Grade 7

Module columns (left to right): Bridge Builder, Design & Construction, Environmental, Madlev, Motion, Highway Safety, SimCity, Traffic Technology, GPS 101, Cantilevel Beam, Jeopardy

MATH - Grade 7: Numerical and Proportional Reasoning
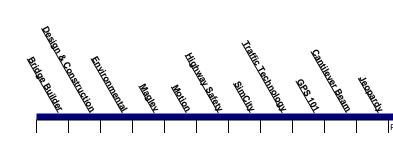
Computation with positive and negative numbers may be modeled in the context of increasing and decreasing value or changes in measurements.

Bridge Builder	Design & Construction	Environmental	Madlev	Motion	Highway Safety	SimCity	Traffic Technology	GPS 101	Cantilevel Beam	Jeopardy	
√	√	√				√	√				Use number theory concepts (primes, factors, multiples, divisibility) to estimate and solve problems.
√	√	√				√	√				Use models and number lines to solve problems that involve integers, powers and roots.
√	√	√				√	√				Use the order of operations to compute and solve a variety of multi-step problems, including those with parentheses and exponents.
√	√	√				√	√				Solve problems involving absolute value.
√	√	√				√	√				Create word problems, write number sentences and matching equations and explain and solve a variety of multi-step word problems.

Very large and very small numbers may be written using scientific notation, which is based on powers of ten.

Bridge Builder	Design & Construction	Environmental	Madlev	Motion	Highway Safety	SimCity	Traffic Technology	GPS 101	Cantilevel Beam	Jeopardy	
√	√	√				√					Use powers of ten and negative exponents to write decimal fractions.
√	√	√				√					Use powers of ten and positive and negative exponents to express and compare magnitude of very large and very small numbers and connect to scientific notation.
											Use the rules for exponents to find the result of multiplication and division with powers of ten.
√	√	√				√					Use and explain estimation strategies that involve powers of ten and scientific notation.
√	√	√				√					Develop, describe and use a variety of methods to estimate and calculate with very large numbers.

Models and pictures may be used to demonstrate the answers to problems involving division with fractions.

Bridge Builder	Design & Construction	Environmental	Madlev	Motion	Highway Safety	SimCity	Traffic Technology	GPS 101	Cantilevel Beam	Jeopardy	
√	√	√						√			Identify equivalent division problems with models, pictures and in written fraction and decimal forms and use that information to estimate reasonable answers.

Percents can be used to make comparisons between groups of unequal size because each group is based on a ratio of parts per hundred.

Bridge Builder	Design & Construction	Environmental	Madlev	Motion	Highway Safety	SimCity	Traffic Technology	GPS 101	Cantilevel Beam	Jeopardy	
											Use number patterns and the distributive property to estimate and find percents, including percents greater then 100%.

Fractions, decimals and percents are equivalent ways to represent real-world situations and the choice of which symbolic form to use may make it easier to describe a relationship or solve a problem.

Bridge Builder	Design & Construction	Environmental	Madlev	Motion	Highway Safety	SimCity	Traffic Technology	GPS 101	Cantilevel Beam	Jeopardy	
											Choose and use a variety of linear, area, and ratio models and diagrams to estimate, round, locate, order, compare and identify equivalent forms of fractions, decimals, mixed numbers, improper fractions, ratios and percents.
											Use models, diagrams, number patterns and common factors to rewrite a rational number in its equivalent fraction, decimal, ratio and percent forms, as powers of ten and in scientific notation.
											Explore, identify and classify fractions as terminating or repeating decimals.
											Use equivalent forms and proportions to find what percent one amount is of another amount.
											Estimate and use the calculator to do computations involving fractions, decimals, mixed numbers, improper fractions, ratios, proportions and percents.
											Use the distributive property to estimate, multiply and divide mixed numbers and decimals.
											Use the associative, commutative, distributive properties, identities and inverses to simplify computations with fractions and decimals and to write and solve multi-step problems.
											Select and describe strategies for estimating reasonable answers to computations with fractions, mixed numbers, decimals, and percents.
											Determine when a situation involving fractions, decimals and percents requires an exact answer, or when an estimate is sufficient.
											Use proportions to identify equivalent ratios and solve practical problems involving rates, scale factors, mixtures and percents.
											Use estimation to predict outcomes and determine reasonableness of results, and describe situations where it is important to recognize whether the estimate is an over- or underestimate.
											Explore alternative ways to express decimal fractions in expanded form.

