

## Alignment of Texas Pre-Admission Content Test (PACT) Mathematics: Grades 7–12 (735) Framework with Texas Essential Knowledge and Skills

This alignment study identifies the Texas Essential Knowledge and Skills that are addressed in whole or in part by each competency of the exam framework. An indication of alignment does not necessarily imply complete congruence of the content of an exam competency with the relevant standard. The information in this document is subject to change if revisions are made to the exam framework. Any changes will fully supersede the information contained in this document.

Competencies		Texas Essential Knowledge and Skills
<b>Field 735: TX PACT: Mathematics: Grades 7–12</b>		<b>Texas Essential Knowledge and Skills for Mathematics</b>
<u>Content Domain I</u>		
<b>MATHEMATICAL PROCESSES AND NUMBER SENSE</b>		
001	Understand mathematical problem solving.	<p><b>Grades 7–8:</b></p> <p><b>111.27 b 1; 111.28 b 1</b> Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding.</p> <p><b>111.27 b 13; 111.28 b 12</b> Personal financial literacy. The student applies mathematical process standards to develop an economic way of thinking and problem solving useful in one's life as a knowledgeable consumer and investor.</p> <hr/> <p><b>Grades 9–12:</b></p> <p><b>111.39 c 1; 111.40 c 1; 111.41 c 1; 111.42 c 1; 111.43 c 1; 111.44 c 1; 111.45 c 1; 111.46 c 1; 111.47 c 1; 111.48 c 1</b> Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding.</p>
002	Understand mathematical communication, connections, and reasoning.	<p><b>Grades 7–8:</b></p> <p><b>111.27 b 1; 111.28 b 1</b> Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding.</p> <p><b>111.27 b 13; 111.28 b 12</b> Personal financial literacy. The student applies mathematical process standards to develop an economic way of thinking and problem solving useful in one's life as a knowledgeable consumer and investor.</p>

Competencies		Texas Essential Knowledge and Skills
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		<p><b>Grades 9–12:</b></p> <p><b>111.39 c 1; 111.40 c 1; 111.41 c 1; 111.42 c 1; 111.43 c 1; 111.44 c 1; 111.45 c 1; 111.46 c 1; 111.47 c 1; 111.48 c 1</b> Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding.</p> <p><b>111.39 c 4</b> Linear functions, equations, and inequalities. The student applies the mathematical process standards to formulate statistical relationships and evaluate their reasonableness based on real–world data.</p> <p><b>111.41 c 4</b> Logical argument and constructions. The student uses the process skills with deductive reasoning to understand geometric relationships.</p>
003	Understand number theory.	<p><b>Grades 7–8:</b></p> <p><b>111.27 b 2; 111.28 b 2</b> Number and operations. The student applies mathematical process standards to represent and use rational numbers in a variety of forms.</p> <p><b>Grades 9–12:</b></p> <p><b>111.39 c 10</b> Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to rewrite in equivalent forms and perform operations on polynomial expressions.</p> <p><b>111.40 c 7</b> Number and algebraic methods. The student applies mathematical processes to simplify and perform operations on expressions and to solve equations.</p> <p><b>111.48 c 4</b> Number and algebraic methods. The student applies mathematical processes to simplify and perform operations on functions represented in a variety of ways, including real–world situations.</p>
<p><u>Content Domain II</u></p> <p><b>PATTERNS, ALGEBRA, AND FUNCTIONS</b></p>		

Competencies		Texas Essential Knowledge and Skills
Field 735: TX PACT: Mathematics: Grades 7–12		Texas Essential Knowledge and Skills for Mathematics
004	Understand relations and functions.	<p><b>Grades 7–8:</b></p> <p><b>111.28 b 5</b> Proportionality. The student applies mathematical process standards to use proportional and non–proportional relationships to develop foundational concepts of functions.</p> <p><b>Grades 9–12:</b></p> <p><b>111.39 c 3</b> Linear functions, equations, and inequalities. The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations.</p> <p><b>111.39 c 12</b> Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions.</p> <p><b>111.40 c 2</b> Attributes of functions and their inverses. The student applies mathematical processes to understand that functions have distinct key attributes and understand the relationship between a function and its inverse.</p> <p><b>111.40 c 4</b> Quadratic and square root functions, equations, and inequalities. The student applies mathematical processes to understand that quadratic and square root functions, equations, and quadratic inequalities can be used to model situations, solve problems, and make predictions.</p> <p><b>111.42 c 2</b> Functions. The student uses process standards in mathematics to explore, describe, and analyze the attributes of functions. The student makes connections between multiple representations of functions and algebraically constructs new functions. The student analyzes and uses functions to model real–world problems.</p>
005	Understand linear, quadratic, and higher–order polynomial functions.	<p><b>Grades 7–8:</b></p> <p><b>111.27 b 5</b> Proportionality. The student applies mathematical process standards to use geometry to describe or solve problems involving proportional relationships.</p> <p><b>111.27 b 7</b> Expressions, equations, and relationships. The student applies mathematical process standards to represent linear relationships using multiple representations.</p>

