# Scope & Sequence

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| Course Name: Mathematical Applications in Agriculture, Food, and Natural Resources **TSDS PEIMS Code:** 13001000 | | | **Course Credit:** 1.0  **Course Requirements:** Recommended for Grades 10-12.  **Prerequisites:** Algebra l.  **Recommended Prerequisites:** One credit from the courses in the Agriculture, Food, and Natural Resources Career Cluster. |
| **Course Description:** In Mathematical Applications in Agriculture, Food, and Natural Resources, students will apply knowledge and skills related to mathematics, including algebra, geometry, and data analysis in the context of agriculture, food, and natural resources. | | | |
| **NOTE:** This is a suggested scope and sequence for the course content. This content will work with any textbook or instructional materials. If locally adapted, make sure all TEKS are covered. | | | |
| **Total Number of Periods**  **Total Number of Minutes**  **Total Number of Hours** | 175 Periods  7,875 Minutes  131.25 Hours\* | \*Schedule calculations based on 175/180 calendar days. For 0.5 credit courses, schedule is calculated out of 88/90 days. Scope and sequence allows additional time for guest speakers, student presentations, field trips, remediation, extended learning activities, etc. | |
| **Unit Number, Title, and Brief Description** | **# of Class Periods\***  (assumes 45-minute periods)  Total minutes per unit | **TEKS Covered**  **130.5. (c) Knowledge and skills** | |
| **Unit 1: Professional Standards and Employability Skills**  Students will discuss the professional standards and employability skills, including identifying career development and entrepreneurship opportunities in agribusiness, demonstrating competencies related to resources, information, interpersonal skills, and systems of operation. Students will further develop and demonstrate these skills and attributes throughout the course. In small groups and/or in other classroom activities, students will demonstrate knowledge of personal and occupational health and safety practices in the workplace identify appropriate work habits, ethical conduct and legal responsibilities, and characteristics of good citizenship. As a culminating activity for the unit, students will utilize technology to research career opportunities. | 15 periods  675 minutes | (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:  (A) identify career development and entrepreneurship opportunities;  (B) demonstrate competencies related to resources, information, interpersonal skills, and systems of operation;  (C) demonstrate knowledge of personal and occupational health and safety practices in the workplace;  (D) identify employers' expectations, including appropriate work habits, ethical conduct, and legal responsibilities;  (E) demonstrate characteristics of good citizenship such as stewardship, advocacy, and community leadership; and  (F) research career topics using technology such as the Internet. | |
| **Unit 2: Mathematical Calculations**  Students will be given multiple opportunities to learn, demonstrate and apply mathematical calculations used in agriculture, food and natural resources. Students will use appropriate technology and/or assigned materials to add, subtract, multiply, and divide whole numbers, fractions, and decimals in calculations related to agriculture, food, and natural resources, apply skills in measurement, conversion, and data analysis, find solution to problems by calculating percentages and averages, convert between English and metric units, use scientific calculations to determine weight, volume, and linear measurements and solve problems using ratios and dimensional analysis and interpret data using tables, charts, and graphs. | 15 periods  675 minutes | (4) The student performs mathematical calculations used in agriculture, food, and natural resources. The student is expected to:  (A) add, subtract, multiply, and divide whole numbers, fractions, and decimals in calculations related to agriculture, food, and natural resources;  (B) apply mathematical skills such as measurement, conversion, and data analysis needed for agriculture, food, and natural resources;  (C) find solutions to problems related to agriculture, food, and natural resources by calculating percentages and averages;  (D) convert between English and metric units;  (E) use scientific calculations to determine weight, volume, and linear measurements;  (F) solve word problems using ratios and dimensional analysis; and  (G) interpret data using tables, charts, and graphs. | |
