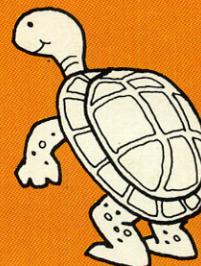
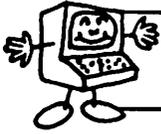


KIDS  
WORKING  
WITH  
COMPUTERS!

THE  
**TEXAS**  
**INSTRUMENTS**  
LOGO MANUAL

**Lynne Mass**  
**Joseph Kuffler**  
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# Introduce Yourself to LOGO

Are you ready to meet LOGO? Here is how you get started:

1. Place the LOGO cartridge in the cartridge slot.
2. Turn on the peripheral expansion system, the computer, and the monitor.
3. The screen will tell you to press any key in order to begin.
4. The next message on the screen will tell you to press the following:

```
1 FOR TI BASIC  
2 FOR TI LOGO II
```

5. Press 2

When you see the words **WELCOME TO TI LOGO!** (**output**) and the **prompt and cursor** (**?\_**), you are ready to begin.

The following chart shows some important keys.  
Find each one. Learn how it works.

### IMPORTANT KEYS

? This is the prompt. When it shows, it means you can start typing.

FCTN 3 This allows you to **ERASE**. When FCTN and 3 are pressed at the same time, you can go back over mistakes and correct them.

ENTER The **ENTER** key allows the cursor (blinking line) to go to the starting position and tells the computer it should try to obey the commands.

FCTN The **FUNCTION** key allows you to type the symbols on the front side of the keys.

For example:

FCTN + R = [

FCTN + T = ]

(For a list of functions, see pages 25-26.)



# 2

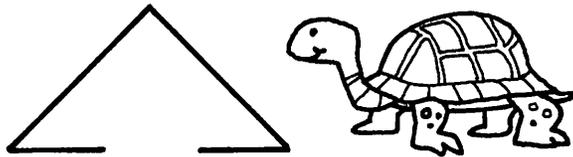
---

## Meet the Turtle

In order to meet your turtle, type:

```
TELL TURTLE
```

You now have a triangle pointing up on your screen that looks like this:



Your LOGO turtle can move **FORWARD**, **BACK**, **RIGHT**, and **LEFT**. The **commands** have abbreviations:

```
FD (FORWARD)
```

```
BK (BACK)
```

```
RT (RIGHT)
```

```
LT (LEFT)
```

The turtle can draw things that you command it to draw. Try this. Type in:

```
FORWARD 30
```

Then press **ENTER**. What happens?

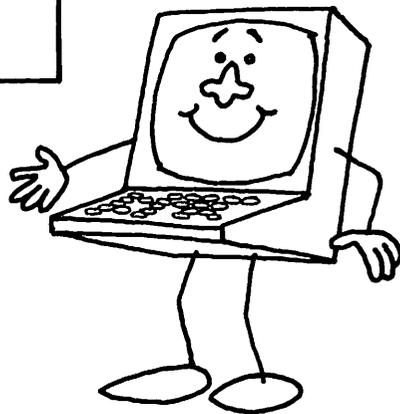
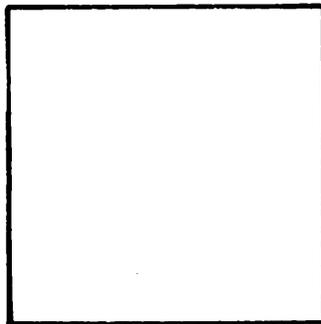
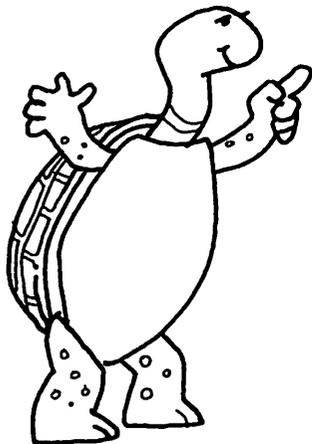
What happens if you don't put a space between **FORWARD** and the number? Try it.

 Try other numbers.

 Try **LEFT** and **RIGHT** commands with different numbers.

To get rid of everything you have drawn on the screen, type **CLEARSCREEN** or **CS**.

 Practice all the steps in this lesson. Then try to draw a square.

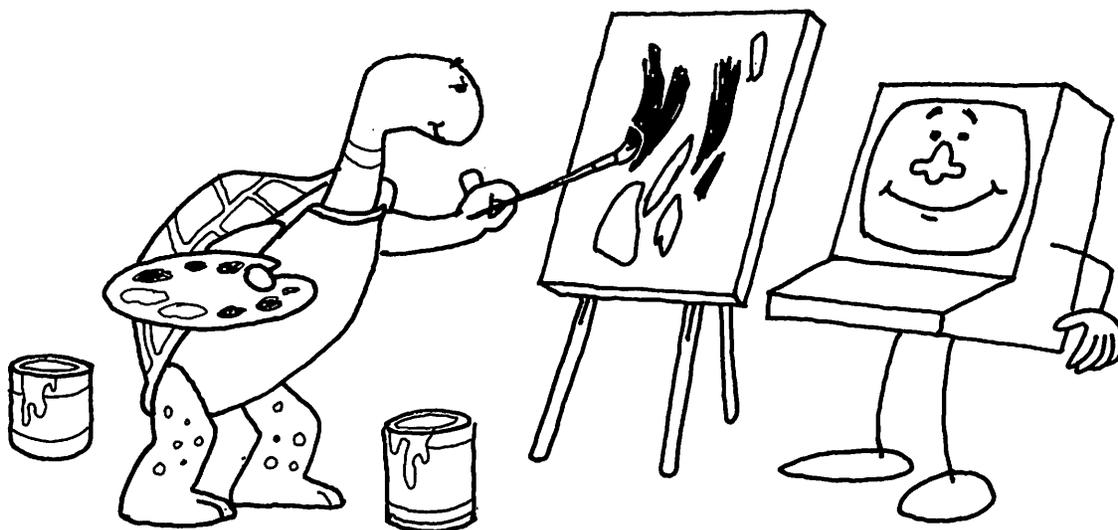


---

# Turtle Colors

Can turtle drawings be colorful? Oh, yes! If you have a color monitor, you can use one color for the background and a different pen color for the rest of the drawing. You use a code to choose the colors. The color codes are:

0 = CLEAR	6 = RED	12 = OLIVE
1 = BLACK	7 = CYAN	13 = PURPLE
2 = GREEN	8 = RUST	14 = GRAY
3 = LIME	9 = ORANGE	15 = WHITE
4 = BLUE	10 = YELLOW	
5 = SKY	11 = LEMON	



You can use shortcut codes for setting both background colors and pen colors. CB is the shortcut command for **SETBACKGROUND**, or “color of background.” SC is the shortcut command for “set pen color.”

