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ABSTRACT

This reinforcement activity has been used by students from the elementary school level to the graduate school level who possess intermediate level ability in programming Logo. The activity, which consists of writing Logo programs that animate an object, can have several positive effects as it: (1) helps develop problem-solving skills; (2) encourages students to work together and share ideas; (3) can motivate accelerated students; and (4) offers excellent practice in use of variables, procedures, conditionals, and iteration/recursion. While the six sample procedures included for animated Logo are written for LogoWriter, they can be easily adapted to other versions of Logo. (CGD)

Animation in Logo: A Reinforcement Activity

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Animation in Logo: A Reinforcement Activity

This activity is both interesting to students and useful in reinforcing several important concepts. While animation is easily achieved with LogoWriter using shapes, the approach presented here works well with several versions of Logo and enables the student to practice programming skills.

Students must be able to program in Logo at an intermediate level. They are first introduced to animation as a three-step process: (1) draw the figure, (2) erase the figure, (3) move and repeat. Students are given a graph of screen coordinates and the assignment is to move an object on the screen.

This activity is conducted in a problem-solving orientation. Students are given the general assignment, and required to organize their existing knowledge in new and different ways to solve the problem. Once the problem has been solved in one way, different methods and embellishments may be suggested. Students are encouraged to work together and to share ideas.

In order to animate the object students use variables and procedures. They use either iteration or recursion to repeat the steps. They use a conditional to stop the object at the edge of the screen.

This project is motivating for accelerated students. Some student projects have included addition of color, addition of a background picture, variation of the speed, variation of the starting point and direction, moving multiple objects simultaneously, and moving an object randomly.

This activity has been included in Logo courses with students from elementary school to graduate school level. It has been a favorite project for the students. It provides excellent practice in use of variables, procedures, conditionals, and iteration/recursion.

The following are six sample procedures for animated Logo. All are written for LogoWriter, but can easily be adapted for other versions of Logo.

Example 1: Simple Iterative

```
TO FASIEST
     PU                             ;sets move mode
     SETH 90                        ;sets heading
     REPEAT 50[WAIT 10 FD 5]        ;moves 50 times with pause
     END
```

Example 2: Simple Recursive

```
TO DRAWIT
     SETH 90                        ;sets heading
     FD 10
     BK 3
     PT 135
     FD 5
     BK 5
     RT 90
     FD 5
     BK 5
     LT 45
     FD 7
     END

TO EASYMOVE                         ;superprocedure
     HT
     PD                             ;sets drawing mode
     DRAWIT                         ;draws figure
     WAIT 10                        ;slows it down
     PE                             ;sets erase mode
     DRAWIT                         ;erases figure
     SETH 90                        ;sets heading
     PU                             ;sets move mode
     FD 5
     EASYMOVE                       ;recursive call
     END
```

Example 3: Intermediate Iterative

```
TO BUG
    SETH 0                          ;sets heading
    REPEAT 4[FD 3 RT 90]            ;draws figure
    END

TO MOVEBUG :X                       ;uses variable to move
    PU                              ;sets move mode
    SETX :X                         ;sets horizontal position
    PD                              ;sets draw mode
    BUG                             ;draws figure
    PE                              ;sets erase mode
    BUG                             ;erases figure
    END

TO DOIT
    MAKE "X -120                    ;assigns initial value
    PU                              ;sets move mode
    SETX -120                       ;sets initial X position
    SETY 10                         ;sets initial Y position
    PD                              ;sets draw mode
    REPEAT 30[MOVEBUG :X MAKE "X :X+10]
                                    ;moves, erases, and
                                    ;  increments
    END
```

Example 4: Intermediate Recursive

```
TO BUG
    SETH 0                          ;sets heading
    REPEAT 4[FD 3 RT 90]            ;draws figure
    END

TO MOVEBUG :X
    PU                              ;sets move mode
    SETX :X                         ;sets horizontal position
    PD                              ;sets draw mode
    BUG                             ;draws figure
    PE                              ;sets erase mode
    BUG                             ;erases figure
    MAKE "X :X + 10                 ;increments X position
    IF :X > 139 [STOP]              ;stops at edge of screen
    MOVEBUG :X                      ;recursive call
    END

TO DOIT
    MAKE "X -120                    ;assigns initial value
    PU                              ;sets move mode
    SETX -120                       ;sets initial X position
    SETY 10                         ;sets initial Y position
    PD                              ;sets draw mode
    MOVEBUG :X
    END
```