MATH - Grade 7: Algebraic Reasoning

Algebraic equations may be used as problem solving tools.

Bridge Builder	Design & Construction	Environmental	Madlev	Motion	Highway Safety	SimCity	Traffic Technology	GPS 101	Cantilevel Beam	Jeopardy	
√	√	√	√	√	√						Solve problems involving simple linear equations using concrete, verbal, graphical and tabular representations.
√	√	√	√	√	√						Recognize and generate equivalent forms for simple algebraic expressions and equations.

A constant rate of change between two variables (slope) will yield a straight line graph (linear), but if the rate of change varies, then the graph is not a line (nonlinear).

Bridge Builder	Design & Construction	Environmental	Madlev	Motion	Highway Safety	SimCity	Traffic Technology	GPS 101	Cantilevel Beam	Jeopardy	
				√							Use graphs, tables and equations to represent and analyze changes in linear and nonlinear relationships.
											Identify the independent and dependent variables in a given situation.
											Recognize that the constant rate of change of a function is the slope.

Some relationships are continuous, others are not continuous (discrete) and the graphs of data points should reflect this.

Bridge Builder	Design & Construction	Environmental	Madlev	Motion	Highway Safety	SimCity	Traffic Technology	GPS 101	Cantilevel Beam	Jeopardy	
					√						Identify how change in the values of data patterns in tables affects changes in the corresponding equations and graphs of linear functions.

The values of slope and of intercepts (the points where a graph intersects each axis) facilitate writing equations and graphing linear relationships.

Bridge Builder	Design & Construction	Environmental	Madlev	Motion	Highway Safety	SimCity	Traffic Technology	GPS 101	Cantilevel Beam	Jeopardy	
					√						Identify points on the graph where the x or y values are equal to zero as representing the x- or y-intercepts, respectively.

MATH - Grade 7: Geometry & Measurement

Subdividing polygons and solids into simpler shapes and prisms can be used to solve geometric and measurement problems.

Bridge Builder	Design & Construction	Environmental	Madlev	Motion	Highway Safety	SimCity	Traffic Technology	GPS 101	Cantilevel Beam	Jeopardy	
											Estimate and develop formulas to find the surface area and volume of prisms and cylinders.
√	√										Develop and use estimation and measurement strategies to solve problems involving the areas of irregular polygons and volumes of irregular solids.
√	√	√	√								Explore the relationships among angles, sides, perimeters and areas of congruent and similar polygons using models and diagrams on the rectangular coordinate plane.
											Understand the relationship of a cubic centimeter and a milliliter. Explore ways to determine the volume of irregular solids using the relationship.

Below are the Connecticut Standards of Learning in Math, Technology, Social Studies, and Science and arranged by competency area and Grade. The Standards are checked (√) to identify the extent to which TRAC PAC 2 modules relate to the Connecticut Standards.

Grade 7

Column key: 1 = Bridge Builder, 2 = Design & Construction, 3 = Environmental, 4 = Madley, 5 = Motion, 6 = Highway Safety, 7 = SimCity, 8 = Traffic Technology, 9 = GPS 101, 10 = Cantilevel Beam, 11 = Jeopardy

The properties of polygons influence the number of flips and turns needed to return a shape to its original orientation.

