Subject	§126. Technology Applications			
Course Title	**§126.37. Discrete Mathematics (One-Half to One Credit), Beginning with School Year 2012-2013**			
TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(a) General Requirements. Students shall be awarded one-half to one credit for successful completion of this course. The required prerequisite for this course is Algebra II. This course is recommended for students in Grades 11 and 12.				
(b) Introduction.				
(1) The technology applications curriculum has six strands based on the National Educational Technology Standards for Students (NETS•S) and performance indicators developed by the International Society for Technology in Education (ISTE): creativity and innovation; communication and collaboration; research and information fluency; critical thinking, problem solving, and decision making; digital citizenship; and technology operations and concepts. (2) Discrete Mathematics provides the tools used in most areas of computer science. Exposure to the mathematical concepts and discrete structures presented in this course is essential in order to provide an adequate foundation for further study. Discrete Mathematics is generally listed as a core requirement for Computer Science majors. Course topics are divided into six areas: sets, functions, and relations; basic logic; proof techniques; counting basics; graphs and trees; and discrete probability. Mathematical topics are interwoven with computer science applications to enhance the students' understanding of the introduced mathematics. Students will develop the ability to see computational problems from a mathematical perspective. Introduced to a formal system (propositional and predicate logic) upon which mathematical reasoning is based, students will acquire the necessary knowledge to read and construct mathematical arguments (proofs), understand mathematical statements (theorems), and use mathematical problem-solving tools and strategies. Students will be introduced to discrete data structures such as sets, discrete functions, and relations and graphs and trees. Students will also be introduced to discrete probability and expectations. (3) 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) Knowledge and Skills.				
1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(A) model algorithms and real-world situations using formal tools of symbolic logic	(i) model algorithms using formal tools of symbolic logic		
1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(A) model algorithms and real-world situations using formal tools of symbolic logic	(ii) model real-world situations using formal tools of symbolic logic		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(B) model computer science problems by using graphs and trees	(i) model computer science problems by using graphs		
1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(B) model computer science problems by using graphs and trees	(ii) model computer science problems by using trees		
1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(C) calculate the probabilities of events and expectations of random variables for such problems as games of chance	(i) calculate the probabilities of events of random variables for such problems as games of chance		
1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(C) calculate the probabilities of events and expectations of random variables for such problems as games of chance	(ii) calculate the expectations of random variables for such problems as games of chance		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(A) convert spoken language statements to appropriate statements in propositional logic			

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(B) explain basic terminology of sets, functions, and relations	(i) explain basic terminology of sets		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(B) explain basic terminology of sets, functions, and relations	(ii) explain basic terminology of functions		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(B) explain basic terminology of sets, functions, and relations	(iii) explain basic terminology of relations		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(C) state the definition of the Master theorem			

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(D) use the context of a particular application to interpret the meaning derived when computing the permutations and combinations of a set	(i) use the context of a particular application to interpret the meaning derived when computing the permutations		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(D) use the context of a particular application to interpret the meaning derived when computing the permutations and combinations of a set	(ii) use the context of a particular application to interpret the meaning derived when computing the combinations of a set		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(E) interpret associated operations and terminology in context	(i) interpret associated operations in context		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(E) interpret associated operations and terminology in context	(ii) interpret associated terminology in context		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(F) define and provide examples of logical equivalence, normal forms, validity, and modus ponens/modus tollens	(i) define logical equivalence		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(F) define and provide examples of logical equivalence, normal forms, validity, and modus ponens/modus tollens	(ii) define normal forms		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(F) define and provide examples of logical equivalence, normal forms, validity, and modus ponens/modus tollens	(iii) define validity		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(F) define and provide examples of logical equivalence, normal forms, validity, and modus ponens/modus tollens	(iv) define modus ponens/modus tollens		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(F) define and provide examples of logical equivalence, normal forms, validity, and modus ponens/modus tollens	(v) provide examples of logical equivalence		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(F) define and provide examples of logical equivalence, normal forms, validity, and modus ponens/modus tollens	(vi) provide examples of normal forms		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(F) define and provide examples of logical equivalence, normal forms, validity, and modus ponens/modus tollens	(vii) provide examples of validity		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(F) define and provide examples of logical equivalence, normal forms, validity, and modus ponens/modus tollens	(viii) provide examples of modus ponens/modus tollens		

