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COMPUTER MATHEMATICS/ BASIC PROGRAMMING

Business Technology **9-12**

Curriculum Standard One: **The student will demonstrate knowledge of programming concepts, syntax, logic, and appropriate structure for problem solving via programs where he/she is the author.**

Performance Objective	Critical Attributes	Benchmarks/Assessment
1. The student will explore and properly use software packages to most efficiently come to solution of problems.	A. Can the student choose appropriate software solutions and use correct features of Database, Spreadsheet, QBASIC, etc. when attempting a problem solution?	• The student will be given generic problems to solve which require him/her to select the appropriate software tool. • The student will write a short essay on the functions of each software tool.
2. The student will recognize various programming languages to use in problem solving.	A. Can the student recognize characteristics of at least three programming languages and be able to write common programs in each?	• The student will produce basic program solutions using at least three different source languages.
3. The student will be able to use correct input methods for communicating with computers and generating proper output.	A. Can the student use appropriate input and output devices for given computer applications and uses?	• The student will produce output by utilizing at least three different input devices including: mouse, keyboard, robotic interface, scanner, and internet imports.
4. The student will be able to identify and use correct syntax in his/her programming efforts.	A. Can the student properly punctuate programs to the programs executes error free?	• The student will submit programs that demonstrate correct execution when demonstrated to peers and teacher.

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Performance Objective	Critical Attributes	Benchmarks/Assessment
		• The student will complete blind exams (with monitor off) to demonstrate knowledge of correct program assembly without debug on.
5. The student will explore and use various programming logic, structures, and decision making methods in his/her solution to problems.	A. Can the student identify and use appropriate commands in his/her attempts to solve programming problems?	• The student will demonstrate this through each program that is submitted.
	B. Can the student identify and use branching and subroutines in his/her attempts to solve problems through his/her programs?	• The student will produce programs which use the "sub" function in organizing the structure of the solution. • The student will use "if/then/else" and gosub logic in relevant programs.
	C. Can the student identify and use arrays in his/her attempts to solve problems through his/her programs?	• The student will use second and third level variables in designing programs with at least a third plan.
	D. Can the student identify and use string manipulations in his/her attempts to solve problems through his/her programs?	• The student will use both numeric and string variables in appropriate places in programs.
	E. Can the student identify and use spatial visualization in his/her attempts to solve problems through his/her programs?	• The student will use graphic screen coordinates with the following commands: locate, circle, line, and paint.

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Performance Objective	Critical Attributes	Benchmarks/Assessment
		• The student will use the following functions in creation of graphic programs: Rnd, Sgn, and Int.
	F. Can the student identify and use loops in his/her attempts to solve programming problems?	• The student will produce programs that demonstrate knowledge of "if/then" and "for/next" loops.
	G. Can the student identify and use functions in his/her attempts to solve programming problems?	• The student will generate solutions with the following functions being part of the code: rnd, int, sqr, sgn, abs.
	H. Can the student identify and use database functions in his/her attempts to solve programming problems?	• The student will generate solutions, write, open, input, append, and close commands.

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Curriculum Standard Two: **The student will be able to utilize his/her own programs to demonstrate problem solving techniques with sound logic and industry acceptable format.**

Performance Objective	Critical Attributes	Benchmarks/Assessment
1. The student will explore industry standards through research of existing programs.	A. Can the student locate and identify industry standard formatting and syntax from research?	• The student will research QBASIC programs and match syntax, logic, and documentation practices with his/her own work.
2. The student will study and implement flow chart logic suing standard flowcharting methods.	A. Can the student identify all flowchart symbols and directional indicators?	• The student will produce a flowchart for a program that mirrors his/her program code for a given solution.
	B. Can the student identify correct decision making structure when flowcharting?	• The student will create Venn and Boolean appendices to a program.
3. The student will write programs which mirror his/her flowcharts in logic and structure.	A. Can the student transfer flowchart structure and logic into code using standard loops and commands?	• The student will write a program that mirrors his/her flowchart both sequentially and dimensionally.
4. The student will solve multi-level problems using standard sequential and subordinate logic formats.	A. Can the student produce modular programming code?	• The student will utilize sub-routines to segment his/her programs where more than one potential module exists.
	B. Can the student create sequential programming code that does not jump around unnecessarily?	• The student will write programs using standard loops and conditional branching without the “go to” command.