| **Unit 3: Mathematical Processes**  Students will be given multiple opportunities to learn, demonstrate and apply mathematical processes to show understanding. Students will use appropriate technology and/or assigned materials to apply mathematics to solve problems in everyday life, society, and the workplace, use a problem-solving model that incorporates analyzing, formulating a plan or strategy, determine a solution, justify the solution and evaluate the problem-solving process and reasonableness of the solution. In small groups and/or in other classroom activities, students will communicate mathematical ideas, reasoning, and their implications by using multiple representations, including symbols, diagrams, graphs, and language as appropriate. Students will also create and use representation to organize, record, and communicate mathematical ideas, analyze mathematical relationships to connect and communicate mathematical ideas and display, explain and justify mathematical ideas and arguments. | 15 periods  675 minutes. | (2) The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:  (A) apply mathematics to problems arising in everyday life, society, and the workplace;  (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;  (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;  (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;  (E) create and use representations to organize, record, and communicate mathematical ideas;  (F) analyze mathematical relationships to connect and communicate mathematical ideas; and  (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication. | |
| **Unit 4: Solve Problems – Agriculture, Food, and Natural Resources Industries**  Students will discuss the mathematics knowledge and skills required to solve problems related to the agriculture, food, and natural resources industries. Students will use appropriate technology and/or assigned materials to demonstrate the use of relational expressions, apply statistical and data analysis to solve problems in a variety of agribusiness areas, and analyze mathematical problem statements for missing or irrelevant data essential to making a determination. Students will learn how to construct and analyze charts, tables, and graphs from functions and data generated in various agribusiness areas and analyze data using measures of central tendency when interpreting operational documents. As a culminating activity for the unit, students will complete a project that will use operation and knowledge of relationships to solve problems. | 20 periods  900 minutes | (5) The student demonstrates mathematics knowledge and skills required to solve problems related to the agriculture, food, and natural resources industries. The student is expected to:  (A) demonstrate use of relational expressions such as equal to, not equal, greater than, and less than in agriculture, food, and natural resources industries such as agribusiness; animal; environmental service; food products and processing; natural resources; plant; and power, structural, and technical systems;  (B) apply statistical and data analysis to solve problems related to agriculture, food, and natural resources industries such as agribusiness; animal; environmental service; food products and processing; natural resources; plant; and power, structural, and technical systems;  (C) analyze mathematical problem statements for missing or irrelevant data essential to agriculture, food, and natural resources industries such as agribusiness; animal; environmental service; food products and processing; natural resources; plant; and power, structural, and technical systems;  (D) construct and analyze charts, tables, and graphs from functions and data generated in agriculture, food, and natural resources industries such as agribusiness; animal; environmental service; food products and processing; natural resources; plant; and power, structural, and technical systems;  (E) analyze data using measures of central tendency when interpreting operational documents in agriculture, food, and natural resources industries such as agribusiness; animal; environmental service; food products and processing; natural resources; plant; and power, structural, and technical systems; and  (F) use mathematical operations and knowledge of relationships to solve problems such as the calculation of gallons of water from inches of rain, acres of ground water, liquid and gaseous volumes, and conversion of units; calculation of caloric value, parts per million of restricted ingredients, conversion of measurements, and U.S. Department of Agriculture (USDA) grades; estimation of wildlife populations and pulpwood yields; and calculation of mapping data inherent to systems of agriculture or agribusiness. | |
| **Unit 5: Solve Problems – Agribusiness Systems**  Students will discuss the mathematical knowledge and skills required to solve problems related to agribusiness systems and related career opportunities. Students will use appropriate technology and/or assigned materials to demonstrate the use of mathematical operations and knowledge of relationships to solve problems related to record keeping in agribusiness systems. Students will demonstrate knowledge of algebraic applications and linear and exponential functions relate to concepts such as simple interest, compound interest, maturity value, tax rates, depreciation, production analysis, market trends, investments and price determination. As a culminating activity for the unit, students will create a report utilizing statistical and data analysis to evaluate an agribusiness system and will include statistical data to support their findings. | 15 periods  675 minutes | (6) The student demonstrates mathematical knowledge and skills required to solve problems related to agribusiness systems and related career opportunities. The student is expected to:  (A) use mathematical operations and knowledge of