# Scope & Sequence

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| Course Name: Mathematics for Medical Professionals **PEIMS Code:** 13020970 | | | **Course Credit:** 1.0  **Course Requirements:** This course is recommended for student in Grades 11 and 12.  **Prerequisites:** Geometry and Algebra II. |
| **Course Description:** The Mathematics for Medical Professionals course is designed to serve as the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on fluency and solid understanding in medical mathematics, students will extend and apply mathematical skills necessary for health science professions. Course content consists primarily of high school level mathematics concepts and their applications to health science professions. | | | |
| **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**  **130.229 (c) Knowledge and skills** | |
| **Unit 1: Meeting Employer Expectations in Health Science**  This unit is designed to inform future Health Science students about industry expectations for employability skills and professional standards. | 20 periods  900 minutes | (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:  (A) express ideas in a clear, concise, and effective manner;  (B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team; and  (C) demonstrate adaptability skills such as problem solving and creative thinking. | |
| **Unit 2: Mathematical Processes and Understanding**  In this unit students are asked to use mathematical processes to solve problems that arise in the health sciences. Communicating math ideas, reasoning, and their implications to the health sciences are developed along with having the ability to justify mathematical ideas and arguments. A variety of tools including real object and mental math will be explored. | 25 periods  1,125 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 health science professions;  (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 in health science professions;  (D) communicate mathematical ideas, reasoning, and their implications to the health science field using multiple representations, including symbols, diagrams, graphs, and language as appropriate;  (E) create and use representations to organize, record, and communicate mathematical ideas in health science professions;  (F) analyze mathematical relationships to connect and communicate mathematical ideas in health science professions; and  (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication as it applies to health science professions. | |
| **Unit 3: Mathematics in Real World Clinical Situations**  Using mathematics as it applies to actual medical situations is the student expectation in this unit. A number of scenarios involving ratios, rates, percentages, and dosages will require students to demonstrate mathematical concepts. Understanding the metric system, military time, and roman numerals helps prepare students for real world clinical situations. | 25 periods  1,125 minutes | (3) The student generates deeper mathematical understandings through problems involving numerical data that arise in health science professions. The student extends existing knowledge and skills to analyze real-world clinical situations. The student is expected to:  (A) add, subtract, multiply, and divide rational numbers fluently in problem-solving situations related to health science professions;  (B) keep track of and manage inventory using the First In, Last Out (FILO) concept;  (C) solve health science related problems involving ratios, rates, and percentages accurately and precisely, including lab analysis, body fluid analysis, vital signs, medication dosages and administration, growth charts, body surface area, parenteral solutions and data collection related to homeostasis;  (D) learn to read and use military time fluently for health science situations, including medication administration, scheduling, and documentation;  (E) apply appropriate estimation techniques used in health science professions to estimate percent and then confirm those estimates with calculations; and  (F) read and determine accurate numerical value of Roman numerals as used in the health science professions, including cranial nerves. | |
| **Unit 4: Analyzing Mathematical Models in Health Science**  In this unit students will gather data and analyze that data to help make informed decisions related to health care. A variety of mathematical tools will be utilized to illustrate how mathematical models can be used in health care. | 30 periods  1,350 minutes | (4) The student applies the process standards in mathematics to create and analyze mathematical models of health science situations to make informed decisions related to improved health care outcomes by appropriate, proficient, and efficient use of tools, including technology. The student judges the validity of a prediction and uses mathematical models to represent, analyze, and solve dynamic health care problems. The student is expected to:  (A) collect data to create a scatterplot and apply various functions to model the data in an effort to interpret results and make predictions in health science situations such as interpreting growth charts, interpreting disease and mortality rates, and diagnosing and determining treatment modalities;  (B) create, represent, and analyze appropriate mathematical functions such as linear, quadratic, exponential, logarithmic, and sinusoidal functions used to model, interpret