STUDENT'S GUIDE

TRS-80® BASIC Computer Camp
(BASIC Camp)

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COURSE OVERVIEW

This course is designed to introduce you to computers and computer programming languages. You will learn the history of computers, how to operate the TRS-80 Color Computer, and how to write simple programs in BASIC and LOGO.

BASIC PROGRAMMING

LESSON 1

OBJECTIVES

Upon successful completion of this lesson, you will be able to:

1. Explain what the word BASIC stands for.

2. Create sound on the computer.

3. Write programs that ask questions and then react to the responses.

4. Write programs that count forwards and backwards.

5. Change parts of a program line by editing.

6. Change the color of the television screen.
BASIC stands for:

B

A

S

I

C

REVIEW

__________ will display information on the television screen. It may be abbreviated as ?.

__________ will make the computer do the instructions (called a program) stored in memory.

__________ will display the program stored in memory.

__________ will erase the program stored in memory.
**SOUND**

Type this program into the computer. Be sure to enter **NEW** first.

```
10 T = 100
20 L = 5
30 SOUND T,L
```

The word **SOUND** in line 30 tells the computer to make a sound. The letters **T** and **L** tell it the kind of sound and how long to play it.

If you make **T** bigger, the sound gets _______________ in pitch.

If you make **L** bigger, the sound is heard _______________.

**INPUT**

Type this program into the computer. Be sure to enter **NEW** first.

```
10 CLS
20 INPUT "WHAT TONE": T
30 INPUT "HOW LONG": L
40 SOUND T, L
50 GOTO 20
```

**CLS** in line 10 tells the computer to _______________ the screen.

**INPUT** tells the computer to _______________ a question and _______________ for the answer.

**GOTO** tells the computer to go to a certain _______________ number.
ALL OF THE SOUNDS

This program will play all of the sounds the computer can make.

1) CLS
2) T = T + 1
3) SOUND T, 1
4) GOTO 20

This program will RUN as long as T is less than 255. Then the computer tells us we have an error.

To fix this, change line 40 to be:

40 IF T<255 THEN 20

The new line 40 tells the computer to ___________ line 20 as long as T is

____________ than 255.
SOME OF THE SOUNDS

Write a program that will play the sounds 5, 10, 15, etc.

Enter this program into the computer and then RUN it to see if it will work.

COUNTING WITH SOUNDS

Type this program into the computer. Be sure to enter NEW first.

10 CLS
20 FOR T = 1 TO 255
30 PRINT T;
40 NEXT T

This program will count from _______________ to _______________.

Now add this line to the program:

35 SOUND T, 1

When the program is RUN, the computer will display the ___________________ and then play the _________________.

6
COUNTING BACKWARDS

Retype line 20 of the program to be:

20 FOR T = 1 TO 255 STEP 2

When the program is RUN, the computer now counts by ________________.

Try this:

20 FOR T = 1 TO 255 STEP 14

And this:

20 FOR T = 255 TO 1 STEP -1

When this program is RUN, the computer counts ___________________ by 1's.

EDITING

Type in this one line program. Be sure to enter NEW first.

10 PRINT "THIS IS A TEST"

This line can be changed without being retyped by editing. To enter the Edit Mode on this line,

   enter EDIT 10.

The keyboard will act differently while editing. Pressing a single key (without pressing ENTER) will perform most functions. Try these keys and see what they will do. Remember, do not press ENTER.
EDITING
(CONT'D)

You should still be in the Edit Mode, and line 10 should look like this:

10 PRINT "THIS IS A TEST"

Follow these steps to add the word GOOD before the word TEST:

1. Press the (SPACEBAR) or the ← to bring the flashing cursor to the T at the beginning of TEST. (The cursor will cover the T.)

2. Press (I) (this means Insert).

3. Type the word GOOD and then press the (SPACEBAR) once to separate the words. Do not press (ENTER).

4. Press (SHIFT+I) together. (This will tell the computer to stop inserting.)

5. Press (L) to list the new line.

You should still be in the Edit Mode, and line 10 should look like this:

10 PRINT "THIS IS A GOOD TEST"

This time, put the word VERY before the word GOOD using the same procedure as before.

Line 10 should look like this when you are done:

10 PRINT "THIS IS A VERY GOOD TEST"
You should still be in the Edit Mode, and line 10 should look like this:

10 PRINT “THIS IS A VERY GOOD TEST”

Follow these steps to remove THIS IS from the line.

1. Press the [SPACEBAR] or the [ ] to bring the flashing cursor to the T at the beginning of THIS. (The cursor will cover the T.)

2. There are four letters in THIS, two letters in IS, and one space after each word. By adding $4 + 2 + 1 + 1$, there are 8 characters to be deleted.

3. Type [B] [D]. Do not press [ENTER].

4. Press [L] to list the new line.

You should still be in the Edit Mode, and line 10 should look like this:

10 PRINT “A VERY GOOD TEST”

This time, delete the word VERY using the same procedure as before.