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TEKS (Knowledge and Skills)	Student Expectation	Breakout	Element	Subelement
(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(A) construct truth tables for negation, conjunction, disjunction, implication, biconditional, and bit operators	(i) construct truth tables for negation		
(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(A) construct truth tables for negation, conjunction, disjunction, implication, biconditional, and bit operators	(ii) construct truth tables for conjunction		
(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(A) construct truth tables for negation, conjunction, disjunction, implication, biconditional, and bit operators	(iii) construct truth tables for disjunction		
(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(A) construct truth tables for negation, conjunction, disjunction, implication, biconditional, and bit operators	(iv) construct truth tables for implication		
(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(A) construct truth tables for negation, conjunction, disjunction, implication, biconditional, and bit operators	(v) construct truth tables for biconditional		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(A) construct truth tables for negation, conjunction, disjunction, implication, biconditional, and bit operators	(vi) construct truth tables for bit operators		
(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(B) use truth tables to demonstrate propositional relations			
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(A) analyze practical examples using appropriate models of sets, functions, and relations	(i) analyze practical examples using appropriate models of sets		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(A) analyze practical examples using appropriate models of sets, functions, and relations	(ii) analyze practical examples using appropriate models of functions		

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TEKS (Knowledge and Skills)	Student Expectation	Breakout	Element	Subelement
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(A) analyze practical examples using appropriate models of sets, functions, and relations	(iii) analyze practical examples using appropriate models of relations		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(B) compare and contrast tautology, contradiction, and contingency as related to propositional equivalences	(i) compare tautology, contradiction, and contingency as terms relate to propositional equivalences		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(B) compare and contrast tautology, contradiction, and contingency as related to propositional equivalences	(ii) contrast tautology, contradiction, and contingency as terms relate to propositional equivalences		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(C) compare and contrast examples and use of counterexamples, contrapositions, and contradictions	(i) compare examples of counterexamples, contrapositions, and contradictions		

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TEKS (Knowledge and Skills)	Student Expectation	Breakout	Element	Subelement
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(C) compare and contrast examples and use of counterexamples, contrapositions, and contradictions	(ii) contrast examples of counterexamples, contrapositions, and contradictions		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(C) compare and contrast examples and use of counterexamples, contrapositions, and contradictions	(iii) compare use of counterexamples, contrapositions, and contradictions		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(C) compare and contrast examples and use of counterexamples, contrapositions, and contradictions	(iv) contrast use of counterexamples, contrapositions, and contradictions		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(D) describe the appropriate use and limitations of predicate logic	(i) describe the appropriate use of predicate logic		

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TEKS (Knowledge and Skills)	Student Expectation	Breakout	Element	Subelement
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(D) describe the appropriate use and limitations of predicate logic	(ii) describe the limitations of predicate logic		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(E) apply formal methods of symbolic propositional and predicate logic	(i) apply formal methods of symbolic propositional logic		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(E) apply formal methods of symbolic propositional and predicate logic	(ii) apply formal methods of symbolic predicate logic		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(F) use formal logic proofs and logical reasoning to solve problems	(i) use formal logic proofs to solve problems		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(F) use formal logic proofs and logical reasoning to solve problems	(ii) use logical reasoning to solve problems		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(G) outline the basic structure of proofs, including direct, indirect, contradiction, induction, existence and constructive proofs	(i) outline the basic structure of proofs, including direct proofs		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(G) outline the basic structure of proofs, including direct, indirect, contradiction, induction, existence and constructive proofs	(ii) outline the basic structure of proofs, including indirect proofs		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(G) outline the basic structure of proofs, including direct, indirect, contradiction, induction, existence and constructive proofs	(iii) outline the basic structure of proofs, including contradiction proofs		