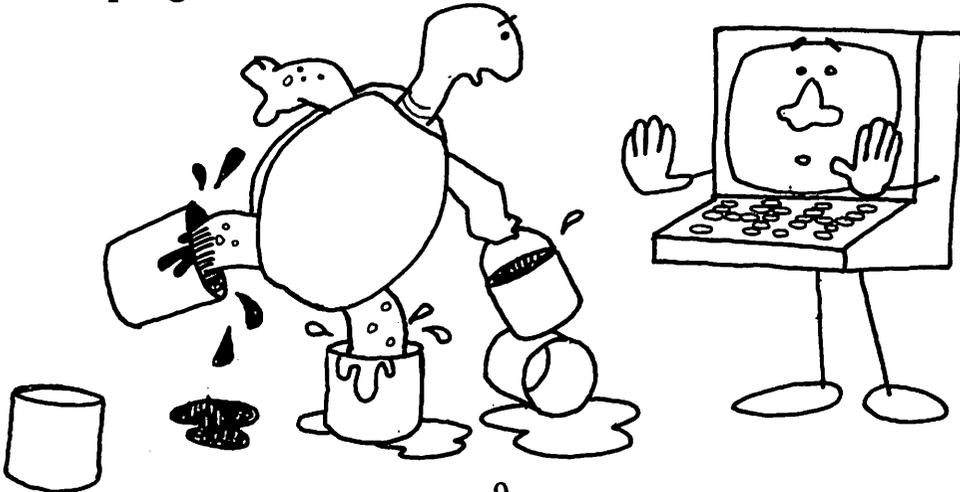
Try this:

```
?CB 4  
?SC 6 (or SC :RED) ← You must use the colon if you use  
?RT 120 the word red.  
?FD 40  
?RT 120  
?FD 40  
?RT 120  
?FD 40  
?RT 120  
?FD 40
```

What did you see?



Now try experimenting with your own color programs.



# 4

---

## Print a Message

LOGO does more than graphics. This lesson and the next one will give you a brief introduction to words (text) and numbers.

First, type **NOTURTLE**. Then try this by typing exactly what you see. (The key information tells you how to type in the **brackets**.) **PRINT** allows the computer to show your message on the screen.

```
PRINT [HELLO THERE]
      ↑           ↑
      FCIN R     FCIN T
```

Push ENTER. What do you see?



Try it with your own message.

LOGO has a clever way for you to invent your own program. It is called a **procedure** in turtle-talk. Type:

```
TO SING
```

What happened to the color of the screen? Hit ENTER again. Now you can write your first procedure.

Type exactly what you see. Remember to press ENTER after each line.

```
PRINT [OPEN MOUTH]
PRINT [LA-LA-LA]
END
```

You have finished your procedure! If you want to see it work, press FCTN and 9 at the same time.



Now every time you want the steps in the procedure “Sing,” just type SING and ENTER. Try it. What happens?

This is called defining a procedure. FCTN 9 signals that you have finished the procedure. CLEARSCREEN clears the screen.

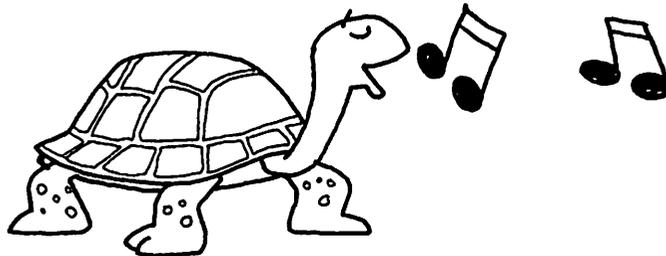
If you want to repeat a procedure, try this:

```
?REPEAT 5 [SING]
```

Press FCTN 9. What happens?



How could you run this procedure 1000 times? Try it. To stop, press FCTN 9.



# 5

---

## Mr. Turtle's Math Magic

LOGO has easy ways to do math. Try this:

```
?PRINT 10 + 9
```

Now press ENTER. What do you see? Now try these. Don't forget to press ENTER after each line.

```
PRINT 20 - 10  
PRINT 10 * 11  
PRINT 18 / 9
```

Can you figure out which sign is for addition?  
subtraction? multiplication? division?

 Try out your own ideas. To get back to graphics, type **TELL TURTLE**.

### Review

---

What do these commands do:

TELL TURTLE

NOTURTLE

Why are they called commands?



# 6

---

## Initialize, SAVE, LOAD

To **initialize** a **disk** means to prepare it for use. To begin, follow these steps:

1. **LOAD** the Disk Manager 2 solid state cartridge in the cartridge slot on the computer.
2. Turn on the expansion system.
3. Turn on the monitor and the computer.
4. Press any key and then press 2 for Disk Manager.

Disk Manager will ask you to make a choice:

1. FILE COMMANDS
2. DISK COMMANDS
3. DISK TESTS
4. SET ALL COMMANDS FOR SINGLE DISK PROCESSING

If you have one **disk drive**, press 4. You will see:

SINGLE DISK PROCESSING HAS BEEN INITIALIZED.

Press 2 for DISK COMMANDS, and Press 4 for "INITIALIZE A NEW DISK." You will see:

```
MASTER DISK (1-3)? 1
NEW DISK NAME? (We named ours LOGO 1)
```

```
TRACKS PER SIDE? 40
SINGLE SIDED (Y/N)?
SINGLE DENSITY (Y/N)?
INITIALIZING NEW DISK
WORKING . . . PLEASE WAIT
COMMAND COMPLETED
PRESS: PROC'D, REDO, BEGIN, OR BACK
```

Now your diskette is initialized. To get to LOGO, turn off the machine and **LOAD** the LOGO cartridge.

You can **SAVE** programs with LOGO. Type **SAVE** and the screen will change to:

```
SAVE
PRESS FOR
1 PROCEDURES
2 SHAPES AND TITLES
3 BOTH 1 AND 2

PRESS 'BACK' FOR TI LOGO
```

After you choose, a new screen will appear:

```
DEVICE
PRESS FOR
1 CASSETTE
2 DISKETTE
3 OTHER

PRESS 'BACK' FOR TI LOGO
```

Then a third screen will ask you to name your new file.

To recall a file, type **RECALL**. The same two screens as for **SAVE** will appear. Then the third screen will ask you to type in the name of the file you want.

# 7

---

## A Procedure from Mr. Turtle

To teach the LOGO turtle how to write a program (a procedure), you type the word TO and some step-by-step instructions. For example, you can write a procedure for a SQUARE.

Try this:

```
?TO  SQUARE ←First type the TO title
>FD  40
>RT  90
>FD  40
>RT  90
>FD  40
>RT  90
>FD  40
>RT  90
>END      ←Finally PRESS FCTN 9
```

←Then type the steps in your procedure

After you typed the TO procedure's name, what happened to the color of the screen?

Once you have defined a procedure, the computer's **memory** will not let you use that name for a different square unless you erase the memory by typing ?ERASE SQUARE. Type CLEARSCREEN (CS) to clear the screen.