and predict situations that occur in health science professions such as supply and demand, inventory control, and cost analysis within clinical situations;  (C) determine or analyze an appropriate sinusoidal model for health science situations that can be modeled with periodic functions, including those related to electrocardiograms (EKG), repolarization of the heart, and medication dosage and administration;  (D) write and solve systems of equations, especially those representing mixtures, which apply to health science situations, including intravenous (IV) solutions and medication dosages;  (E) use properties of logarithmic and exponential functions to solve equations related to health science situations such as determining the pH of a solution, the concentration of hydrogen ions (H+) given the pH, calculating the absorbance and transmittance, and determining exponential growth and decay; and  (F) calculate accurate and precise unit rates used in health science situations. | |
| **Unit 5: Making Accurate and Precise Measurements**  Students will learn the importance of accurate precise measurement in the medical field in this unit. Students will identify different measurement systems used in a variety of health professions. The use of appropriate measurement tools to measure lengths, temperature, fluids, solids, fluids, and pressures are evaluated. Students evaluate the correct tools for precise measurements, including determining measures for medication, nutrition, fluids, and homeostasis. | 25 periods  1,125 minutes | (5) The student applies mathematical process standards to obtain accurate and precise measurements. The student is expected to:  (A) define each of the health science professions that require a unique set of measurement or calculation standards and explain or identify the importance of each measurement system (apothecary, metric, household systems);  (B) explain the necessity of obtaining accurate measurements in the health science professions;  (C) use dimensional analysis with precision and accuracy in performing unit conversions from one measurement system to another, including the use of proportions and unit rates in pharmacology;  (D) classify the specific system to which a given unit belongs and explain its similarity or differences to units in other measurement systems;  (E) select and use appropriate measurement tools used in health science professions such as rulers, tape measures, thermometers, syringes, scales, and sphygmomanometer gauges to obtain accurate and precise measurements; and  (F) select and use appropriate measurement techniques used in health science professions to obtain accurate and precise measurements, including determining measures for medication, nutrition, fluids, and homeostasis. | |
| **Unit 6: Applying Statistical Information**  Having the ability to make sense out of complicated statistical information if the goal of this unit. Students will learn analyze data and to describe the characteristics of a well designed study. Common terms like placebo effect, z-scores, normal distributions, and the Empirical Rules will be described by students. | 30 periods  1,125 minutes | (6) The student applies mathematical process standards to analyze statistical information used in health science professions. The student is expected to:  (A) obtain and analyze lab reports to evaluate if values lie outside normal parameters;  (B) obtain and analyze vital signs by comparing to normal parameters;  (C) calculate and apply measures of central tendency in application problems in the health science field;  (D) demonstrate an understanding of the significance of the normal distribution;  (E) demonstrate an understanding of and apply the Empirical Rule to find probabilities from normal distributions;  (F) calculate and use the z-score to calculate standard deviation of a normal distribution using a formula;  (G) calculate the percentile rank for a given score using a formula;  (H) describe characteristics of well-designed and well-conducted experiments, observational studies, and surveys in the health science field, including the ethical issues associated with each;  (I) distinguish between populations and samples;  (J) explain placebo and placebo effect; and  (K) define epidemiology and its extension of statistical procedures to public health issues. | |
| **Unit 7: Geometrical Problems Arising in Health Science Professions**  Student will solve a variety of geometrical problems common to health science professions by applying mathematical processes. Calculating range of motion, surface area, and the volume of even irregularly shaped objects are skills students will learn in this unit. | 20 periods  900 minutes | (7) The student applies mathematical process standards to solve geometric problems arising in health science professions. The student is expected to:  (A) calculate volumes of various liquids and solids encountered in health science professions, including irregularly shaped solids, using formulas and geometric reasoning;  (B) calculate surface area of various surfaces encountered in health science professions, including body surface area, using formulas and geometric reasoning;  (C) calculate appropriate angles encountered in health science professions such as medication administration, body positioning, and physical therapy using geometric reasoning; and  (D) calculate and analyze range of motion using a goniometer. | |