

Hillsborough Township Public Schools  
Mathematics Department  
Computer Programming 1

Essential Questions	Enduring Understandings	Standard	Strand	CPI	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21 <sup>st</sup> Century Connections
<b>Unit 1 – Introduction to Programming</b> <b>Pacing: 15 days</b>						Common Unit Test		
What are the ethical implications for programming in today’s technological world?	There are ethical responsibilities to consider when writing computer programs.	Technology Education, Engineering and Design	Technological Citizenship, Ethics and Society	8.2.12.C2 - Evaluate ethical considerations regarding the sustainability of resources that are used for the design, creation, and maintenance of a chosen product.	Discuss the ethics associated with programming and technology in today's world	List two ethical considerations associated with programming today and discuss their importance.	W.11-12.2 - Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.	9.1.12.F.4 - Explain the impact of computer hacking on products and services.
Why is a development environment useful for programming?	A development environment facilitates application development.	Technology Education, Engineering and Design	Resources for a Technological World	8.2.12.F.1 - Determine and use the appropriate application of resources in the design, development, and creation of a technological product or system.	Navigate an integrated development environment (IDE) and execute fundamental program instructions in an interactive mode thereby introducing input and assignment syntax rules and I/O functionality.	Navigate the development environment and interactively test the behavior of instructions.		9.1.12.B.2 - Create and respond to a feedback loop when problem solving.
How can the computer be used to automate a	Instructions to a computer can solve problems involving				Recognize and use variables, expressions, numerical and	Determine the output of an instruction. Apply order of	A-CED.1 - Create equations and inequalities in one variable and use	

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problem's solution?	numbers and strings.				string data types, numerical and string operators, and sequence statements to create simple programs.	operations to numerical expressions. Use variables, expressions, and statements to create simple problem solving programs.	them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.	
Why is it useful to know computer science vocabulary and terminology?	Well-defined vocabulary facilitates communication.	Technology Education, Engineering and Design	Resources for a Technological World	8.2.12.F.1 - Determine and use the appropriate application of resources in the design, development, and creation of a technological product or system.	Learn and use standard computer science vocabulary including a recognition of the programming language's key words.	Communicate programming concepts both verbally and in written form.	W.11-12.2 - Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.	
Why is a development environment useful for programming?	A development environment facilitates application development.	Technology Education, Engineering and Design	The Designed World that provides the means to convert resources into products and systems.	8.2.12.G.1 - Analyze the interactions among various technologies and collaborate to create a product or system demonstrating their interactivity.	Write, save and execute scripted programs in a program development environment. Document code for readability.	Use the development environment to create, save, and run a simple scripted program.	A-CED.1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.	

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What techniques can be used to quickly isolate and identify errors?	Apply debugging techniques that lead to quick identification of programming errors.	Technology Education, Engineering and Design	Resources for a Technological World	8.2.12.F.3 - Select and utilize resources that have been modified by digital tools (e.g., CNC equipment, CAD software) in the creation of a technological product or system.	Distinguish and correct programming errors of the following types: Syntax, Runtime, and Logic.	Identify and correct syntax errors.		9.1.12.A.1 - Apply critical thinking and problem-solving strategies during structured learning experiences.
How can various coding structures be combined to develop varying levels of application complexity?	Composing applications requires a comprehensive knowledge of disparate coding structures	Technology Education, Engineering and Design	Resources for a Technological World	8.2.12.F.1 - Determine and use the appropriate application of resources in the design, development, and creation of a technological product or system.	Use web resources or built in language resources as reference guides to promote independent learning.	Find the syntax/usage rules for unfamiliar instructions.		9.1.12.A.1 - Apply critical thinking and problem-solving strategies during structured learning experiences.
<b>Unit 2 – Modular Programming</b>						Common Unit Test		
<b>Pacing: 10 days</b>								
Why is it useful to know computer science vocabulary and terminology?	Well-defined vocabulary facilitates communication.	Technology Education, Engineering and Design	Resources for a Technological World	8.2.12.F.1 - Determine and use the appropriate application of resources in the design, development,	Learn and use standard computer science vocabulary of functions.	Communicate the concept of functions both verbally and in written form.	W.11-12.2 - Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective	

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				and creation of a technological product or system.			selection, organization, and analysis of content.	
How can program modularity improve program design?	Using modular programming techniques leads to compact and efficient applications.	Technology Education, Engineering and Design	Resources for a Technological World	8.2.12.F.1 - Determine and use the appropriate application of resources in the design, development, and creation of a technological product or system.	Use built-in mathematical and string functions in program development.	Interpret and write code using functions.	F-IF.2 - Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	
How can the modular/function facilitate better designed programs?	Using modular programming techniques leads to compact and efficient applications.	Technology Education, Engineering and Design	Nature of Technology: Creativity and Innovation	8.2.12.A.1 - Design and create a technology product or system that improves the quality of life and identify trade-offs, risks, and benefits.	Write user defined functions.	Create functions and use them in programs.	F-BF.1.b- Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.	