relationships to solve daily problems related to record keeping such as profit/loss statements, income statements, capital asset inventories, insurance, risk management, lease agreements, employee payroll and benefits, and investments and loan, real estate contract, or tax documentation in agribusiness systems;  (B) demonstrate knowledge of algebraic applications and linear and exponential functions related to concepts such as simple interest, compound interest, maturity value, tax rates, depreciation, production analysis, market trends, investments, and price determination in agribusiness systems;  (C) use statistical and data analysis, including counts, percentages, central tendency, and prediction, to evaluate agribusiness systems data such as demographic, production, consumption, weather, and market data; and  (D) report statistical data related to concepts such as pricing, market trends, commodity prices, exports and imports, supply and demand, and production yields numerically or graphically. | |
| **Unit 6: Solve Problems – Animal Systems**  Students will discuss the mathematical knowledge and skills required to solve problems related to animal systems and related career opportunities. Students will use appropriate technology and/or assigned materials to demonstrate the use of mathematical operations and knowledge of relationships to solve problems related to various calculations related to animal systems. Students will demonstrate knowledge of algebraic applications related to animal systems calculations such as ration formulation using the Pearson Square, percent homozygosity, heritability, USDA grades, gene frequency, cost per unit of nutrient, and weaning weight ratio. Students will also use geometric principles to solve problems. As a culminating activity for the unit, students will create a report utilizing statistical and data analysis to evaluate animal systems including numerically or graphically displays of data to support their findings. | 15 periods  675 minutes | (7) The student demonstrates mathematical knowledge and skills required to solve problems related to animal systems and related career opportunities. The student is expected to:  (A) use mathematical operations and knowledge of relationships to solve problems such as the calculation of purchasing, marketing, and production costs; housing requirements; conversion of units; average daily gain; topical and injectable medication dosages; USDA grades; feeding schedules; volumes; stocking rates; and breeding and gestation cycles related to animal systems;  (B) demonstrate knowledge of algebraic applications related to animal system calculations such as ration formulation using the Pearson Square, percent homozygosity, heritability, USDA grades, gene frequency, cost per unit of nutrient, and weaning weight ratio;  (C) use geometric principles to solve problems such as the use of right triangles for perpendicular cross fencing and the calculation of square footage for housing requirements; acreage for normal and irregular shaped pastures; feed bin volume based upon shape such as cylinder, cone, cube, or pyramid; and housing volume for ventilation related to animal systems; and  (D) use statistical and data analysis to evaluate animal systems data reported numerically or graphically such as birth weight, weaning weight, days to market weight, expected progeny differences, feed efficiencies, birth type, litter size, presence or absence of genetic abnormality, milk production, sow productivity index, and veterinary costs or records. | |
| **Unit 7: Solve Problems – Environmental Service Systems**  Students will discuss the mathematical knowledge and skills required to solve problems related to environmental service systems and related career opportunities. Students will use appropriate technology and/or assigned materials to demonstrate the use of algebraic applications to create solutions to problems related to environmental service systems. Students will demonstrate the use of geometric principles to solve problems such as calculating acreage for normal and irregular shaped pastures and slope of land, planning runoff drainage structures, and applying differential leveling techniques. As a culminating activity for the unit, students will create a report that uses statistical and data analysis to evaluate an environmental service system including numerically or graphically displays of data to support their findings. | 10 periods  450 minutes | (8) The student demonstrates mathematical knowledge and skills required to solve problems related to environmental service systems and related career opportunities. The student is expected to:  (A) demonstrate knowledge of algebraic applications to create solutions to problems such as the calculation of acre feet of water, water volume in ponds, water well volume, water pressure friction loss, flow rate, total head pressure, pump efficiency, soil solids volume, and soil degree of saturation related to environmental service systems;  (B) use geometric principles to solve problems such as calculating acreage for normal and irregular shaped pastures and slope of land, planning runoff drainage structures, and applying differential leveling techniques related to environmental service systems; and  (C) use statistical and data analysis to evaluate environmental service systems data reported numerically or graphically such as rainfall, soil classifications, groundwater levels, recycling activities, and pollution rates. | |