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TEKS (Knowledge and Skills)	Student Expectation	Breakout	Element	Subelement
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(G) outline the basic structure of proofs, including direct, indirect, contradiction, induction, existence and constructive proofs	(iv) outline the basic structure of proofs, including induction proofs		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(G) outline the basic structure of proofs, including direct, indirect, contradiction, induction, existence and constructive proofs	(v) outline the basic structure of proofs, including existence proofs		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(G) outline the basic structure of proofs, including direct, indirect, contradiction, induction, existence and constructive proofs	(vi) outline the basic structure of proofs, including constructive proofs		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(H) compare and contrast the types of problems best satisfied by direct, indirect, contradiction, induction, existence, and constructive proofs	(i) compare the types of problems best satisfied by direct, indirect, contradiction, induction, existence, and constructive proofs		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(H) compare and contrast the types of problems best satisfied by direct, indirect, contradiction, induction, existence, and constructive proofs	(ii) contrast the type of problems best satisfied by direct, indirect, contradiction, induction, existence, and constructive proofs		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(I) relate mathematical induction to recursion and recursively defined structures	(i) relate mathematical induction to recursion		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(I) relate mathematical induction to recursion and recursively defined structures	(ii) relate mathematical induction to recursively defined structures		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(J) compare and contrast weak, strong, and structural induction, including when each is most appropriately used and examples of each	(i) compare weak, strong, and structural induction, including when each is most appropriately used		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(J) compare and contrast weak, strong, and structural induction, including when each is most appropriately used and examples of each	(ii) compare weak, strong, and structural induction, including examples of each		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(J) compare and contrast weak, strong, and structural induction, including when each is most appropriately used and examples of each	(iii) contrast weak, strong, and structural induction, including when each is most appropriately used		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(J) compare and contrast weak, strong, and structural induction, including when each is most appropriately used and examples of each	(iv) contrast weak, strong, and structural induction, including examples of each		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(K) compare and contrast dependent and independent events	(i) compare dependent and independent events		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(K) compare and contrast dependent and independent events	(ii) contrast dependent and independent events		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(L) use recurrence equations to analyze algorithms and other practical problems	(i) use recurrence equations to analyze algorithms		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(L) use recurrence equations to analyze algorithms and other practical problems	(ii) use recurrence equations to analyze other practical problems		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(M) use counting techniques to analyze algorithms and other practical problems	(i) use counting techniques to analyze algorithms		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(M) use counting techniques to analyze algorithms and other practical problems	(ii) use counting techniques to analyze other practical problems		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(N) apply probability tools to solve problems			
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(i) define simple graphs using definitions		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(ii) define multigraphs using definitions		

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TEKS (Knowledge and Skills)	Student Expectation	Breakout	Element	Subelement
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(iii) define directed graphs using definitions		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(iv) define undirected graphs using definitions		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(v) define simple graphs using properties		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(vi) define multigraphs using properties		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(vii) define directed graphs using properties		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(viii) define undirected graphs using properties		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(ix) define simple graphs using examples, including special cases		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(x) define multigraphs using examples, including special cases		

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(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(xi) define directed graphs using examples, including special cases		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(xii) define undirected graphs using examples, including special cases		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(xiii) compare simple graphs, multigraphs, and directed and undirected graphs using definitions		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(xiv) compare simple graphs, multigraphs, and directed and undirected graphs using properties		

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(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(xv) compare simple graphs, multigraphs, and directed and undirected graphs using examples, including special cases		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(xvi) contrast simple graphs, multigraphs, and directed and undirected graphs using definitions		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(xvii) contrast simple graphs, multigraphs, and directed and undirected graphs using properties		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases	(xviii) contrast simple graphs, multigraphs, and directed and undirected graphs using examples, including special cases		

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TEKS (Knowledge and Skills)	Student Expectation	Breakout	Element	Subelement
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(A) model ethical acquisition and use of digital information	(i) model ethical acquisition of digital information		
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(A) model ethical acquisition and use of digital information	(ii) model ethical use of digital information		
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(B) demonstrate proper digital etiquette, responsible use of software, and knowledge of acceptable use policies	(i) demonstrate proper digital etiquette		
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(B) demonstrate proper digital etiquette, responsible use of software, and knowledge of acceptable use policies	(ii) demonstrate responsible use of software		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(B) demonstrate proper digital etiquette, responsible use of software, and knowledge of acceptable use policies	(iii) demonstrate knowledge of acceptable use policies		
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(C) investigate how the concepts of discrete mathematics are related to relevant problems and significant questions	(i) investigate how the concepts of discrete mathematics are related to relevant problems		
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(C) investigate how the concepts of discrete mathematics are related to relevant problems and significant questions	(ii) investigate how the concepts of discrete mathematics are related to significant questions		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(A) perform operations associated with sets, functions, and relations	(i) perform operations associated with sets		