You can define the procedure for the same square in a different way. A shorter way to do the same square is:

```
?TO SQUARE  
>REPEAT 4 [FD 40 RT 90]  
>END
```

What does the screen say? You can use your SQUARE procedure as a command, over and over. Try:

```
?SQUARE  
?FD 10  
?SQUARE
```

What happens? Experiment with many squares.

One of the most important ways you can use procedures is to build other procedures. Try this:

```
?TO RSQUARE  
>REPEAT 12 [RT 45 SQUARE]  
>END
```

Now let's build a procedure from RSQUARE:

```
?TO SQUAREWHEEL  
>FD 30  
>RSQUARE  
>RT 30  
>RSQUARE  
>RT 30  
>RSQUARE  
>END
```



Use SQUARE to build your own procedures.

# 8

---

## Hide and Seek

It sometimes gets boring watching the turtle move in every direction. There is a command that will make drawing on the screen faster. It hides the turtle! The command is called **HIDETURTLE** or **HT**.

Try this:

```
?REPEAT 4 [RT 90 FD 50]
```

Before going to the next step, type CS.

Now try this:

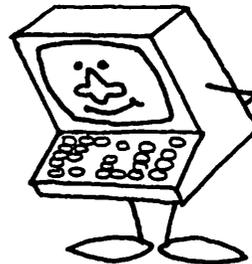
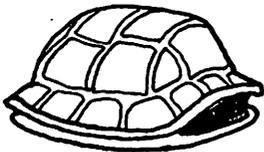
```
?HT  
?REPEAT 4 [RT 90 FD 50]
```

Did you notice that the lines were drawn faster this time?



Now add colors to get a nice procedure.

*NOTE: ST, which stands for SHOWTURTLE, returns the turtle.*



# 9

---

## Can I Draw My Face?

Drawing a face on paper is easy. It can be easy in LOGO, too. All you have to do is to be able to lift up the pen and put it down again.

You can do this with the commands **PENUP (PU)** and **PENDOWN (PD)**

Now try this:

```
?RT 90 FD 15  
?PU  
?FD 15  
?PD  
?FD 15
```

Did you draw two lines for eyes?



Try to add a nose and a mouth.

Add colors

### Review

---

What do these mean:

```
CB HT  
SC ST
```

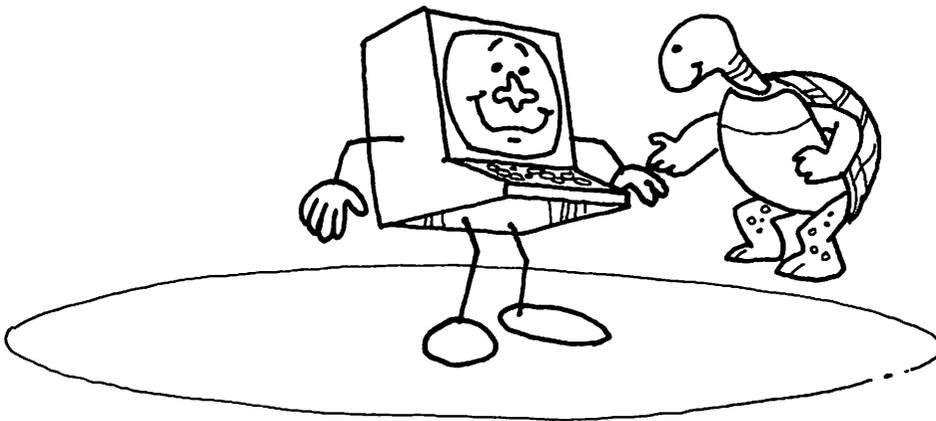
# Mr. Turtle's Merry-go-round

Have you thought about drawing a circle? It is very easy. All you have to do is use your **REPEAT** command. Try this:

```
REPEAT 360 [RT 1 FD 1]
```

What happened? Why do you think you put 360 after the command REPEAT?

Now that you have made a circle, you are ready to learn an easier way to do it.



# Easy Circles

You can make your own circle program:

*Space before colon No space here*

↓ ↓

```
?TO CIRCLER : JUMP ← This means that to run the procedure
> HT you must put in a number.
> REPEAT 36 [RT 10 FD] : JUMP]
> ST
> END
```

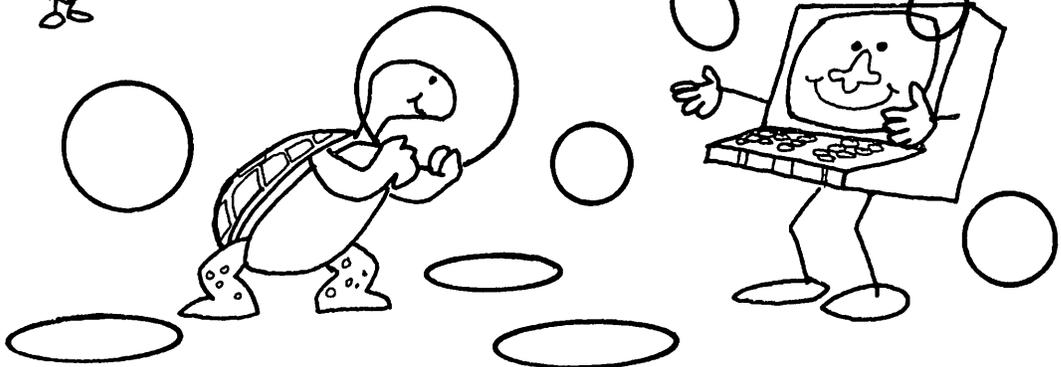
```
?TO CIRCLEL : JUMP
> HT
> REPEAT 36 [LT 10 FD] : JUMP]
> ST
> END
```

Try:

```
CIRCLER 4
CIRCLEL 4
```



Try other numbers.



# 12

---

## Arcs

If you can draw circles, you can also draw parts of circles. All you have to do is change the circle procedure by taking out the 36 and by telling the computer how many times to turn.

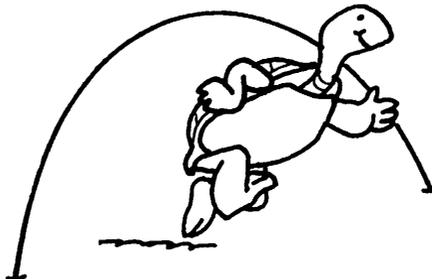
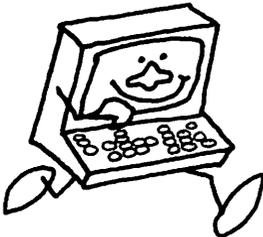
Try this:

```
?TO ARCL :TIMES :JUMP  
>HT  
>REPEAT :TIMES [LT 10 FD :JUMP]  
>ST  
>END
```

```
?TO ARCR :TIMES :JUMP  
>HT  
>REPEAT :TIMES [RT 10 FD :JUMP]  
>ST  
>END
```



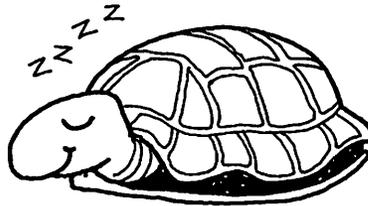
Experiment. Draw a face.



