Texas CTE: Health Science

# Mathematics for Medical Professionals

**Implementation.** A

1 **The provisions of this section shall be implemented by school districts beginning with the 2017- 2018 school year.** A.1

2 **School districts shall implement the employability skills student expectations listed in §127.15(d)(2) of this chapter (relating to Career and Technical Education Employability Skills) as an integral part of this course.** A.2

**General requirements. This course is recommended for student in Grades 11 and 12. Prerequisites: Geometry and Algebra II. Students shall be awarded one credit for successful completion of this course.** B

b **General requirements. This course is recommended for student in Grades 11 and 12. Prerequisites: Geometry and Algebra II. Students shall be awarded one credit for successful completion of this course.** B

**Introduction.** C

1 **Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.** C.1

2 **The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.** C.2

3 **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.** C.3

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**he mathematical process standards describe ways in which students are xpected to engage in the content. The placement of the process standards at the**

**beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will 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. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.** C.4

5 **Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.** C.5

6 **Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.** C.6

**Knowledge and skills.** D

1 **The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:** D.1

A apply mathematics to problems arising in health science professions; D.1.A

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; D.1.B

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.1.C

D communicate mathematical ideas, reasoning, and their implications to the health science field using multiple representations, including symbols, diagrams, graphs, and language as appropriate; D.1.D

E create and use representations to organize, record, and communicate mathematical ideas in health science professions; D.1.E

F analyze mathematical relationships to connect and communicate mathematical ideas in health science professions; and D.1.F

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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. D.1.G

2 **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:** D.2

A add, subtract, multiply, and divide rational numbers fluently in problem-solving situations related to health science professions; D.2.A

B keep track of and manage inventory using the First In, Last Out (FILO) concept; D.2.B

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.2.C

D learn to read and use military time fluently for health science situations, including medication administration, scheduling, and documentation; D.2.D

E apply appropriate estimation techniques used in health science professions to estimate percent and then confirm those estimates with calculations; and D.2.E

F read and determine accurate numerical value of Roman numerals as used in the health science professions, including cranial nerves. D.2.F

3 **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:** D.3

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; D.3.A

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; D.3.B

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.3.C

) write and solve systems of equations, especially those representing mixtures, which apply to health science situations, including intravenous (IV) solutions and medication dosages; D.3.D

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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 D.3.E

F calculate accurate and precise unit rates used in health science situations. D.3.F

**4 The student applies mathematical process standards to obtain accurate and precise measurements. The student is expected to:** D.4

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); D.4.A

B explain the necessity of obtaining accurate measurements in the health science professions; D.4.B

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.4.C

D classify the specific system to which a given unit belongs and explain its similarity or differences to units in other measurement systems; D.4.D

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 D.4.E

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. D.4.F

**5 The student applies mathematical process standards to analyze statistical information used in health science professions. The student is expected to:** D.5

A obtain and analyze lab reports to evaluate if values lie outside normal parameters; D.5.A

B obtain and analyze vital signs by comparing to normal parameters; D.5.B

C calculate and apply measures of central tendency in application problems in the health science field; D.5.C

D demonstrate an understanding of the significance of the normal distribution; D.5.D

E demonstrate an understanding of and apply the Empirical Rule to find probabilities from normal distributions; D.5.E

F calculate and use the z-score to calculate standard deviation of a normal distribution using a formula; D.5.F

G calculate the percentile rank for a given score using a formula; D.5.G

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; D.5.H

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I distinguish between populations and samples; D.5.I

J explain placebo and placebo effect; and D.5.J

K define epidemiology and its extension of statistical procedures to public health issues. D.5.K

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6 **The student applies mathematical process standards to solve geometric problems arising in health science professions. The student is expected to:** D.6

A calculate volumes of various liquids and solids encountered in health science professions, including irregularly shaped solids, using formulas and geometric reasoning; D.6.A

B calculate surface area of various surfaces encountered in health science professions, including body surface area, using formulas and geometric reasoning; D.6.B

C calculate appropriate angles encountered in health science professions such as medication administration, body positioning, and physical therapy using geometric reasoning; and D.6.C

D calculate and analyze range of motion using a goniometer. D.6.D