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	<p><b>111.27 b 10</b> Expressions, equations, and relationships. The student applies mathematical process standards to use one–variable equations and inequalities to represent situations.</p> <p><b>111.27 b 11</b> Expressions, equations, and relationships. The student applies mathematical process standards to solve one–variable equations and inequalities.</p> <p><b>111.27 b 13; 111.28 b 12</b> Personal financial literacy. The student applies mathematical process standards to develop an economic way of thinking and problem solving useful in one's life as a knowledgeable consumer and investor.</p> <p><b>111.28 b 4</b> Proportionality. The student applies mathematical process standards to explain proportional and non–proportional relationships involving slope.</p> <p><b>111.28 b 5</b> Proportionality. The student applies mathematical process standards to use proportional and non–proportional relationships to develop foundational concepts of functions.</p> <p><b>111.28 b 8</b> Expressions, equations, and relationships. The student applies mathematical process standards to use one–variable equations or inequalities in problem situations.</p> <p><b>111.28 b 9</b> Expressions, equations, and relationships. The student applies mathematical process standards to use multiple representations to develop foundational concepts of simultaneous linear equations.</p> <hr/> <p><b>Grades 9–12:</b></p> <p><b>111.39 c 2</b> Linear functions, equations, and inequalities. The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations.</p> <p><b>111.39 c 3</b> Linear functions, equations, and inequalities. The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations.</p>

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	<p><b>111.39 c 4</b> Linear functions, equations, and inequalities. The student applies the mathematical process standards to formulate statistical relationships and evaluate their reasonableness based on real–world data.</p> <p><b>111.39 c 5</b> Linear functions, equations, and inequalities. The student applies the mathematical process standards to solve, with and without technology, linear equations and evaluate the reasonableness of their solutions.</p> <p><b>111.39 c 6</b> Quadratic functions and equations. The student applies the mathematical process standards when using properties of quadratic functions to write and represent in multiple ways, with and without technology, quadratic equations.</p> <p><b>111.39 c 7</b> Quadratic functions and equations. The student applies the mathematical process standards when using graphs of quadratic functions and their related transformations to represent in multiple ways and determine, with and without technology, the solutions to equations.</p> <p><b>111.39 c 8</b> Quadratic functions and equations. The student applies the mathematical process standards to solve, with and without technology, quadratic equations and evaluate the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real–world data.</p> <p><b>111.40 c 2</b> Attributes of functions and their inverses. The student applies mathematical processes to understand that functions have distinct key attributes and understand the relationship between a function and its inverse.</p> <p><b>111.40 c 3</b> Systems of equations and inequalities. The student applies mathematical processes to formulate systems of equations and inequalities, use a variety of methods to solve, and analyze reasonableness of solutions.</p> <p><b>111.40 c 4</b> Quadratic and square root functions, equations, and inequalities. The student applies mathematical processes to understand that quadratic and square root functions, equations, and quadratic inequalities can be used to model situations, solve problems, and make predictions.</p> <p><b>111.40 c 6</b> Cubic, cube root, absolute value and rational functions, equations, and inequalities. The student applies mathematical processes to understand that cubic, cube root, absolute value and rational functions, equations, and inequalities can be used to model situations, solve problems, and make predictions.</p>





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007	Understand rational, radical, absolute value, and piece–wise defined functions.	<p><b>Grades 7–8:</b></p> <p><b>111.27 b 2</b> Number and operations. The student applies mathematical process standards to represent and use rational numbers in a variety of forms.</p> <p><b>111.27 b 3</b> Number and operations. The student applies mathematical process standards to add, subtract, multiply, and divide while solving problems and justifying solutions.</p>