# The Egg Timer, or Delays

Train your turtle to slow down with the command **WAIT**. Try this:

```
?FD 50
?RT 90
?FD 50
?RT 90
?WAIT 100
?FD 50
```



What happened? Did your drawing have a pause in it?



See if you can make up some procedures with the command **WAIT**.

Try this procedure using our **CIRCLEL** and **CIRCLER** procedures:

```
?TO DOUBLECIRCLE
>CIRCLER 6
>WAIT 100
>CIRCLEL 6
>WAIT 50
>CIRCLER 4
>WAIT 25
>CIRCLEL 4
>END
```



Can you draw a pair of eyeglasses?

---

# Idea Time...Fun with LOGO

You have learned a lot so far! Now let's have fun. Here is one idea. If you have made a procedure for **SQUARE**, **LOAD** it and type:

```
?TO MANYSQUARE  
>REPEAT 4 [RT 90 SQUARE]  
>END
```

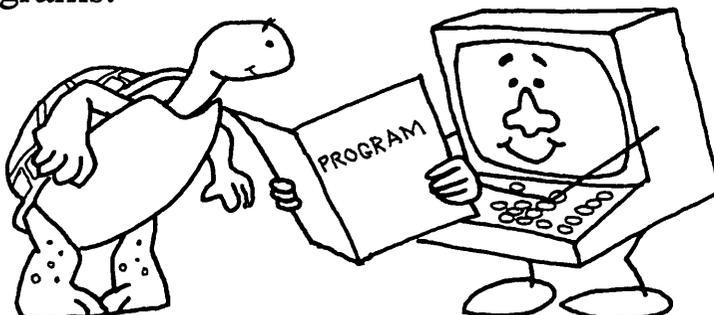
Did you remember to press FCTN 9 to end your procedure?



What other procedures can you think of? Try them out.



Share your ideas with your classmates. Try out one another's programs.



# 15

---

## Catalog and Erase

To find out what is on a disk, insert Disk Manager 2 and press 2 for DISK COMMANDS and then 1 for CATALOG DISK. The computer will display:

```
MASTER DISK (1-3)? (enter number)
CATALOG DISK
DISK NAME = _____(enter name)
WHERE DO YOU WANT LISTING?
1. SCREEN
2. SOLID STATE PRINTER
3. RS232 INTERFACE
4. OTHER
YOUR CHOICE?
```

After you have answered all the questions, you will get a **catalog** of the disk. To erase a file, insert Disk Manager 2 and press 1 for FILE COMMANDS and then 3 for DELETE FILE. The computer will display:

```
SELECTIVE (Y/N)? ←This asks if you want to delete all files or just one.
MASTER DISK (1-3)? (enter number)
```

The screen will then show you the name of each file and ask if you want to delete it. If you do, press Y and ENTER; if you do not, press N and ENTER.

# 16

---

## The Fixer...Editing

If you make a mistake while writing a procedure, don't worry. It is easy to fix.

Suppose you typed this:

```
?TO ME
>FD 45
>RT 90
>FD 45
>RT 90
>FD 45
>RT 90
>FD 25 ←OOPS! You meant to put 45.
>RT 90
>END
```

To correct the mistake, type:

```
?EDIT ME
```

Did the screen turn green? Did the cursor turn orange?

The screen will show you all the steps of the procedure called ME. At this point the computer will let you use any of the following functions:

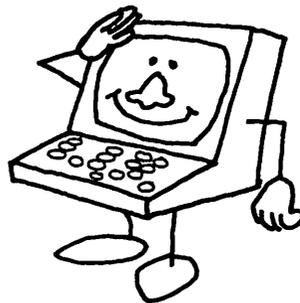
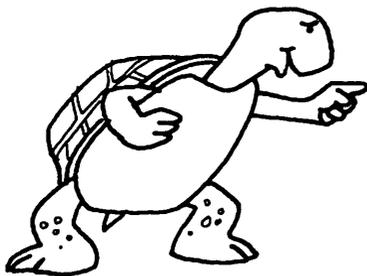
FCTN 5            moves the cursor to the beginning  
                  of the line

FCTN 6	moves the cursor all the way to the end of the line
FCTN ↑	moves the cursor up one line
FCTN ←	moves the cursor one space left
FCTN →	moves the cursor one space right
FCTN ↓	moves the cursor down one line
FCTN ENTER	leaves a blank row between the line the cursor is on and the next line (if the cursor is at the end of a line)
FCTN 3	erases the character or space one space to the left of the cursor
FCTN 1	erases the character or space above the cursor and moves the cursor to the right
FCTN 4	clears the line to the right of the cursor, including the character above the cursor
FCTN 9	leaves the editing mode

Now you can correct the mistake in ME by pressing FCTN ↓ until the cursor is at the right line, then FCTN ← until it is under the 2. Now press 4 and then FCTN 1. To get out of the editing mode, press FCTN 9.

# Command Your Computer

COMMAND	WHAT COMMAND DOES
?ERASE TITLE	clears the procedure from the memory
?NOTURTLE	makes the screen all text
?TELL TURTLE	gets you into the turtle mode
?HT	hides the turtle
?ST	shows the turtle
?CS	clearscreen—erases what has been drawn or typed
?HOME	moves the turtle's position to the center of the screen
?PP	prints the names of the procedures the computer knows
?PA	prints all the procedures and names
?PN	prints all the names
?PO	prints out the procedure named



---

# Erasable Pen

Do you have an erasable pen? Now you can have an erasable turtle too! Here is how.

Suppose you meant to type:

```
?FD 30  
?RT 45  
?FD 18
```

Instead you accidentally typed:

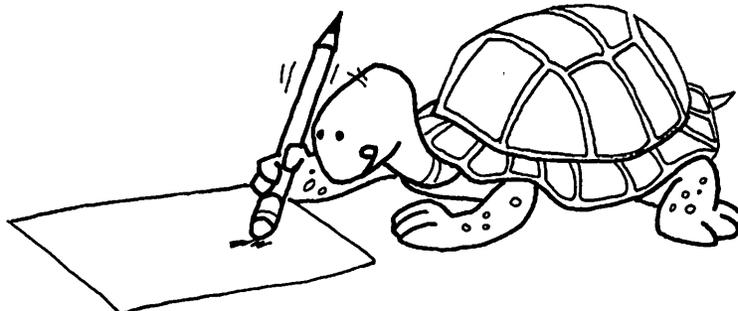
```
?FD 30  
?RT 45  
?FD 180
```

And you pressed ENTER.