1	2	3	4	5	6	7	8	9	10	11	
√	√										Explore constructing various angles and polygons using a compass and straightedge.
√	√										Examine and describe the effect of transformations on polygons with line and/or rotational symmetry.

Base plans (footprints), orthogonal views (from the front, side and top) and isometric drawings (on a triangle-based grid) are ways to represent three-dimensional objects in two-dimensional diagrams.

1	2	3	4	5	6	7	8	9	10	11	
√	√										Draw and interpret nets, cross-sections and front, side, top views of various solids.

Problems involving measurement can be solved through the use of appropriate tools, techniques and strategies.

1	2	3	4	5	6	7	8	9	10	11	
√	√	√	√	√	√	√	√	√	√		Choose appropriate units and use standard and nonstandard referents as benchmarks when estimating length, area, volume, wt, mass, time, temperature and angle.

MATH - Grade 7: Working with Data: Probability and Statistics

Selecting the appropriate visual representation of data is based on the kind of data collected and the purpose for its use.

1	2	3	4	5	6	7	8	9	10	11	
√	√	√	√								Make conjectures, design surveys and samplings. Select appropriate representations for the data, including histograms and scatter plots. Organize and analyze the data and defend the analysis.
											Find, use and interpret measures of central tendency and spread including mode, median, mean, range and outliers. Decide which measure(s) may be most appropriate for a given situation.
											Compare two sets of data based on their distributions and measures of central tendency.

Recognizing whether order matters may be important when determining possible outcomes.

1	2	3	4	5	6	7	8	9	10	11	
											Distinguish between combinations and permutations as ways to predict possible outcomes.

Experimental probabilities are determined by actual sampling and use of statistics. Theoretical probabilities are determined through identifying all possible outcomes under stated conditions.

1	2	3	4	5	6	7	8	9	10	11	
√	√										Identify the two ways of obtaining probabilities–by gathering data from experiments (experimental probability) and by analyzing the possible and likely outcomes (theoretical probability).
											Conduct experiments and compare experimental to theoretical probabilities.

SCIENCE - Grade 7: Core Scientific Inquiry, Literacy and Numeracy

Energy provides the ability to do work and it can exist in many forms.

1	2	3	4	5	6	7	8	9	10	11	
			√				√				Explain the relationship between force, distance and work, and use the relationship (W=F x D) to calculate work done in lifting heavy objects.
			√				√				Explain how simple machines such as inclined planes, pulleys and levers are used to create mechanical advantage.
			√				√				Describe how different types of stored (potential) energy can be used to make objects move.

Many organisms, including humans, have specialized organ systems that interact with each other to maintain dynamic internal balance.

1	2	3	4	5	6	7	8	9	10	11	
											Describe the basic structures of an animal cell, including nucleus, cytoplasm, mitochondria and cell membrane, and how they function to support life.
											Describe the structures of the human digestive, respiratory, and circulatory systems, and explain how they function to bring oxygen and nutrients to the cells and expel waste materials.
											Explain how the human muscular/skeletal system supports the body and allows movement.

Landforms are the result of the interaction of constructive and destructive forces over time.

1	2	3	4	5	6	7	8	9	10	11	
√	√	√									Describe how folded and faulted rock layers provide evidence of the gradual up and down motion of the Earth's crust.
√	√	√									Explain how glaciation, weathering and erosion create and shape valleys and floodplains.
√	√	√									Explain how the boundaries of tectonic plates can be inferred from the location of earthquakes and volcanoes.

Technology allows us to improve food production and preservation, thus improving our ability to meet the nutritional needs of growing populations.

1	2	3	4	5	6	7	8	9	10	11	
											Describe how freezing, dehydration, pickling and irradiation prevent food spoilage caused by bacteria.

TECH ED - Grades 5-8 - Economics

Students will understand the link between technology and the economy, and recognize that link as the force behind societal emergence and evolution.