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	<p><b>Grades 9–12:</b></p> <p><b>111.39 c 11</b> Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to rewrite algebraic expressions into equivalent forms.</p> <p><b>111.40 c 6</b> Cubic, cube root, absolute value and rational functions, equations, and inequalities. The student applies mathematical processes to understand that cubic, cube root, absolute value and rational functions, equations, and inequalities can be used to model situations, solve problems, and make predictions.</p> <p><b>111.40 c 7</b> Number and algebraic methods. The student applies mathematical processes to simplify and perform operations on expressions and to solve equations.</p> <p><b>111.42 c 2</b> Functions. The student uses process standards in mathematics to explore, describe, and analyze the attributes of functions. The student makes connections between multiple representations of functions and algebraically constructs new functions. The student analyzes and uses functions to model real-world problems.</p> <p><b>111.42 c 5</b> Algebraic reasoning. The student uses process standards in mathematics to evaluate expressions, describe patterns, formulate models, and solve equations and inequalities using properties, procedures, or algorithms.</p> <p><b>111.44 c 3</b> Algebraic reasoning (expressions, equations, and generalized relationships). The student applies the process standards in mathematics to create and analyze mathematical models of everyday situations to make informed decisions related to earning, investing, spending, and borrowing money by appropriate, proficient, and efficient use of tools, including technology.</p> <p><b>111.48 c 3</b> Patterns and structure. The student applies mathematical processes to understand the connections among representations of functions and combinations of functions, including the constant function, <math>f(x) = x</math>, <math>f(x) = x^2</math>, <math>f(x) = \sqrt{x}</math>, <math>f(x) = 1/x</math>, <math>f(x) = x^3</math>, <math>f(x) = 3\sqrt{x}</math>, <math>f(x) = bx</math>, <math>f(x) =  x </math>, and <math>f(x) = \log_b(x)</math> where <math>b</math> is 10 or <math>e</math>; functions and their inverses; and key attributes of these functions.</p>

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Content Domain III		
<b>MEASUREMENT AND GEOMETRY</b>		
008	Understand measurement principles and procedures.	<p><b>Grades 7–8:</b></p> <p><b>111.27 b 4</b> Proportionality. The student applies mathematical process standards to represent and solve problems involving proportional relationships.</p> <p><b>111.27 b 8</b> Expressions, equations, and relationships. The student applies mathematical process standards to develop geometric relationships with volume.</p> <p><b>111.27 b 9</b> Expressions, equations, and relationships. The student applies mathematical process standards to solve geometric problems.</p> <p><b>111.28 b 3</b> Proportionality. The student applies mathematical process standards to use proportional relationships to describe dilations.</p> <p><b>111.28 b 6</b> Expressions, equations, and relationships. The student applies mathematical process standards to develop mathematical relationships and make connections to geometric formulas.</p> <p><b>111.28 b 7</b> Expressions, equations, and relationships. The student applies mathematical process standards to use geometry to solve problems.</p> <p><b>111.28 b 8</b> Expressions, equations, and relationships. The student applies mathematical process standards to use one–variable equations or inequalities in problem situations.</p> <p><b>111.28 b 10</b> Two–dimensional shapes. The student applies mathematical process standards to develop transformational geometry concepts.</p>

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	<p><b>Grades 9–12:</b></p> <p><b>111.41 c 7</b> Similarity, proof, and trigonometry. The student uses the process skills in applying similarity to solve problems.</p> <p><b>111.41 c 10</b> Two–dimensional and three–dimensional figures. The student uses the process skills to recognize characteristics and dimensional changes of two– and three–dimensional figures.</p> <p><b>111.41 c 11</b> Two–dimensional and three–dimensional figures. The student uses the process skills in the application of formulas to determine measures of two– and three–dimensional figures.</p> <p><b>111.41 c 12</b> Circles. The student uses the process skills to understand geometric relationships and apply theorems and equations about circles.</p> <p><b>111.44 c 2</b> Numeric reasoning. The student applies the process standards in mathematics to generate new understandings by extending existing knowledge. The student generates new mathematical understandings through problems involving numerical data that arise in everyday life, society, and the workplace. The student extends existing knowledge and skills to analyze real–world situations.</p> <p><b>111.48 c 3</b> Patterns and structure. The student applies mathematical processes to understand the connections among representations of functions and combinations of functions, including the constant function, <math>f(x) = x</math>, <math>f(x) = x^2</math>, <math>f(x) = \sqrt{x}</math>, <math>f(x) = 1/x</math>, <math>f(x) = x^3</math>, <math>f(x) = 3\sqrt{x}</math>, <math>f(x) = bx</math>, <math>f(x) =  x </math>, and <math>f(x) = \log_b(x)</math> where <math>b</math> is 10 or <math>e</math>; functions and their inverses; and key attributes of these functions.</p> <p><b>114.48 c 4</b> Number and algebraic methods. The student applies mathematical processes to simplify and perform operations on functions represented in a variety of ways, including real–world situations.</p>

