Texas CTE

Applied Mathematics for Technical Professionals (One Credit) (2015)

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Introduction. B

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.** B.1

2 **The process standards describe ways in which students are expected 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,**

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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. B.2

3 **Career development is a lifelong pursuit of answers to the questions: Who am I? Why am I here? What am I meant to do with my life? It is vital that students have a clear sense of direction for their career choice. Career planning is a critical step and is essential to success.** B.3

4 **Applied Mathematics for Technical Professionals uses problem-solving situations, hands-on activities, and technology to extend mathematical thinking and engage student reasoning. Situations relating to technical applications provide students opportunities to make connections with mathematics and the workplace. In addition, students will learn the skills necessary to communicate using mathematics. Hands-on activities will allow students to model, explore, and develop abstract concepts applicable to technical careers. (Essential to this course is the partnership between mathematics and technical teachers.)** B.4

5 **Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.** B.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.** B.6

Knowledge and skills. C

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

A apply mathematics to problems arising in everyday life, society, and the workplace; C.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; C.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; C.1.C

D communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate; C.1.D

E create and use representations to organize, record, and communicate mathematical ideas; C.1.E

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F analyze mathematical relationships to connect and communicate mathematical ideas; and C.1.F

G display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication. C.1.G

2 **The student uses mathematical concepts of algebra to explain linear and non-linear applications in business and industry situations. The student is expected to:** C.2

A calculate rise and run such as the rise and run of stair stringers or roof pitch; C.2.A

B distinguish the purpose and difference of a linear and non-linear increase and decrease of a variable with time such as cost or profit; C.2.B

C write systems of equations and inequalities from real-life situations that compare "best deal opportunities" with profit and expenses in businesses; C.2.C

D use linear programing to maximize or minimize linear objective function in real-life situations and determine the reasonableness of solutions; C.2.D

E express numbers as powers of 10 in business and industry settings; C.2.E

F determine the powers and roots of numbers; C.2.F

G apply compound interest formulas related to operating a business; and C.2.G

H use exponential decay models to determine the depreciation on equipment used in business and industry and explain the meaning of models. C.2.H

3 **The student applies geometric concepts to real-world problems in technical situations. The student is expected to:** C.3

A identify various geometric figures in order to identify what formulas are needed to solve situational problems; C.3.A

B compute measurements such as area, surface area, volume, perimeter, and circumference in order to prepare engineering drawings for projects; C.3.B

C use trigonometric functions such as sine, cosine, tangent, cotangent, cosecant, and secant to calculate angles and length of sides; C.3.C

D apply Heron's formula for finding areas of triangles when the height is not known; C.3.D

E determine how changing dimensions will affect the perimeter, area, surface area, or volume in a project; C.3.E

F determine how angles will affect structural strength and stability; C.3.F

G apply right triangle relationships using the Pythagorean Theorem, special right triangles, and trigonometry for roof construction, building the frame of a car, or calculating machined parts; C.3.G

H determine the materials needed for a job or project by finding missing parts of a circle; C.3.H

I draw orthographic and isometric views and use them to produce engineering drawings; C.3.I

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use cross-sections, including conic sections, of three-dimensional figures to relate to plane figures in specific detail on an engineered drawing; and C.3.J

K explain and use auxiliary views, revolutions, intersections, and engineered drawings. C.3.K

4 The student applies measurement to all aspects of business and industry occupations. The student is expected to: C.4

A use dimensional analysis to select an appropriate tool to make measurements; C.4.A

B apply accurate readings of both U.S. customary and metric measuring devices to a problem situation; C.4.B

C square, measure, and cut materials to specified dimensions; C.4.C

D draw segments to scale using an accurate scale and measure segments that are drawn to scales; C.4.D

E convert temperature values between Celsius and Fahrenheit in situations involving thermodynamics; and C.4.E

F determine length, distance, area, surface area, volume, and weight with appropriate unit labels. C.4.F

5 The student uses mathematical processes with graphical and numerical techniques to study patterns and analyze data related to finance. The student is expected to: C.5

A use rates and linear functions to solve problems involving finance and budgeting, including compensations and deductions; C.5.A

B solve problems related to local, state, and federal taxes; C.5.B

C analyze data to make decisions about banking and finance; C.5.C

D use mathematical processes with algebraic formulas, numerical techniques, and graphs to solve problems related to job cost analysis; C.5.D

E identify what parameters to change such as cost of materials, cost of labor, and work time required to improve the overall cost of a project; and C.5.E

F identify the most reasonable mathematical solution using estimation. C.5.F

6 The student applies mathematical processes to design a study and use graphical, numerical, and analytical techniques to communicate the results. The student is expected to: C.6

A interpret and present situations in terms of given graphs and that fit graphics; C.6.A

B apply Ohm's Law and Kirchhoff's laws to troubleshoot electrical circuits; C.6.B

C collect and organize data; make and interpret scatterplots; and model, predict, and make decisions and critical judgments; and C.6.C

D prepare technical reports and presentations with visual media or models, including tables, graphs, and verbal descriptions. C.6.D

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'he student applies mathematical principles of manufacturing processes. The student is expected to: C.7

A identify the line types used on engineering drawings; C.7.A

B identify selected symbols commonly used on engineering drawings; C.7.B

C identify the components of engineering drawings; C.7.C

D read, interpret, and create engineering drawings; and C.7.D

E use proper nomenclature when identifying engineering or manufacturing processes. C.7.E