You could use the command **PENERASE (PE)**:

```
?PENERASE or (PE)  
?BK 180  
?PR ← This stops the ERASE and reverses it. It stands for PENREVERSE.
```

Is everything O.K. now? Try it to make sure.



---

# Has Your Turtle Lost His Way?

If your turtle has lost its way and you can't see in what direction it is heading, use the command **PRINT HEADING**:

?PRINT HEADING

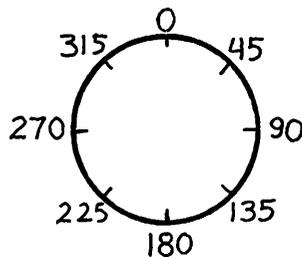
LOGO responds with a number such as 180. This means that the turtle is pointing 180° away from straight up. The drawing below shows how a circle would look if you traced it around the outside edge for 360°.



What if LOGO answered 270? Where would the turtle be pointing?



How could you turn the turtle to 0°?



---

# Turn the Turtle

You have already learned that you can turn the turtle by typing **RT** or **LT** and the number of degrees you want to turn.

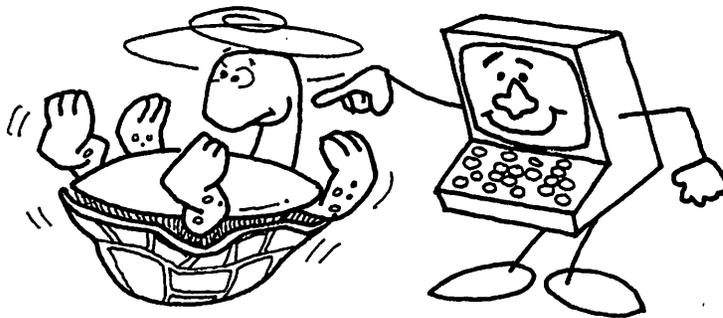
You can also turn the turtle with another simple command—**SH** or **SETHEADING**.

Suppose the turtle is pointing straight down (toward  $180^\circ$ ) and you want it to point straight up. Look at the circle on page 29. What number is straight up? If you type **SH 0** what happens?



How could you point the turtle to the right  $135^\circ$ ?

If you want to return the turtle to the center of the screen facing  $0^\circ$ , type **HOME**.



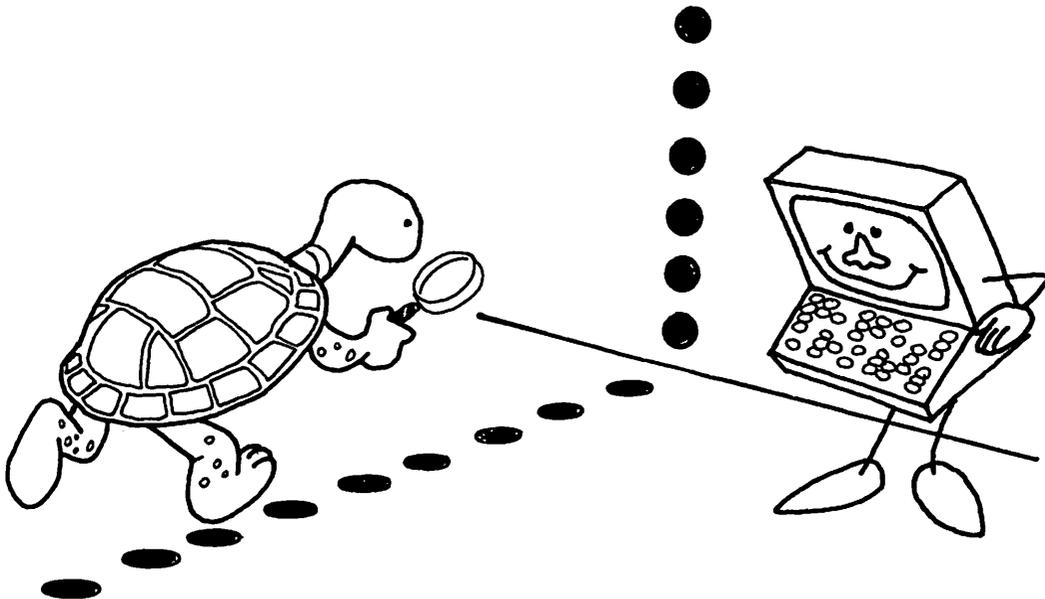
---

# Follow the Dots

The command **DOT** will place a dot on the screen without moving the turtle. Try this:

```
      ↓ Location of X-coordinate  
?DOT 80 5 ← Location of Y-coordinate  
?FD 10  
?RT 90  
?FD 180
```

The **X-coordinate** is a horizontal position ( $\leftarrow\rightarrow$ ).  
The **Y-coordinate** is a vertical position ( $\uparrow\downarrow$ ). If you type **PRINT XCOR**, you will find the position of the X-coordinate. What do you think the command **PRINT YCOR** does?



## SX SY

Suppose you want to move the turtle before you begin to draw on the screen. Use SX and SY to set the location of the turtle.

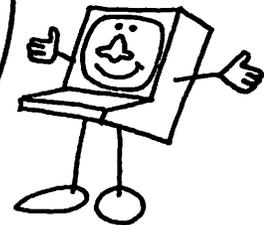
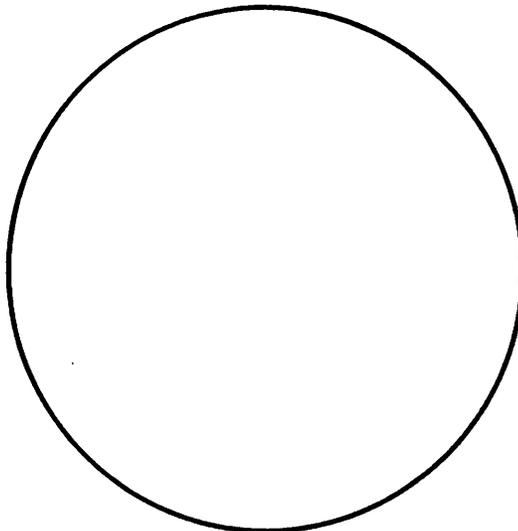
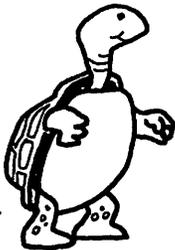
Now suppose you want to draw a very large circle. Try typing in:

```
?CIRCLER12
```

This time try:

```
SXY - 66 30 CIRCLER 12
```

That's a lot better for drawing, isn't it?



