadsheets, graphing calculators, or software.

O*NET Detailed Work Activity	Industry Examples
Weigh materials to ensure compliance with specifications	<p>Industry: Advanced Manufacturing Position: Inspector Tester Weigher Example: Records inspection or test data such as weights, temperatures, grades, or moisture content, and quantities inspected or graded.</p>
Assess physical conditions of patients to aid in diagnosis or treatment.	<p>Industry: Healthcare Sciences Position: Physical Therapist Example: Measures patients' range-of-joint motion, body parts, or vital signs to determine effects of treatments or for patient evaluations.</p>

Subarea II.7 – Data Analysis (cont.)

C. Determine and use probability to solve problems.

1. Understand probability in real-world situations.
2. Understand the influence of independence and dependence of events and variables.

O*NET Detailed Work Activity	Industry Examples
Coordinate shipping activities with external parties.	<p>Industry: Transportation, Distribution, Logistics Position: Production Planning Expediting Clerk Example: Revises production schedules when required due to design changes, labor or material shortages, backlogs, or other interruptions.</p>

Subarea II.8 – Financial Literacy

Subarea Standards:

A. Understand the Connections Among Income, Expenses, and Careers.

1. Research and analyze college and career opportunities.
2. Understand skills needed for a specific career and income potential of different types of jobs and careers.
3. Understand taxes (e.g., income, sales, property, etc.).
4. Understand fixed and variable expenses and how to develop your personal budget.

Relevant Life Skill	Industry Examples
Estimate market value of products or services.	Uses the U.S. Department of Labor’s Occupational Information Network (O*NET): <ul style="list-style-type: none"> • to research specific occupations in an industry that matches career interest areas; • to identify related knowledge, skills, and abilities, level of education and certifications required; and • to gain perspective on wages associated with different occupations by education and labor market factors across the state of Texas and nationally.

Subarea II.8 – Financial Literacy (cont.)

B. Develop and use an economic way of thinking and problem solving useful in one’s life as a knowledgeable employee, consumer, provider, and investor.

1. Apply critical thinking skills to analyze the costs and benefits of personal financial decisions, including assumption of large amounts of debt.
2. Understand how to provide for basic needs while living and working within a budget.
3. Compare and understand the various financial-aid methods available for college and other postsecondary education and training.
4. Develop an economic way of thinking and problem solving useful in one’s life as a knowledgeable consumer, employee, and investor.
5. Understand the role of financial markets/institutions in saving, borrowing, and capital formation.
6. Understand the role of individuals in financial markets as well as banking and credit systems.
7. Calculate and compare simple interest and compound interest as it applies to saving, borrowing, and lines of credit.
8. Navigate and use banking, credit, and financial markets in saving, borrowing, and capital formation.

Subarea II.8 – Financial Literacy (cont.)

Relevant Life Skill	Examples
Estimate market value of products or services.	<p>Return on Investment (ROI): ROI is an economic way of thinking and problem solving that can be used to determine how much an additional investment in further training, certification, or education will add to wage-earning potential over time. Key to decision-making using ROI is knowing the anticipated costs associated with education or training/ certification and the benefits in increased wages in different occupations within a career field.</p>
Estimate market value of products or services.	<p>Opportunity Cost: This is an economic way of thinking and problem solving in which a person chooses one option, for instance, to pursue further education rather than benefiting from the income he or she could have received from working during the same time period. The cost is the income not received.</p>
Estimate market value of products or services.	<p>Earned Income Tax Credit: Potential source of income based on employment, income level, marital status, and number of dependents.</p>