| **Unit 8: Solve Problems – Food Products and Processing Systems**  Students will discuss the mathematical knowledge and skills required to solve problems related to food products and processing systems and related career opportunities. Students will use appropriate technology and/or assigned materials to demonstrate the use of algebraic applications to create solutions to problems related to food products and processing systems. Students will demonstrate the use of geometric principles to solve problems such as the calculation of packaging requirements, construction of food storage structures and containers, liquid transfer materials, and vessels design and volume related to food products and processing systems. As a culminating activity for the unit, students will create a report that uses statistical and data analysis to evaluate food products and processing systems including numerically or graphically displays of data to support their findings. | 10 periods  450 minutes | (9) The student demonstrates mathematical knowledge and skills required to solve problems related to food products and processing systems and related career opportunities. The student is expected to:  (A) demonstrate knowledge of algebraic applications to solve problems such as the calculation of exponential growth of bacteria, contribution margin in processing, percentage of weight loss in packaged food, percentage of water absorption in packaged food, and microbe analysis following pasteurization related to food products and processing systems;  (B) use geometric principles to solve problems such as the calculation of packaging requirements, construction of food storage structures and containers, liquid transfer materials, and vessels design and volume related to food products and processing systems; and  (C) use statistical and data analysis to evaluate food products and processing systems data reported numerically or graphically such as governmental regulations, hazard analysis, critical control points data, taste tests, quality assurance data, and industry packing practices. | |
| **Unit 9: Solve Problems – Natural Resource Systems**  Students will discuss the mathematical knowledge and skills required to solve problems related to natural resource systems and related career opportunities. Students will use appropriate technology and/or assigned materials to demonstrate the use of algebraic applications to create solutions to problems related to natural resource systems. Students will demonstrate the use of geometric principles to solve problems such as planning and construction of structures related to wildlife and fisheries management, determination of lumber volume in given tree stock, and calculation of tank volume for chemical application related to natural resource systems. As a culminating activity for the unit, students will create a report that uses statistical and data analysis to evaluate natural resource systems including numerically or graphically displays of data to support their findings. | 15 periods  675 minutes | (10) The student demonstrates mathematical knowledge and skills required to solve problems related to natural resource systems and related career opportunities. The student is expected to:  (A) demonstrate knowledge of algebraic applications to solve problems such as the calculation of mean harvest area, calibration of pesticides, and the Doyle Log Rule related to natural resource systems;  (B) use geometric principles to solve problems such as planning and construction of structures related to wildlife and fisheries management, determination of lumber volume in given tree stock, and calculation of tank volume for chemical application related to natural resource systems; and  (C) use statistical and data analysis to evaluate natural resource systems data reported numerically or graphically such as Geographic Information Systems and Global Positioning Systems data, weather-related data, and data related to wildlife and habitat. | |
| **Unit 10: Solve Problems – Plant Systems**  Students will discuss the mathematical knowledge and skills required to solve problems related to plant systems and related career opportunities. Students will use appropriate technology and/or assigned materials to demonstrate the use of mathematical operations and knowledge of relationships to solve problems related to plant systems. Students will demonstrate the use of algebraic applications to solve problems such as the calculation of grain handling efficiency, harvesting capacity, crop rotation, seeding rates, fertilizer nutrient requirements, and greenhouse ventilation related to plant systems. Students will demonstrate the use of geometric principles for the analysis of problems such as planning grain storage structures and calculating volume of grain storage vessels, grain handling volume, greenhouse capacity, and regular and irregular shaped planting bed size related to plant systems. As a culminating activity for the unit, students will