---

# MANYSHAPES

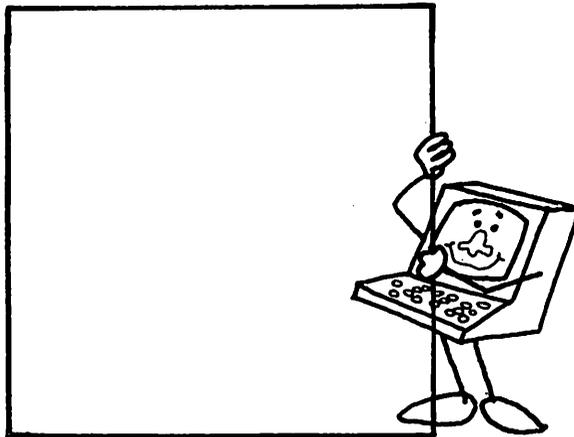
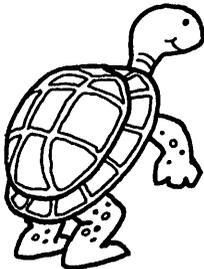
## Changing Squares

In lesson 7, you learned how to make a square. But suppose you wanted to be able to change the size of a square easily. The information that follows will tell you what you can do.

Try this:

```
?TO SQUARE :SIDE ← This requires an input number for the size of the side.  
>REPEAT 4 [FD :SIDE RT 90]  
>END
```

↑ There must always be a space before the colon (:).  
The colon signals that an input word will follow.



Now use this procedure and try this:

```
?SQUARE 40 ← When you input a number, you  
?SQUARE 10 do not need the colon.  
?SQUARE 20  
?SQUARE 30
```

There are endless variations using inputs. You can create many shapes. Try this:

```
?TO MANYSHAPES :SIDE :ANGLE  
>FD :SIDE  
>RT :ANGLE  
>MANYSHAPES (:SIDE + 3) :ANGLE  
>END
```



Experiment with different inputs such as:

```
?MANYSHAPES 6 97
```



Try other numbers.

Here are some examples of MANYSHAPES that other children have invented:

TITLE	INPUTS FOR MANYSHAPES	
Bomb. Hit	1	150
Rose	5	94
Doily	1	170
Maze	3	45
Better. Stairs	53	243
Endless. Tunnel	8	90

---

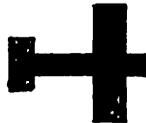
# Fun with SPRITES

TI LOGO has some other creatures and objects for you to play with. They are called **SPRITES**.

There are thirty-two **SPRITES** in all, numbered from 0 to 31. Each one can carry a different shape. You can design the shapes yourself, if you want to.

There are five shapes in the computer's memory. They are numbered from 1 to 5:

1 is an airplane



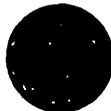
2 is a truck



3 is a rocket



4 is a ball



5 is a box



Now try this:

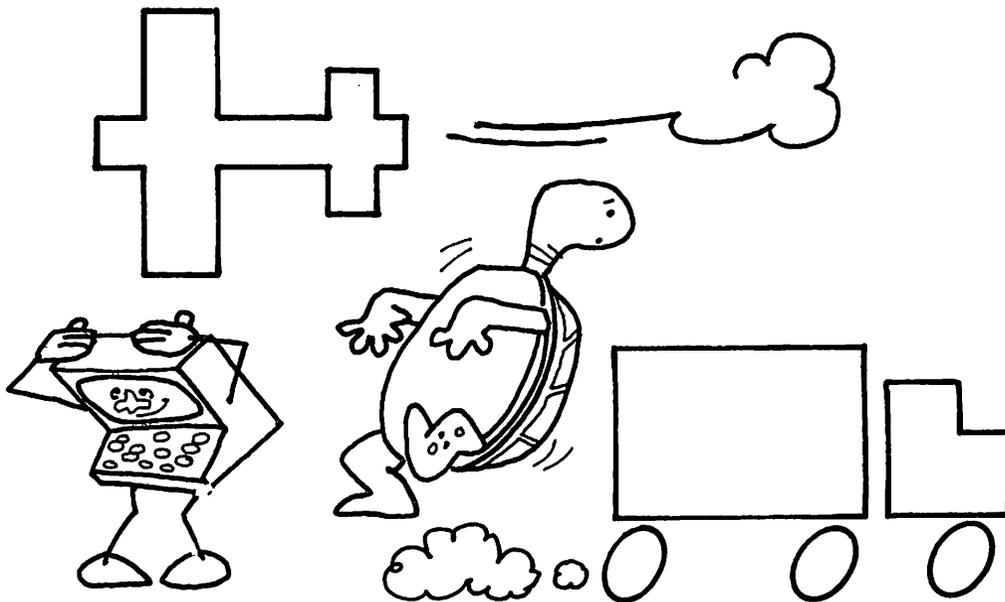
```
?TELL SPRITE 1  
?CARRY 2  
?HOME  
?SC 4
```

What object did you get? What color is it? Did you see a blue truck? To make the truck disappear, type SC 0.

Now try making a red airplane with this program:

```
?TELL SPRITE 2  
?CARRY 1  
?SXY 50 50  
?SC 6
```

*TI LOGO II USERS ONLY: Do you want to see it double in size? Type BIG. To see it go to half size, type SMALL.*



# 25

---

## Moving SPRITES

Let's move our two SPRITES. The truck should move across the screen, so let's set the heading at 90 and the speed at 25. SS means SET SPEED:

```
?TELL SPRITE 1  
?SH 90  
?SS 25
```

That will get the truck moving.

Now let's get the plane moving:

```
?TELL SPRITE 2  
?SH 45 ← We want the plane to go up.  
?SS 75 ← Planes go faster than trucks.
```

What happens when the plane hits the truck?

If you want to get everything moving at the same speed, try:

```
?TELL : ALL  
?SS 50
```

Are you tired of all that writing down the side of the screen? Type CS.

---

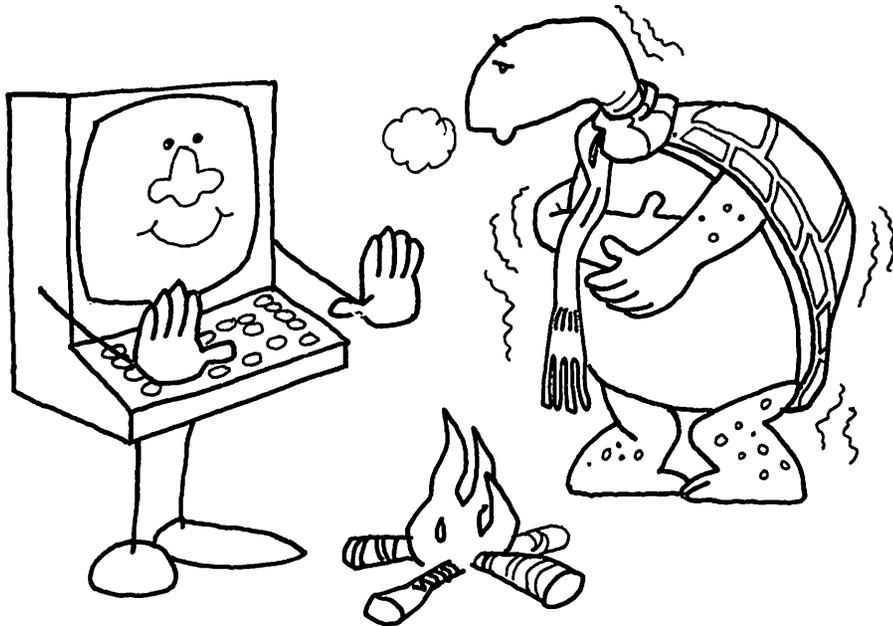
# Freeze and Thaw

You can stop the SPRITES any time you wish. Just type **FREEZE**. When you want to get them going again, type **THAW**.