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How can the modular/function facilitate better designed programs?	Using modular programming techniques leads to compact and efficient applications.	Technology Education, Engineering and Design	Nature of Technology: Creativity and Innovation	8.2.12.A.1 - Design and create a technology product or system that improves the quality of life and identify trade-offs, risks, and benefits.	Determine when/where the need for program modularity arises. Improve program readability/maintainability through modular programming.	Students will revise code making it more modular and readable.	F-BF.1.b- Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.	
<b>Unit 3 – Program Flow Control Pacing: 20 days</b>						Common Project		
How can program flow statements facilitate applications development?	Program flow statements allow programs to contain several or more computational options.	Technology Education, Engineering and Design	F. Resources for a Technological World	8.2.12.F.1 - Determine and use the appropriate application of resources in the design, development, and creation of a technological product or system.	Write programs using iterative program flow control statements (i.e. counted looping).	Revise code making it more modular and readable.	A-CED.1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.	
How can we use Boolean logic to direct program logic flow?	Boolean logic determines the flow of a program.	Technology Education, Engineering and Design	F. Resources for a Technological World	8.2.12.F.1 - Determine and use the appropriate application of resources in the	Use Boolean operators to control program flow: AND, OR, and NOT.	Use flow control instructions.		

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				design, development, and creation of a technological product or system.				
How can flowcharts and pseudo code facilitate problem solving and program design?	Diagrams can be useful in outlining a problem solution.	Technology Education, Engineering and Design	Resources for a Technological World	8.2.12.F.1 - Determine and use the appropriate application of resources in the design, development, and creation of a technological product or system.	Represent program flow control structures using flow charts. Translate flowcharts to pseudo code.	Create flowcharts of flow control structures.  Write flow control statements from flow charts.  Translate flow charts into pseudo code and program code.		9.1.12.B.3 - Assist in the development of innovative solutions to an onsite problem by incorporating multiple perspectives and applying effective problem-solving strategies during structured learning experiences, service learning, or volunteering.
What are the various ways that control statements can alter the flow of program execution?	Control statements control the flow of a program.	Technology Education, Engineering and Design	Resources for a Technological World	8.2.12.F.1 - Determine and use the appropriate application of resources in the design, development, and creation of a technological product or system.	Write programs using branching flow control statements (i.e. conditionals).	Write simple programs using conditional statements.		

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What is the benefit of nesting conditional and iterative flow control statements?	Nesting permits the repetition of repetitive processes.	Technology Education, Engineering and Design	Resources for a Technological World	8.2.12.F.1 - Determine and use the appropriate application of resources in the design, development, and creation of a technological product or system.	Write programs using nested iterative program flow control statements (i.e. nested looping).	Write simple programs using nested iterative statements.		
What is the benefit of nesting conditional and iterative flow control statements?	Nesting permits the repetition of repetitive processes.	Technology Education, Engineering and Design	Resources for a Technological World	8.2.12.F.1 - Determine and use the appropriate application of resources in the design, development, and creation of a technological product or system.	Write programs using nested branching flow control statements (i.e. nested conditionals).	Write simple programs using nested conditional statements.		
What is the benefit of nesting conditional and iterative flow control statements?	Nesting permits the repetition of processes.	Technology Education, Engineering and Design	Resources for a Technological World	8.2.12.F.1 - Determine and use the appropriate application of resources in the design, development, and creation of a technological product or system.	Write programs using combinations of branching flow control statements and iterative control statements.	Write simple programs using combined iterative statements and conditional statements.		9.1.12.A.1 -Apply critical thinking and problem-solving strategies during structured learning experiences.