create a report that uses statistical and data analysis to evaluate plant systems. | 10 periods  450 minutes | 11) The student demonstrates mathematical knowledge and skills required to solve problems related to plant systems and related career opportunities. The student is expected to:  (A) use mathematical operations and knowledge of relationships to solve problems such as the calculation of crop yields, crop loss, grain drying requirements, grain weight shrinkage, germination rates, greenhouse heating, and cooling and fertilizer application rates related to plant systems;  (B) demonstrate knowledge of algebraic applications to solve problems such as the calculation of grain handling efficiency, harvesting capacity, crop rotation, seeding rates, fertilizer nutrient requirements, and greenhouse ventilation related to plant systems;  (C) use geometric principles for the analysis of problems such as planning grain storage structures and calculating volume of grain storage vessels, grain handling volume, greenhouse capacity, and regular and irregular shaped planting bed size related to plant systems; and  (D) use statistical and data analysis to evaluate plant systems data such as crop yields, Global Information Systems data, plant growth data, and climate data. | |
| **Unit 11: Solve Problems – Power, Structural, and Technical Systems**  Students will discuss the mathematical knowledge and skills required to solve problems related to power, structural, and technical systems. Students will use appropriate technology and/or assigned materials to demonstrate the use of mathematical operations and knowledge of relationships to solve problems related to power, structural, and technical systems. Students will demonstrate the use of algebraic applications to solve problems such as the calculation of strength of magnetism, chain or belt tension, horsepower, Ohm's Law, hydraulic multiplication of force, stresses using Mohr's Circle, and tensile strength related to power, structural, and technical systems. Students will demonstrate the use of geometric principles for the evaluation of problems such as rafter length, land measurement, differential leveling, concrete volume, heating, ventilating, and air conditioning requirements and creation of structural drawings related to power, structural, and technical systems. Students will create a report that uses statistical and data analysis to evaluate power, structural and technical systems. As a culminating activity for the unit, students will use geometric principles to develop and implement a plan for construction of a project such as a trailer, an agricultural structure, a storage facility, or fence. | 15 periods  675 minutes | (12) The student demonstrates mathematical knowledge and skills required to solve problems related to power, structural, and technical systems and related career opportunities. The student is expected to:  (A) use mathematical operations and knowledge of relationships to solve problems such as the calculation of gear ratio, fuel efficiency, construction costs, project layout, energy costs, unit conversions, and bid preparation and labor-related calculations related to power, structural, and technical systems;  (B) demonstrate knowledge of algebraic applications such as the calculation of strength of magnetism, chain or belt tension, horsepower, Ohm's Law, hydraulic multiplication of force, stresses using Mohr's Circle, and tensile strength related to power, structural, and technical systems;  (C) use geometric principles for the evaluation of problems such as rafter length, land measurement, differential leveling, concrete volume, heating, ventilating, and air conditioning requirements and creation of structural drawings related to power, structural, and technical systems;  (D) use statistical and data analysis to evaluate power, structural, and technical systems data such as construction cost data; equipment maintenance; heating, ventilation, and air conditioning efficiencies; engine performance; and labor costs; and  (E) use geometric principles to develop and implement a plan for construction of a project such as a trailer, an agricultural structure, a storage facility, or a fence. | |
| **Unit 12: Supervised Agriculture Experience Program**  Students will discuss and develop all components of a supervised agriculture experience. Through a variety of classroom activities, students will utilize appropriate technology to plan, propose, conduct, document and evaluate their supervised agriculture experience program, apply appropriate record-keeping skills, and participate in leadership opportunities. As a culminating activity for the unit, students will produce and participate in a local program of activities using a strategic planning process. | 20 periods  900 minutes | (3) The student develops a supervised agriculture experience program. The student is expected to:  (A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;  (B) apply proper record-keeping skills as they relate to the supervised agriculture experience;  (C) participate in youth leadership opportunities to create a well-rounded experience program; and  (D) produce and participate in a local program of activities using a strategic planning process. | |