Subject	§126. Technology Applications			
Course Title	**§126.37. Discrete Mathematics (One-Half to One Credit), Beginning with School Year 2012-2013**			
TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(A) perform operations associated with sets, functions, and relations	(ii) perform operations associated with functions		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(A) perform operations associated with sets, functions, and relations	(iii) perform operations associated with relations		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(B) apply basic counting principles, including cardinality and the pigeonhole principle	(i) apply basic counting principles, including cardinality		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(B) apply basic counting principles, including cardinality and the pigeonhole principle	(ii) apply basic counting principles, including the pigeonhole principle		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(C) apply appropriate precedence when using logical operators			
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(D) use appropriate strategies, including De Morgan's Laws, to identify propositional equivalences			
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(E) identify and appropriately use predicates, existential and universal quantifiers, and valid arguments	(i) identify predicates		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(E) identify and appropriately use predicates, existential and universal quantifiers, and valid arguments	(ii) identify existential quantifiers		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(E) identify and appropriately use predicates, existential and universal quantifiers, and valid arguments	(iii) identify universal quantifiers		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(E) identify and appropriately use predicates, existential and universal quantifiers, and valid arguments	(iv) identify valid arguments		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(E) identify and appropriately use predicates, existential and universal quantifiers, and valid arguments	(v) appropriately use predicates		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(E) identify and appropriately use predicates, existential and universal quantifiers, and valid arguments	(vi) appropriately use existential quantifiers		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(E) identify and appropriately use predicates, existential and universal quantifiers, and valid arguments	(vii) appropriately use universal quantifiers		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(E) identify and appropriately use predicates, existential and universal quantifiers, and valid arguments	(viii) appropriately use valid arguments		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(F) identify possible applications of proofs, including evaluating algorithmic complexity			
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(G) state and appropriately use the product and sum rules	(i) state the product rules		

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Course Title	§126.37. Discrete Mathematics (One-Half to One Credit), Beginning with School Year 2012-2013			
TEKS (Knowledge and Skills)	Student Expectation	Breakout	Element	Subelement
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(G) state and appropriately use the product and sum rules	(ii) appropriately use the product rules		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(G) state and appropriately use the product and sum rules	(iii) state the sum rules		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(G) state and appropriately use the product and sum rules	(iv) appropriately use the sum rules		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(H) compute permutations and combinations of a set	(i) compute permutations of a set		

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Course Title	**§126.37. Discrete Mathematics (One-Half to One Credit), Beginning with School Year 2012-2013**			
TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(H) compute permutations and combinations of a set	(ii) compute combinations of a set		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(I) solve a variety of basic recurrence equations			
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(J) apply the binomial theorem to independent events			
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(K) apply Bayes' theorem to dependent events			

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TEKS (Knowledge and Skills)	Student Expectation	Breakout	Element	Subelement
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(L) demonstrate transversal methods for trees and graphs	(i) demonstrate transversal methods for trees		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(L) demonstrate transversal methods for trees and graphs	(ii) demonstrate transversal methods for graphs		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(M) relate graphs and trees to data structures, algorithms, and counting	(i) relate graphs to data structures		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(M) relate graphs and trees to data structures, algorithms, and counting	(ii) relate graphs to algorithms		

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TEKS (Knowledge and Skills)	**Student Expectation**	**Breakout**	**Element**	**Subelement**
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(M) relate graphs and trees to data structures, algorithms, and counting	(iii) relate graphs to counting		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(M) relate graphs and trees to data structures, algorithms, and counting	(iv) relate trees to data structures		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(M) relate graphs and trees to data structures, algorithms, and counting	(v) relate trees to algorithms		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(M) relate graphs and trees to data structures, algorithms, and counting	(vi) relate trees to counting		