Line 10 should look like this when you are done:

10 PRINT “A GOOD TEST”

To exit from editing and to return to the Command Mode, press [ENTER].
COLORS

Type in this program. Be sure to enter **NEW** first.

```
10 INPUT "WHAT COLOR (0-8)" ; C
20 CLS (C)
30 FOR A = 1 TO 1000
40 NEXT A
50 GOTO 10
```

CLS all by itself tells the computer to clear the screen.

CLS (C) will clear the screen and __________________________ the color.

How many colors are there? __________________________
LESSON 2
OBJECTIVES

Upon successful completion of this lesson, you will be able to:

1. Explain what the READ and DATA statements do.
2. Explain what PCLEAR, PCLS, and PMODE do in the TRS-80 Color Computer.
3. Explain the system of points on the television screen.
4. Explain the two color sets available for graphics.
5. Write programs to create lines on the television screen.
6. Write programs to create circles on the television screen.
7. Use the PAINT statement to color in large areas on the screen.
REVIEW

Enter this program from the previous lesson. Be sure to enter **NEW** first.

```
10 CLS
20 INPUT "WHAT TONE"; T
30 INPUT "HOW LONG"; L
40 SOUND T, L
50 GOTO 20
```

RUN the program and answer the questions with:

```
89, 5, 133, 5, 159, 5,
176, 10, 159, 5, 176, 10
```

**BREAK**

Would it be easy to play a song doing this? ________________

READ/DATA

This program will play the song the other program couldn't. Type in this program. Be sure to enter **NEW** first.

```
10 DATA 89,5, 133,5, 159,5
20 DATA 176,10, 159,5, 176,10
30 FOR N = 1 TO 6
40 READ T, L
50 SOUND T, L
60 NEXT N
```

The computer will store answers to questions in a __________________ line and will get those answers with a __________________ line.
P WORDS

will set aside a portion of memory for one to eight graphic segments; e.g., PCLEAR 8 will reserve eight graphic segments.

will clear the graphic screen in the same way CLS clears the regular screen; e.g., PCLS 2 will clear the graphic screen and set the background to color number 2.

will tell the computer how much detail and how many colors are wanted on our graphic pages as well as the desired page number; i.e.,

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>resolution</th>
<th>colors</th>
<th>segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1-8</td>
<td>low</td>
<td>two</td>
<td>one</td>
</tr>
<tr>
<td>1</td>
<td>1-4</td>
<td>low</td>
<td>four</td>
<td>two</td>
</tr>
<tr>
<td>2</td>
<td>1-4</td>
<td>medium</td>
<td>two</td>
<td>two</td>
</tr>
<tr>
<td>3</td>
<td>1-2</td>
<td>medium</td>
<td>four</td>
<td>four</td>
</tr>
<tr>
<td>4</td>
<td>1-2</td>
<td>high</td>
<td>two</td>
<td>four</td>
</tr>
</tbody>
</table>
**SCREEN & COLORS**

The $x$ will tell the computer to display a text page or graphics page, and $y$ will select the color set to use; e.g., SCREEN 1,1 will display a graphics page using color set 1.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
<th>Text Screen:</th>
<th>2 Color Graphics:</th>
<th>4-Color Graphics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>Black/Green</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>Red/Orange</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>Black/Green</td>
<td>Green/Yellow</td>
<td>Blue/Red</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Black/Buff</td>
<td>Buff/Cyan</td>
<td>Magenta/Orange</td>
</tr>
</tbody>
</table>
SCREEN DIMENSIONS

The television screen is set up like a grid when used for graphics.

\[ \begin{align*}
 & \text{X axis} \\
 & \begin{array}{c|c}
  (0,0) & (255,0) \\
 \end{array} \\
\end{align*} \]

\[ y \quad \text{Graphic points are identified by two numbers, called } x \text{ and } y \text{, within parentheses. The first} \]
\[ a \quad \text{number (x) is the position going across from} \]
\[ x \quad \text{left to right, and the second number (y) is the} \]
\[ i \quad \text{position going down from top to bottom.} \]

\[ \begin{align*}
 & \begin{array}{c|c}
  (0,191) & (255,191) \\
 \end{array} \\
 \end{align*} \]

The top left corner of the screen is called \((\quad , \quad)\).

The top right corner is \((\quad , \quad)\), bottom left is

\((\quad , \quad)\), and the bottom right corner is

\((\quad , \quad)\).
LINES

Type in this program that will demonstrate the graphic statements used so far. Be sure to enter NEW first.

10 PCLEAR 4

20 PMODE 0,1

30 PCLS

40 SCREEN 1,0

50 LINE (0,0) – (255,191),PSET

60 COTO 60
BOXES

Change line 50 in our program to be:

```
50 LINE (50,40) – (200,150),PSET
```

This will draw a line starting at point ____________________________ and ending at point ____________________________.