Competencies		Texas Essential Knowledge and Skills
Field 735: TX PACT: Mathematics: Grades 7–12		Texas Essential Knowledge and Skills for Mathematics
009	Understand Euclidean geometry in two and three dimensions.	<p><b>Grades 7–8:</b></p> <p><b>111.27 b 8</b> Expressions, equations, and relationships. The student applies mathematical process standards to develop geometric relationships with volume.</p> <p><b>111.27 b 9</b> Expressions, equations, and relationships. The student applies mathematical process standards to solve geometric problems.</p> <p><b>111.27 b 11</b> Expressions, equations, and relationships. The student applies mathematical process standards to solve one–variable equations and inequalities.</p> <p><b>111.28 b 6</b> Expressions, equations, and relationships. The student applies mathematical process standards to develop mathematical relationships and make connections to geometric formulas.</p> <p><b>111.28 b 7</b> Expressions, equations, and relationships. The student applies mathematical process standards to use geometry to solve problems.</p>

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	<p><b>Grades 9–12:</b></p> <p><b>111.41 c 4</b> Logical argument and constructions. The student uses the process skills with deductive reasoning to understand geometric relationships.</p> <p><b>111.41 c 5</b> Logical argument and constructions. The student uses constructions to validate conjectures about geometric figures.</p> <p><b>111.41 c 6</b> Proof and congruence. The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart.</p> <p><b>111.41 c 8</b> Similarity, proof, and trigonometry. The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart.</p> <p><b>111.41 c 9</b> Similarity, proof, and trigonometry. The student uses the process skills to understand and apply relationships in right triangles.</p> <p><b>111.41 c 10</b> Two-dimensional and three-dimensional figures. The student uses the process skills to recognize characteristics and dimensional changes of two- and three-dimensional figures.</p> <p><b>111.41 c 12</b> Circles. The student uses the process skills to understand geometric relationships and apply theorems and equations about circles.</p> <p><b>111.42 c 5</b> Algebraic reasoning. The student uses process standards in mathematics to evaluate expressions, describe patterns, formulate models, and solve equations and inequalities using properties, procedures, or algorithms.</p> <p><b>111.43 c 6</b> Mathematical modeling in science and engineering. The student applies mathematical processes with algebra and geometry to study patterns and analyze data as it applies to architecture and engineering.</p> <p><b>111.44 c 2</b> Numeric reasoning. The student applies the process standards in mathematics to generate new understandings by extending existing knowledge. The student generates new mathematical understandings through problems involving numerical data that arise in everyday life, society, and the workplace. The student extends existing knowledge and skills to analyze real-world situations.</p>

Competencies		Texas Essential Knowledge and Skills
Field 735: TX PACT: Mathematics: Grades 7–12		Texas Essential Knowledge and Skills for Mathematics
010	Understand coordinate and transformational geometry.	<p><b>Grades 7–8:</b></p> <p><b>111.28 b 3</b> Proportionality. The student applies mathematical process standards to use proportional relationships to describe dilations.</p> <p><b>111.28 b 7</b> Expressions, equations, and relationships. The student applies mathematical process standards to use geometry to solve problems.</p> <p><b>111.28 b 10</b> Two–dimensional shapes. The student applies mathematical process standards to develop transformational geometry concepts.</p> <hr/> <p><b>Grades 9–12:</b></p> <p><b>111.39 c 3</b> Linear functions, equations, and inequalities. The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations.</p> <p><b>111.39 c 7</b> Quadratic functions and equations. The student applies the mathematical process standards when using graphs of quadratic functions and their related transformations to represent in multiple ways and determine, with and without technology, the solutions to equations.</p> <p><b>111.41 c 2</b> Coordinate and transformational geometry. The student uses the process skills to understand the connections between algebra and geometry and uses the one– and two–dimensional coordinate systems to verify geometric conjectures.</p> <p><b>111.41 c 3</b> Coordinate and transformational geometry. The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non–rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity).</p> <p><b>111.42 c 3</b> Relations and geometric reasoning. The student uses the process standards in mathematics to model and make connections between algebraic and geometric relations.</p>
<p><u>Content Domain IV</u></p> <p><b>TRIGONOMETRY AND CALCULUS</b></p>		