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Curriculum Standard Three: **The student will demonstrate knowledge of mathematical concepts through application and simulation of conditions which include math framework strands.**

Performance Objective	Critical Attributes	Benchmarks/Assessment
1. The student will explore and incorporate the numbers strand in his/her programs.	A. Can the student identify and use signed, real, integral, and exponents in his/her programs?	• The student will design a program that will serve as a menu to all appropriate number functions and order of operations as accepted by the computer and program.
2. The student will explore and incorporate measurement in his/her programs.	A. Can the student use concepts and tools of measurement, as well as postulates, theorems, and definitions in his/her programs?	• The student will create graphic programs which rely on pixel and character measurements, as well as clock, speed, and time requirements. • The student will create a program which measures a line on screen and scrolls the line on a third dimension to be measured. • The student will build and program a robot which, through a parallel interface, will have precisely measured movements and coordinates.
3. The student will explore and incorporate in geometry his/her programs.	A. Can the student use right triangle theorem and properties in solving problems with his/her programs?	• The student will develop a “geometry” program which will query users over eight basic geometric solutions.

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Performance Objective	Critical Attributes	Benchmarks/Assessment
	B. Can the student illustrate congruent and similarities in solving problems with his/her programs?	
	C. Can the student visualize three-dimensional objects based on two-dimensional representation in his/her solutions to programs?	• The student will produce a "screen saver" program that utilizes lines and circles in various controlled loops.
4. The student will explore and incorporate patterns and functions in his/her programs.	A. Can the student extend patterns and the relationship between two variables within his/her programs?	• The student will satisfy this attribute through the "screen saver" program which produces a series of geometric patterns.
5. The student will explore and incorporate statistics and probability in his/her programs.	A. Can the student solve combination and probability problems in his/her solutions to problems?	• The student will create a simulation "number generation" which requires basic statistical analysis.
	B. Can the student determine and measure data tendencies and be able to interpret and make inferences?	• See above assessment.
6. The student will explore and incorporate the logic strand in his/her programs.	A. Can the student use the principles of logic in his/her solutions to problems?	• The student will use a variety of logical branching methods to design programs with multi-level logic branches.
7. The student will explore and incorporate algebra in his/her programs.	A. Can the student evaluate algebraic expressions with rational number substitution?	• The student will design programs that require polynomial and quadratic solutions within his/her programs.

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Performance Objective	Critical Attributes	Benchmarks/Assessment
		• The student will generate output from programs that are direct solutions to algebraic expressions.
	B. Can the student solve equations and word problems using one or more variables in the code for his/her programs?	• The student will complete assignments where 80% of the problems are from word problems with at least 50% of those containing two or more variables.
	C. Can the student understand and solve concepts of ratio, proportion, and percent in solutions to his/her programs?	• The student will produce the "geometry" program which includes modules on ratio, proportion, and percentages.
	D. Can the student graph algebraic expressions through the use of his/her programming language?	• The student will complete screen graphing assignments with two and three variable expressions.

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Curriculum Standard Four: **The student will demonstrate knowledge of mathematical concepts through application and simulation of conditions which are rigorous in the critical thinking process.**

Performance Objective	Critical Attributes	Benchmarks/Assessment
1. The student will explore ways of combining basic programming methods to build complex multi-function programs.	A. Can the student identify basic building modules of programming?	• The student will create programs that utilize sub-routine modules. • The student will design a documented program that processes through a segmented menu.
	B. Can the student incorporate basic modules into his/her programs to create more complex programs?	• The student will use sub-routines to divide functions in his/her programs.
2. The student will explore ways of combining basic programming methods to build three dimensional programs that demonstrate depth of understanding.	A. Can the student incorporate arrays within his/her program as part of the process of developing three-dimensional solutions?	• The student will write programs which utilize arrays of variables (x(a)) to create a third plane for processing.
3. The student will write programs that interact with commercial grade software to enhance the final product of his/her code.	A. Can the student interface this/her code and product with applications software to produce enhanced output?	• The student will generate text files that can be imported into Word, Excel, and Access for further processing.