1	2	3	4	5	6	7	8	9	10	11	
√		√	√		√	√	√			√	Describe how societies are organized to produce and distribute goods and services in a structured manner.
√	√	√	√	√	√	√	√	√			Describe how society uses resources and distributes its goods and services.
	√	√			√	√	√				Describe how a business produces profit.
		√			√	√	√				Describe the major economic and political systems in relation to techno-logical activity.
		√			√	√	√				Identify three types of businesses.
√	√	√			√	√	√				Describe free enterprise.
		√			√	√	√				Analyze a product for its ability to satisfy consumer demands.
		√			√	√	√				Develop skills in making wise consumer decisions.
		√			√	√	√				Discuss the global market/ economy and understand its effects on the United States.

TECH ED - Grades 5-8 - Technological Impact

Students will understand the impact that technology has on the social, cultural and environmental aspects of their lives.

1	2	3	4	5	6	7	8	9	10	11	
√	√	√	√	√	√	√	√	√	√	√	Explain how technology has expected and unexpected effects.
√	√	√	√	√	√	√	√	√	√	√	Explore personal, societal, economic and environmental effects of technological systems.
√	√	√	√	√	√	√	√	√	√	√	Trace the historical development of at least one technology, identifying its effects and hypothesizing about its future.

Below are the Connecticut Standards of Learning in Math, Technology, Social Studies, and Science and arranged by competency area and Grade. The Standards are checked (√) to identify the extent to which TRAC PAC 2 modules relate to the Connecticut Standards.

Grade 7

Bridge Builder	Design & Construction	Environmental	Madley	Motion	Highway Safety	SimCity	Traffic Technology	GPS-101	Cantilever Beam	Jeopardy	
√	√		√			√	√	√	√	√	Identify the social and economic impacts of automation and computer-controlled processing.
											Describe the universal input, process, output, feedback (IPOF) systems model.
√	√	√	√	√	√	√	√	√	√	√	Develop criteria for evaluating technology.
√	√	√	√	√	√	√	√	√	√	√	Identify and describe how individual technological innovations may be combined to create new technologies.

TECH ED - Grades 5-8 - Career Awareness

Students will become aware of the world of work and its function in society, diversity, expectations, trends and requirements.

Bridge Builder	Design & Construction	Environmental	Madley	Motion	Highway Safety	SimCity	Traffic Technology	GPS-101	Cantilever Beam	Jeopardy	
√	√	√	√	√	√	√	√	√	√	√	Describe how technological development affects careers and occupations.
√	√	√	√	√	√	√	√	√	√	√	Demonstrate awareness of changes in job requirements over time.
√	√	√	√	√	√	√	√	√	√	√	Describe strategies for assuming responsibility.
√	√	√	√	√	√	√	√	√	√	√	Develop personal responsibility and accountability in the workplace.
√	√	√	√	√	√	√	√	√	√	√	Define and discuss personal and professional ethics.
√	√	√	√	√	√	√	√	√	√	√	Discuss coping strategies for change.
√	√	√	√	√	√	√	√	√	√	√	Identify expectations in the workplace.
√	√	√	√	√	√	√	√	√	√	√	Define and discuss the concept of "work ethic."
√	√	√	√	√	√	√	√	√	√	√	Explore career options.
√	√	√	√	√	√	√	√	√	√	√	Define and discuss "career path."

TECH ED - Grades 5-8 - Problem Solving/Research & Development

Students will recognize technology as the result of a creative act, and will be able to apply disciplined problem-solving strategies to enhance invention and innovation.