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011	Understand trigonometric functions.	Grades 7–8: n/a
		<p><b>Grades 9–12:</b></p> <p><b>111.41 c 6</b> Proof and congruence. The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart.</p> <p><b>111.41 c 9</b> Similarity, proof, and trigonometry. The student uses the process skills to understand and apply relationships in right triangles.</p> <p><b>111.42 c 2</b> Functions. The student uses process standards in mathematics to explore, describe, and analyze the attributes of functions. The student makes connections between multiple representations of functions and algebraically constructs new functions. The student analyzes and uses functions to model real-world problems.</p> <p><b>111.42 c 4</b> Number and measure. The student uses process standards in mathematics to apply appropriate techniques, tools, and formulas to calculate measures in mathematical and real-world problems.</p> <p><b>111.43 c 6</b> Mathematical modeling in science and engineering. The student applies mathematical processes with algebra and geometry to study patterns and analyze data as it applies to architecture and engineering.</p>
012	Understand differential calculus.	Grades 7–8: n/a
		Grades 9–12: n/a
013	Understand integral calculus.	Grades 7–8: n/a
		Grades 9–12: n/a

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<u>Content Domain V</u> <b>STATISTICS, PROBABILITY, AND DISCRETE MATHEMATICS</b>		
014	Understand principles and techniques of statistics.	<b>Grades 7–8:</b> <b>111.27 b 12</b> Measurement and data. The student applies mathematical process standards to use statistical representations to analyze data. <b>111.28 b 11</b> Measurement and data. The student applies mathematical process standards to use statistical procedures to describe data.



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	<p><b>Grades 9–12:</b></p> <p><b>111.41 c 13</b> Probability. The student uses the process skills to understand probability in real–world situations and how to apply independence and dependence of events.</p> <p><b>111.44 c 4</b> Probabilistic and statistical reasoning. The student uses the process standards in mathematics to generate new understandings of probability and statistics. The student analyzes statistical information and evaluates risk and return to connect mathematical ideas and make informed decisions. The student applies a problem–solving model and statistical methods to design and conduct a study that addresses one or more particular question(s). The student uses multiple representations to communicate effectively the results of student–generated statistical studies and the critical analysis of published statistical studies.</p> <p><b>111.47 c 2</b> Statistical process sampling and experimentation. The student applies mathematical processes to apply understandings about statistical studies, surveys, and experiments to design and conduct a study and use graphical, numerical, and analytical techniques to communicate the results of the study.</p> <p><b>111.47 c 3</b> Variability. The student applies the mathematical process standards when describing and modeling variability.</p> <p><b>111.47 c 4</b> Categorical and quantitative data. The student applies the mathematical process standards to represent and analyze both categorical and quantitative data.</p> <p><b>111.47 c 6</b> Inference. The student applies the mathematical process standards to make inferences and justify conclusions from statistical studies.</p> <p><b>111.47 c 7</b> Bivariate data. The student applies the mathematical process standards to analyze relationships among bivariate quantitative data.</p>

Competencies		Texas Essential Knowledge and Skills
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015	Understand principles and techniques of probability.	<p><b>Grades 7–8:</b></p> <p><b>111.27 b 6</b> Proportionality. The student applies mathematical process standards to use probability and statistics to describe or solve problems involving proportional relationships.</p> <p><b>111.28 b 11</b> Measurement and data. The student applies mathematical process standards to use statistical procedures to describe data.</p> <p><b>Grades 9–12:</b></p> <p><b>111.41 c 13</b> Probability. The student uses the process skills to understand probability in real–world situations and how to apply independence and dependence of events.</p> <p><b>111.43 c 8</b> Mathematical modeling in social sciences. The student applies mathematical processes to determine the number of elements in a finite sample space and compute the probability of an event.</p> <p><b>111.44 c 4</b> Probabilistic and statistical reasoning. The student uses the process standards in mathematics to generate new understandings of probability and statistics. The student analyzes statistical information and evaluates risk and return to connect mathematical ideas and make informed decisions. The student applies a problem–solving model and statistical methods to design and conduct a study that addresses one or more particular question(s). The student uses multiple representations to communicate effectively the results of student–generated statistical studies and the critical analysis of published statistical studies.</p> <p><b>111.47 c 5</b> Probability and random variables. The student applies the mathematical process standards to connect probability and statistics.</p>
016	Understand principles of discrete mathematics.	<b>Grades 7–8:</b> n/a

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		<p><b>Grades 9–12:</b></p> <p><b>111.46 c 1</b> Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding.</p> <p><b>111.46 c 2</b> Graph theory. The student applies the concept of graphs to determine possible solutions to real-world problems.</p>