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<b>Unit 4 – Problem Solving</b> <b>Pacing: 15 days</b>						Common Unit Test		
How does a program communicate with external data sources?	Knowledge of a programming language’s instructions is needed to perform desired tasks.	Technology Education, Engineering and Design	Communication and Collaboration	8.2.12.E.1 - Use the design process to devise a technological product or system that addresses a global issue, and provide documentation through drawings, data, and materials, taking the relevant cultural perspectives into account throughout the design and development process.	Learn file input and file output instructions.	Open and read a file. Write to a file and close the file.		
How can Flow Diagrams and Pseudo Code facilitate the applications development process?	Flow Diagrams and Pseudo Code are critical to the pre-planning/analysis phase of application development.				Analyze a problem expressing its solutions via flowcharts and pseudo code.	Create flow charts and pseudo code to solve a given problem.	9.1.12.A.1 -Apply critical thinking and problem-solving strategies during structured learning experiences.	
					Translate flow charts and pseudo code into a program.	Write a program from flow charts and pseudo code	9.1.12.A.1 -Apply critical thinking and problem-solving strategies during structured learning experiences.	
<b>Unit 5 – Program Testing</b> <b>Pacing: 10 days</b>						Common Unit Test		
Why is testing a program important to successful program development?	A clearly planned and/or structured debugging session improves the timeliness of program error resolution.	Technology Education, Engineering and Design	Research and Information Fluency	8.2.12.D.1 - Reverse-engineer a product to assist in designing a more eco-friendly version, using an analysis of trends and	Design test cases for control structures, operators and their data types.	Write test cases for program segments containing various control structures and operations (involving both arithmetic and string operators and exception	N-Q.2 - Define appropriate quantities for the purpose of descriptive modeling.	

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				data about renewable and sustainable materials to guide your work.		handling).		
Why is testing a program important to successful program development?	A clearly planned and/or structured debugging session improves the timeliness of program error resolution.	Technology Education, Engineering and Design	Research and Information Fluency	8.2.12.D.1 - Reverse-engineer a product to assist in designing a more eco-friendly version, using an analysis of trends and data about renewable and sustainable materials to guide your work.	Develop test cases to verify the robustness of an entire given program.	Write test cases for a program.	N-Q.2 - Define appropriate quantities for the purpose of descriptive modeling.	9.1.12.B.2 -Create and respond to a feedback loop when problem solving.
How is program maintenance integrated into the development of applications?	Program maintenance is an indispensable component of applications development. It is needed to correct specification gaps and/or errors not exposed during testing.	Technology Education, Engineering and Design	C. Technological Citizenship, Ethics, and Society	8.2.12.C.3 - Evaluate the positive and negative impacts in a design by providing a digital overview of a chosen product and suggest potential modifications to address the negative impacts.	Apply program specification modifications to a pre-existing program. Test and verify accuracy of Modifications	Update and retest a simple program.	N-Q.2 - Define appropriate quantities for the purpose of descriptive modeling.	9.1.12.A.1 -Apply critical thinking and problem-solving strategies during structured learning experiences.

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<b>Unit 6 – Data Structures - Lists</b> <b>Pacing: 7 days</b>						Common Unit Test		
How can data be stored manipulated and retrieved?	A programming language supports various ways of storing, manipulating, and retrieving data. For example using a list.	Technology Education, Engineering and Design	Design: Critical Thinking, Problem Solving, and Decision-Making	8.2.12.B.1 - Design and create a product that maximizes conservation and sustainability of a scarce resource, using the design process and entrepreneurial skills throughout the design process.	Know what a list is and how to perform operations on lists.	Create and modify lists.		
How do data structures facilitate applications that manage complex data processing?	The List and Array structures are useful for maintaining static data that supports processing functionality.				Program a problem solution implemented using lists.	Write a program segments using lists.	9.1.12.A.1 -Apply critical thinking and problem-solving strategies during structured learning experiences.	
<b>Unit 7 – Case Studies</b> <b>Pacing: 13 days</b>						Projects		
How can multiple design teams work together to build modular components that will support the functionality of a complex application?	Multi-functional applications designed for critical processing require modularization for timely and effective development.	Technology Education, Engineering and Design	The Designed World	8.2.12.G.1 - Analyze the interactions among various technologies and collaborate to create a product or system demonstrating their interactivity.	Design modules that contribute to the construction of a major application	Write program modules of the application.		9.1.12.C.4 - Demonstrate leadership and collaborative skills when participating in online learning communities and structured learning experiences.  9.1.12.C.5 - Assume a

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								<p>leadership position by guiding the thinking of peers in a direction that leads to successful completion of a challenging task or project.</p> <p>9.1.12.F.2 - Demonstrate a positive work ethic in various settings, including the classroom and during structured learning experiences.</p>