Bridge Builder	Design & Construction	Environmental	Madley	Motion	Highway Safety	SimCity	Traffic Technology	GPS-101	Cantilever Beam	Jeopardy	
√	√	√	√	√	√	√	√	√	√	√	Differentiate between human problems and needs.
√	√	√	√	√	√	√	√	√	√	√	Define decision-making, research and invention.
√	√	√	√	√	√	√	√	√	√	√	Discuss how technological systems have been used to solve human problems.
√	√	√	√	√	√	√	√	√	√	√	Select and apply a general problem-solving model in a laboratory setting.
√	√	√	√	√	√	√	√	√	√	√	Identify research methods, materials and techniques.
√	√	√	√	√	√	√	√	√	√	√	Apply cooperative tech-niques while engaged in group problem-solving activities.
√	√	√	√	√	√	√	√	√	√	√	Engage in an activity that requires creativity.
√	√	√	√	√	√	√	√	√	√	√	Describe and apply the processes used to make decisions.
√	√	√	√	√	√	√	√	√	√	√	Apply appropriate and effective questioning techniques.
√	√	√	√	√	√	√	√	√	√	√	Conduct an applied research project.
√	√	√	√	√	√	√	√	√	√	√	Develop, test and modify a design idea through experimentation.
√	√	√	√	√	√	√	√	√	√	√	Differentiate between invention and innovation.
√	√	√	√	√	√	√	√	√	√	√	Develop a solution for a real-life problem.

TECH ED - Grades 5-8 - Leadership

Students will identify and develop leadership attributes and apply them in team situations.

Bridge Builder	Design & Construction	Environmental	Madley	Motion	Highway Safety	SimCity	Traffic Technology	GPS-101	Cantilever Beam	Jeopardy	
											Create a simple flowchart of their daily activities.
√	√	√	√	√	√	√	√	√	√	√	Engage in presentation activities.
√	√	√	√	√	√	√	√	√	√	√	Identify the elements of interpersonal communication.
√	√	√	√	√	√	√	√	√	√	√	Identify and demonstrate organizational skills.
√	√	√	√	√	√	√	√	√	√	√	Explore different roles while working cooperatively and effectively in team situations.
√	√	√	√	√	√	√	√	√	√	√	Demonstrate strategies for effectively managing time.
√	√	√	√	√	√	√	√	√	√	√	Develop organizational skills through practical experiences.
√	√	√	√	√	√	√	√	√	√	√	Explore different roles within a team environment.

TECH ED - Grades 5-8 - Materials and Processes

Students will know the origins, properties and processing techniques associated with the material building blocks of technology.

Bridge Builder	Design & Construction	Environmental	Madley	Motion	Highway Safety	SimCity	Traffic Technology	GPS-101	Cantilever Beam	Jeopardy	
√	√	√	√	√	√	√	√	√	√		Identify and describe a group of new and recycled materials used in technological systems.
√	√	√	√								Differentiate between primary and secondary raw materials.
											Explore methods used to convert raw and recycled materials into usable products.
											Demonstrate the appropriate selection and safe operation of basic hand and power tools.
√	√	√	√	√				√			Use manual and electronic measuring devices accurately.
											Explore the principles of manual material-processing techniques.
											Describe how products are manufactured.
											Demonstrate a working knowledge of the layout, shaping, smoothing, assembly and finishing techniques used to produce a product.
											Explore the principles of computer-controlled processing techniques.

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Bridge Builder	Design & Construction	Environmental	Maglev	Motion	Highway Safety	SimCity	Traffic Technology	GPS 101	Cantilever Beam	Jeopardy	
											Produce simple products from a variety of materials, using manual and computer controlled devices.