Do you want to make all the SPRITES go away?

Try:

```
?TO CLEARSPRITES  
>TELL :ALL  
>SC 0  
>END
```

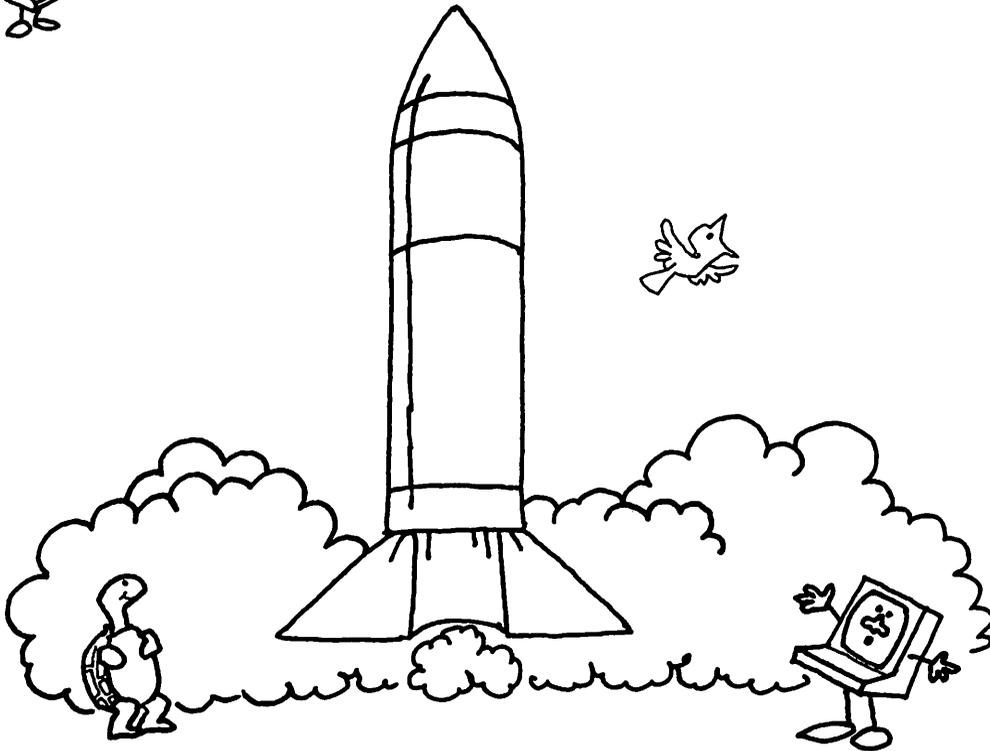


---

# Make Scenes

Now that you know how to position objects on the screen, you can begin to combine SPRITES to create interesting scenes.

-  Try to make the sprite rocket land on a planet.
-  Try to make other scenes.



---

# Make Shapes

One day you may feel like making your own SPRITES. Try this:

```
?TELL SPRITE (a number 0 through 31)
?MAKESHAPE (a number more than 6)
```

Do you see a grid with a blinking square? You can move the square by typing:

```
E (UP)
S (LEFT)
D (RIGHT)
X (DOWN)
```

If you want to plot the square, just hold down FCTN and E, S, D, or X. When you are finished, hold down FCTN and press 9. Then type:

```
CARRY (number you used for MAKESHAPE)
SETCOLOR (color number 0-15)
SETHEADING (heading number 0-360)
SETSPEED (speed number-127-127)
```

Try this:

```
?TELL SPRITE 3
?MS 14
FCTN E
FCTN E
```

```

FCTN E
FCTN E
FCTN E
FCTN D
FCTN D
FCTN D
FCTN E
FCTN E
FCTN E

```

```

FCTN E
FCTN E
FCTN 9
?CARRY 14
?SC 13
?CB 15
?HOME
?SH 45
?SS 76

```

You can have SPRITES do different things by using the command **EACH**. Try this:

```

?TELL :ALL
?CARRY :BALL
?EACH [ESC YOUR NUMBER]
?HOME
?EACH [SH YOURNUMBER]
?SS 76

```

To make an arrow:

```

?TELL SPRITE 4
?MS 15
D, D, D, D, D, D, D
FCTN D
FCTN X
FCTN X
FCTN S
FCTN X
FCTN X
FCTN S
FCTN D, D, D, D

```

```

X
FCTN S, S, S, S, S, S
X
FCTN D, D, D, D, D, D, D, D
FCTN 9
?CARRY 15
?SC 13
?CB15
?HOME
?SH 0
?SS 76

```



Make your own shapes.

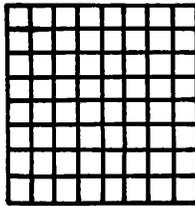
---

# Designs with Tiles

Would you like to make designs with letters? Try:

```
MAKECHAR 45
```

What happened? Did you see a grid that looks like this:



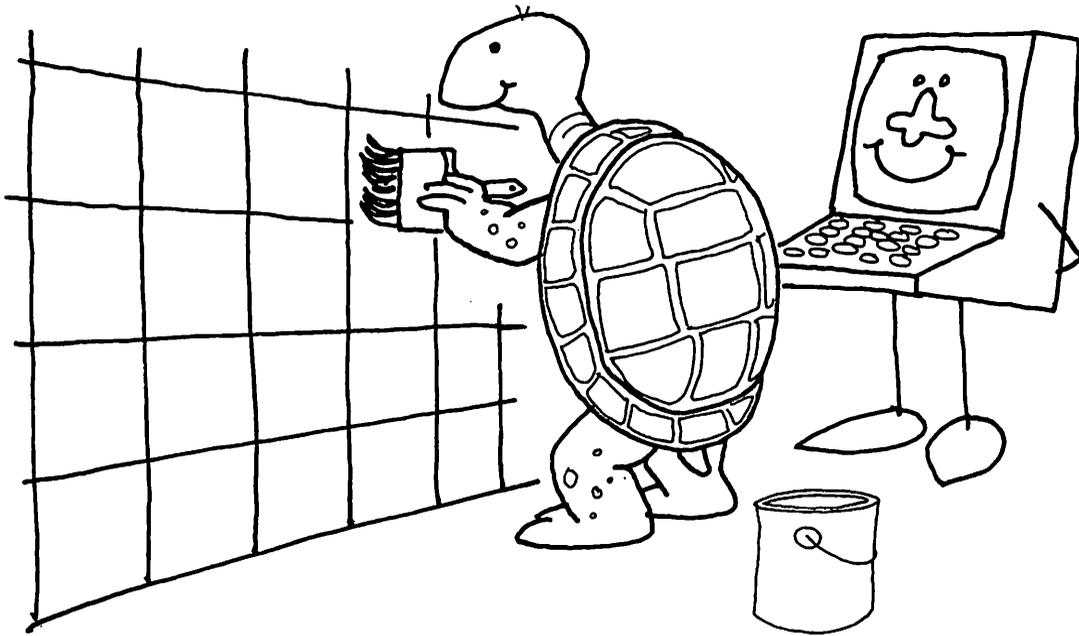
All the characters that you see on the screen belong to a group of objects called tiles. There are 128 tiles.

