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EXPERIMENTS

Photosynthesis

Growth Rate

Genetics

Wavelengths

Includes

Educational Software
Preview Guide
The area of a sector of a circle is given by the formula:

\[ A = \left( \frac{\theta}{360} \right) \pi r^2 \]

where:
- \( \theta \) is the value of the central angle
- \( r \) is the radius of the circle
- \( \pi \) is the Greek letter 'pi'

Press RETURN to Continue (or M for MENU)

4. REVIEW - PYTHAGOREAN THEOREM

The Pythagorean Theorem states:

In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the two legs.

Press RETURN to Continue (or M for MENU)

The first recommendation concerns the inability to backup to a previous frame. This capability should be available in most instructional software. The second recommendation is to improve clarity by asking for the number of drill or test problem to be worked, rather than asking for the beginning number.

Summary:
AREA AND VOLUME is an excellent program for the initial or supplementary instruction of concepts of areas and volumes. Students frequently have difficulty with such concepts primarily due to an inability to visualize the problem. AREA AND VOLUME provides the visuals, hints, and formulas to assist these students. Due to ease of use and the number of different types of assistance provided, each student should be encouraged to complete the lesson even when difficulty is encountered. Students, on the other hand, who feel confident about their knowledge of a specific topic can take the test and if needed return to the topic introduction and the drill exercises.

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PRODUCT UPDATE: Structured BASIC Packages

In the Spring 1988 issue of JCMST, I compared three structured BASIC packages: True BASIC 2.0, Turbo BASIC 1.0, and Microsoft QuickBASIC 3.0. Since that review was written in the Fall 1987, Microsoft has published QuickBASIC 4.0, a substantial revision which contains some major changes. In this update I will outline what is new about QuickBASIC 4.0 and also describe the current status of educational support for all three products.

QuickBASIC 4.0 (QB4) differs from version 3.0 both in programming environment and in syntax. Almost without exception, these changes constitute improvements from the point of view of the
instructor of a freshman level course. Beginning with the programming environment, the first change is the introduction of a "Smart Editor"; this means that the program is checked for syntax and partially compiled as each line is entered. One result is that misspellings of reserved words and other simple errors are frequently caught and sometimes even corrected immediately. Final compilation is also accelerated. One small disadvantage, from the point of view of simplicity, is that source code is saved in this partially compiled form. This means that if you want to use QB4 as a text editor, you need to follow different procedures for creating and loading text files. By and large, though, the "Smart Editor" saves students some of the frustration of dealing with typographical errors in their programs.

Another big change in the programming environment is an extremely sophisticated program debugger. QB3 already has by far the best debugging facilities of the three products, but QB4 is even better. The user can specify variables or expressions to keep track of, can set breakpoints in the program, and can trace forward or backward through program statements. Some of these techniques may be too advanced to be useful in an introductory course, but the debugging system is easy enough to use that it will encourage students to debug programs.

Other improvements to the QB programming environment include an "Immediate Mode," in which single lines can be executed. There is also a good online help system; help can be obtained for menu commands or for syntax. Overall, the new QuickBASIC programming environment should help beginning students, as well as professional programmers, to design bug-free programs.

QuickBASIC 4.0 contains two important language changes; both are improvements over QB3. The first is a greatly improved implementation of subprograms and user-defined functions. The second is the introduction of a structured variable that is similar to the "RECORD" type in Pascal.

In QB4, functions have been revamped to be more analogous with subprograms. Instead of the "DEF END DEF" structure, the programmer can now use a "FUNCTION END FUNCTION" construct that doesn't require function names beginning in "FN." In addition, the new FUNCTION construct obeys the same rules regarding parameters and local variables as the SUBPROGRAM structure. Moreover, both structures have some other improvements over QB3. Both now permit recursion, and, perhaps more importantly in a low level course, both "do the right thing" if the programmer uses default typing for parameters and local variables (untyped parameters frequently led to mismatch problems in QB3). The example below shows an implementation of a function to compute factorials in QB3 and QB4 (the reserved word "LET" is optional):

```basic
DEF FnFactorial (n%)
STATIC i%, prod%
LET prod% = 1
FOR i% = 2 TO n% 
  LET prod% = prod% * i%
NEXT i%
LET FnFactorial = prod%
END DEF

FUNCTION Factorial (n)
LET prod = 1
FOR i = 2 TO n
  LET prod = prod * i
NEXT i
LET Factorial = prod
END FUNCTION
```

QuickBASIC 4.0 contains one more new language feature that was not present in version 3.0. The TYPE END TYPE data structure offers some of the flexibility of Pascal's RECORD type for user-defined data structures. The next example uses this construct to define a data structure named "MDY" with three variable fields to represent month, date, and year, and then defines and inputs a variable of this type:

```basic
TYPE MDY
  month AS STRING*9
  date AS INTEGER
  year AS INTEGER
END TYPE

DIM birthday AS MDY

PRINT "What is your birthday (month, day, year)?"
INPUT birthday.month, birthday.date, birthday.year
```

The textbook situation for these products is changing, but slowly. There is now one textbook available for QuickBASIC (published by Scott, Foresman, and not updated as of this writing to QB4) and at least one text/user guide for Turbo BASIC, (published by McGraw-Hill). As mentioned in my earlier review, True BASIC, which is the oldest product, is supported by a wide variety of texts.

All three products remain a bargain with QB4 at $25 (10 or more copies for lab use only), Turbo BASIC at $40, and True BASIC at $50 (happily, True BASIC has dropped its policy of requiring an initial investment of $1000; also, student copies are $35). These excellent structured BASICs's should make many educators reconsider the question of whether BASIC is a good choice for a first programming language.

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