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Bridge Builder	Design & Construction	Environmental	Madley	Motion	Highway Safety	SimCity	Traffic Technology	GPS_101	Cantilever Beam	Jeopardy	
TECH ED - Grades 5-8 - Communication Systems											
											Students will understand and be able to effectively apply physical, graphic and electronic communications techniques in processing, transmitting, receiving and organizing information.
√	√	√	√	√	√	√	√				Identify and give examples of integrated technologies.
											Identify the elements of interpersonal communication.
											Identify the elements of mass communications.
√	√	√	√	√	√	√	√	√			Acquire technology based information and apply it in classroom and laboratory situations.
√	√	√	√	√	√	√	√	√	√	√	Explore and explain the integration of communication technologies into transportation and production systems.
√	√										Apply techniques of interpersonal and mass communication through activities such as sketching, CAD, photography, and video.
√	√	√	√	√	√	√	√	√			Evaluate and select appropriate methods of communication for a given problem or situation.
TECH ED - Grades 5-8 Production Systems											
											Students will understand and be able to demonstrate the methods involved in turning raw materials into usable products.
√	√	√	√								Define manufacturing terminology, including interchange ability, automation, standardization, etc.
											Describe how products are manufactured using the methods of single craftsman, line and mass, and automated-robotics manufacturing.
√		√	√	√							Identify and describe the tools and methods used in manufacturing products.
											Identify the characteristics of sub- and superstructures.
√	√										Identify and describe the tools, materials, and methods used in constructing sub- and superstructures.
√	√	√	√								Design, construct and test models of shelters and other structures.
											Produce a product using a simple production sequence: layout, shaping, smoothing, assembly, and finishing techniques.
TECH ED - Grades 5-8 - Transportation Systems											
											Students will understand transportation systems and the environments used to move goods and people, and the subsystems common to each.
√	√	√	√	√	√	√	√	√	√	√	Differentiate between vehicular and stationary transportation systems.
√	√	√	√	√	√	√	√	√	√	√	Differentiate between fixed and random-route land transportation systems.
√	√	√	√	√	√	√	√	√	√	√	Describe and be able to identify the trans. subsystems of body/frame, propulsion, suspension, control, guidance and support in a variety of transportation devices.
√	√	√	√	√	√	√	√	√	√	√	Explore the characteristics of lighter than air and heavier than air atmospheric transportation systems.
√	√	√	√	√	√	√	√	√	√	√	Apply the concept of transportation subsystems while solving transportation problems.
√	√	√	√	√	√	√	√	√	√	√	Identify and experiment with devices used to protect product and personnel in transportation systems.
√	√	√	√	√	√	√	√	√	√	√	Explore, build and experiment with model marine, space, land and airportation systems.
TECH ED - Grades 5-8 - Enterprise											
											Students will demonstrate the techniques of enterprise and how they relate to product and service production, economics, human and material resources, and technology.
										√	Describe the evolution of techological enterprise.
										√	Discuss the influence of enterprise on culture, society, and the environment.
√	√	√	√	√	√	√	√	√	√	√	Define the terms single ownership, company, corporation, and partnership.
√	√	√	√	√	√	√	√	√	√	√	Explore the career possibilities and responsibilities in enterprise.
√	√	√	√	√	√	√	√	√	√	√	Identify and explore a variety of organizational structures, describing the advantages and disadvantages of each
√	√	√	√	√	√	√	√	√	√	√	Explore market research and its relationship to satisfying consumer needs.
											Develop, distribute and evaluate a customer survey.
TECH ED - Grades 5-8 - Engineering Design											
											Students will be able to apply the engineering design process to achieve desired outcomes across all technology content areas.
√	√	√	√	√	√	√	√	√	√		Identify the elements of design.
√	√	√	√	√	√	√	√	√	√		Discuss the differences between problem soving and engineering design strategies.
√	√	√	√	√	√	√	√	√	√		Explain the role of creativity in the engineering design process.
√	√	√	√	√	√	√	√	√	√		Describe conceptual design, embodiment design, and detail design and identify their roles in the engineering process.
√	√	√	√	√	√	√	√	√	√		Explore a variety of creativity-enhancing techniques.
√	√	√	√	√	√	√	√	√	√		Develop conceptual designes for transportation, communications, production and bio-related problems.
√	√	√	√	√	√	√	√	√	√		Use a variety of creativity-enhancing techniques in conceptual design situations.
√	√	√	√	√	√	√	√	√	√		Explore techniques used to refine conceptual design sketches.
√	√		√								Develop preliminary product layouts.