You can change the shape of any tile by using the command **MAKECHAR** and the code number for the character you want to see. How do you find out the code number? Suppose, for example, you want to know the code for A. Try this:

```
PRINT CHARNUM 'A
```

Suppose you want to know what character has the code number 78. Try this:

```
PRINTCHAR 78
```



Now you can put a tile anywhere on the screen by typing:

```
PUTTILE 65 20 10 (print tile 65 at position 20, 10)
```



Use the arrow keys ←, →, ↓, ↓, to draw on the grid. For real fun, try coloring the tiles:

```
?PUTTILE 65 20 10
?TELL TILE 65
?SETCOLOR :RED
```



Experiment with different tiles. You can use these shortcuts:

```
MAKECHAR = MC
PRINTCHAR = PC
PUTTILE = PT
```

# GLOSSARY

---

**BACK (BK, number)** Moves the turtle backward the number of spaces entered. If the pen is down, the turtle draws a line on the screen.

**BRACKETS** A symbol ([ ]) obtained by pressing FCTN R (left bracket) and FCTN T (right bracket).

**CATALOG** A list of the procedures that have been saved on a disk.

**CARRY** A command that comes after SPRITE in the sequence of making a SPRITE appear.

**CLEARSCREEN (CS)** A command that erases everything you have drawn on the screen.

**COMMAND** Information you enter that tells the computer what to do; for example, CB, SC, TO.

**CURSOR** The white blinking line that moves on the screen. It shows where the next character will be printed and moves one space ahead of whatever you are writing.

**DISK** Stores information magnetically.

**DISK DRIVE** "Reads" the disk and converts its information to electrical impulses to be used by the computer.

**DOT** A command that places a dot on the screen at the X-coordinate and the Y-coordinate.

**EACH** A command that allows you to use a list of commands with more than one SPRITE.

**EDIT (ED)** A command that puts you into the LOGO editor.

**END** A command that tells the computer your procedure is finished.

**ENTER** Pushing this key enables you to go to the next line. It also processes whatever has been typed into the computer.

**ERASE (ER)** A command that erases a program from the memory.

**FORWARD (FD, number)** A command that moves the turtle forward the number of spaces entered. If the pen is down, the turtle will draw a line.

**FREEZE** A command that stops a moving SPRITE.

**HIDETURTLE (HT)** A command that makes the turtle disappear.

**HOME** A command that puts the turtle in the center of the screen pointing straight up (0°).

**INITIALIZE** To prepare a disk for use.

**INPUT** Requires the user to type in a number after a word command when the word is followed by a space and a colon. For example, in a procedure such as SQUARE :SIDE, the :SIDE indicates the need for a number to tell the computer how long to make the side.

**LEFT (LT, number)** A command that turns the turtle left the number of degrees entered.

**LOAD** A command that allows you to load a procedure from the disk to the computer.

**MAKECHAR (MC)** A command that draws a character on a grid.

**MEMORY** The place where the computer stores information.

**MAKESHAPE (MS)** A command that allows you to create your own SPRITE.

**NOTURTLE** A command that makes the screen all text.

**OUTPUT** What you see on the screen, printer, or other hardware.

**PA** Prints out everything in the workspace.

**PENDOWN (PD)** A command that enables the turtle to move while drawing. The opposite of PENUP.

**PENERASE (PE)** A command that erases lines that have been drawn on the screen by the turtle.

**PENREVERSE (PR)** A command that reverses the color of anything the pen crosses.

**PENUP (PU)** A command that enables the turtle to move without drawing. The opposite of PENDOWN.

**PO procedurename** Takes a procedure as input and prints out the procedure.

**PP** Prints procedures.

**PRINT** A command that must be entered before writing a statement. For example, PRINT HELLO allows the computer to display HELLO on the screen after you push RETURN.

**PRINTCHAR (PC)** A command that gives a character shape to a number.

**PRINT HEADING** A command that prints on the screen the degree (to the right of vertical) that the turtle is heading.

**PRINTOUT** A command that prints a procedure either on the screen or on the printer.

**PROCEDURE** Instructions to the computer telling it what to do and how to do it. A procedure can be recalled from disk or memory whenever that procedure is needed.

**PROMPT** The sign at the beginning of a line (either a ? or a >).

**PUTTILE** A command that places a tile on a grid.

**RECALL** A command that allows you to load previously saved procedures from a cassette or disk.

**REPEAT** A command that tells the computer to repeat your commands. You must tell the computer how many times to repeat the command.

**RIGHT (RT, number)** A command that turns the turtle right (clockwise) the number of degrees entered.

**SAVE** A command that allows you to save your procedures on the disk.

**SETBACKGROUND (CB)** A command that lets you change the color of the background of the screen.

**SETHEADING (SH)** A command that sets the turtle's angle in degrees (from 0 to 360).

**SHOWTURTLE (ST)** A command that places the turtle in the middle of the screen. It puts you in the graphics (drawing) mode.

**SPRITE** A shape that you can create or one that is stored in the computer's memory.

**TELL SPRITE** A command that puts you in the SPRITE mode.

**TELL TILE** A command that puts you in the TILE mode.

**TELL TURTLE** A command that puts you in the TURTLE mode.

**THAW** A command that reverses the effect of FREEZE.

**WAIT** A command that allows a procedure to pause.

**X-COORDINATE** A horizontal position on the screen as measured from a central line.

**Y-COORDINATE** A vertical position on the screen as measured from a central line.

## ERROR MESSAGES

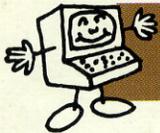
---

TELL ME MORE	Input missing.
OUT OF SPACE	You used up all available memory.
OUT OF INK	All available tiles used up for drawing. To draw more, clear the screen.
TELL ME HOW TO (do something)	Either you have typed in a procedure that does not exist, or you have used a command that Mr. Turtle does not recognize.
(Something) DOES NOT LIKE (something) AS INPUT	The procedure you have entered does not go with the data you have entered.
TELL ME WHAT TO DO WITH (something)	You have generated some data and have not given instructions as to what to do with it.

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