Example 5. Advanced Spiderweb

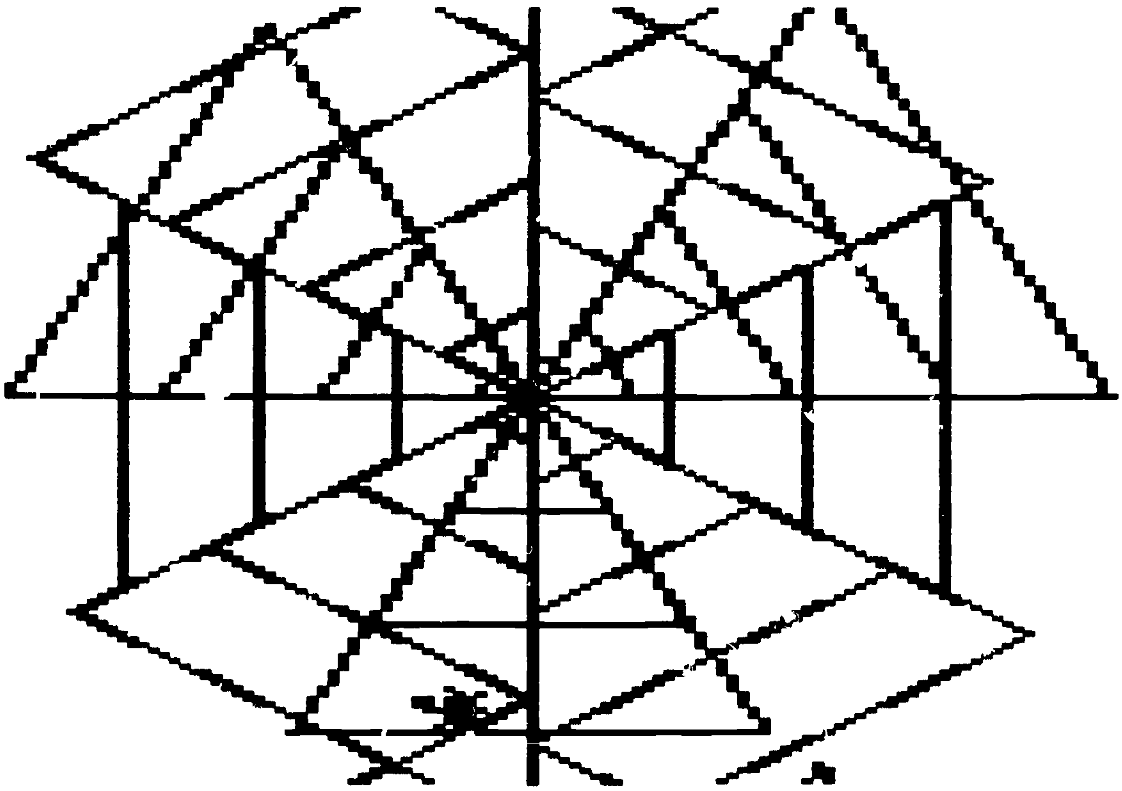
```
TO WEB :SIZE                          ;uses recursion to draw
    TRI :SIZE                         ;a series of triangles
    RIGHT 120
    IF :SIZE > 100 [STOP]
    WEB :SIZE + 10
    END

TO TRI :SIZE                          ;draws a triangle of
    REPEAT 3[FD :SIZE RT 120]         ;variable size
    END

TO MAKEWEB                            ;calls WEB to create a
    WEB 10 RT 30                      ; spiderweb figure
    WEB 10 RT 30
    WEB 10
    END

TO SPIDER                             ;moves spider
    RT RANDOM 360                     ;random turn
    FD RANDOM 100                     ;random distance moved
    END

TO CHASE                              ;superprocedure
    PD MAKEWEB PU
    REPEAT 30[ST SPIDER WAIT 10]      ;moves spider 30 times
    END
```



Example 6: Advanced Honeybee

```
TO FLOWER
     HT
     SETSH 24                           ;available in LogoWriter
     PU BK 80 RT 90 BK 120
     REPEAT 8[PD STAMP PU FD 25]        ;stamps flower shape
     FD 15
     END

TO TREETOP                              ;draws an arc
     REPEAT 25[RT 5 FD 5]
     END

TO TREE
     LT 90 PD
     FD 100 LT 110                      ;draws tree trunk
     TREETOP                            ;draws tree top
     END

TO OVAL :W :X :Y :Z                     ;used to draw bee hive
     REPEAT :Z[RT :Y FD 1]
     RT :W FD :X
     RT :W REPEAT :Z[RT :Y FD 1]
     FD :X
     END

TO HIVE
     PU RT 165 FD 75 LT 90 FD 40        ;moves into position
     PD OVAL 20 10 10 16                ;calls OVAL
     PU FD 3 RT 90 FD 10 LT 90
     PD OVAL 0 20 9 20
     PU FD 3 RT 90 FD 10 LT 90
     PD OVAL 0 25 9 20
     PU BK 3 RT 90 FD 10 LT 90
     PD OVAL 0 20 9 20
     PU BK 6 RT 90 FD 10 LT 90
     PD OVAL 20 10 10 16 PU
     END

TO BACKGROUND                           ;draws background parts
     FLOWER
     TREE
     HIVE
     END
```

```
TO BEE                                   ;superprocedure
     BACKGROUND
     SETSH 0 ST                          ;sets shape and shows
     PU BK 7 RT 90 REPEAT 30[FD 1]       ;moves bee
     LT 90 REPEAT 150[FD 1]              ;slower than FD 150
     RT 45 REPEAT 30[FD 1] WAIT 10
     LT 90 REPEAT 50[FD 1]
     RT 90 REPEAT 50[FD 1] WAIT 10
     LT 75 REPEAT 60[FD 1]
     REPEAT 270[RT 1]
     FD 20
     HT
     END
```