Change line 50 to be:

```
50 LINE (50,40) – (200,150),PSET,B
```

The B at the end of line 50 changes the line into a ________________.

Change line 50 to be:

```
50 LINE (50,40) – (200,150),PSET,DF
```

The BF at the end of line 50 changes the line into a ________________. 
TWO BOXES

Write a program that will draw two boxes on the screen, one of them inside the other. Hint: one box will have its far corners at (50,40) and (200,150), and the other box will have its far corners at (100,80) and (150,100).
CIRCLES

Type in this program. Be sure to enter NEW first.

10 PCLEAR 4 : PMODE 3,1
20 PCLS : SCREEN 1,0
30 X = 128 : Y = 96
40 CIRCLE (X,Y), 75
50 GOTO 50

When this program is RUN, it will draw a circle on the screen.

In line 40, the X and the Y tell the computer where the _______ of the circle

is. The 75 tells the computer ___________________ from the center to draw the circle.
CIRCLES AND COLORS

Add these lines to our program:

35 FOR R = 0 TO 90 STEP 10
<0 CIRCLE (X,Y), R
45 NEXT R

This will draw several circles on the screen. The center of each circle is the same, but the Radius (distance from the center) increases by 10's.

Change line 40 to be:

40 CIRCLE (X,Y), R, 3

The number after the R in line 40 tells the computer the _____________ to use when drawing the circle.

This chart shows which colors are assigned to which numbers:

<table>
<thead>
<tr>
<th>Number</th>
<th>Colorset 0</th>
<th>Colorset 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Red</td>
<td>Orange</td>
</tr>
<tr>
<td>1</td>
<td>Green</td>
<td>Buff</td>
</tr>
<tr>
<td>2</td>
<td>Yellow</td>
<td>Cyan</td>
</tr>
<tr>
<td>3</td>
<td>Blue</td>
<td>Magenta</td>
</tr>
</tbody>
</table>
PAINT

Type in this program. Be sure to enter NEW first.

```
10 PCLEAR 4 : PMODE 3,1
20 PCLS : SCREEN 1,0
30 LINE (0,0) - (255,191),PSFT
40 LINE (0,191) - (255,0),PSET
90 GOTO 90
```

What will this program do? ______________________________________

Add this line to the program:

```
50 PAINT (100,0), 3, 0
```

This line will paint an area of the screen using color 3 (blue) until it reaches a color 0 (red) border. The number within the parentheses tells the computer where the painting is to begin.

MORE PAINT

Add these lines to the program:

```
60 PAINT (255,100), 2, 0
70 PAINT (100,191), 1, 0
80 PAINT (0,100), 0, 0
```

When this program is RUN, the computer should paint each of the triangles a different color.

Is the bottom triangle painted? __________________________________

What color is it painted? ________________________________________
PAINT EXERCISE

Write a program that will draw a circle with a radius of 70 on the screen. Then have the computer paint the inside of the circle blue and the outside of the circle red. Hint: blue is color 3 and red is color 0.

Enter this program into the computer and then RUN it to see if it will work.
LESSON 3
OBJECTIVES

Upon successful completion of this lesson, you will be able to:

1. Explain the use of a subroutine.
2. Use string-packing to create special characters.
3. Create animation on the TRS-80 Color Computer.

SUBROUTINES

A subroutine is a little program within a larger program. To tell the computer to go to the subroutine, the ________________ statement is used.

Type in these program lines. Be sure to enter NEW first.

100 INPUT "WHAT COLOR (0-8)"; C
110 CLS(C)
120 FOR X=1 TO 1000: NEXT X
130 RETURN

200 INPUT "WHAT TONE"; T
210 INPUT "HOW LONG"; L
220 SOUND T,L
230 RETURN

300 PCLS: SCREEN 1,0
310 CIRCLE(128,96),70
320 PAINT(128,96),3,0
330 PAINT(0,0),0,0
340 FOR T = 1 TO 1000: NEXT T
350 RETURN
SUBROUTINES
(CONT'D)

Add these lines to the program in memory:

10 PCLR 4: PMODE 3,1
15 CLS: PRINT TAB(10) "MENU"
20 PRINT: PRINT "1 - COLOR TEST"
25 PRINT "2 - SOUND TEST"
30 PRINT "3 - GRAPHIC TEST"
35 PRINT "4 - END"
40 PRINT: INPUT "ENTER YOUR CHOICE": A
45 IF A=1 THEN GOSUB 100
50 IF A=2 THEN GOSUB 200
55 IF A=3 THEN GOSUB 300
60 IF A=4 THEN END
65 GOTO 15

These lines add a menu to the program and tie the subroutines together. RUN the program to see how it works.
STRINGS

A string variable is one that contains a "string" of characters instead of numeric values. This type of variable is identified by a $ after the variable name.

Type in this program. Be sure to enter NEW first.

10 INPUT "WHAT IS YOUR NAME": A$
20 A$ = A$ + " 
30 PRINT A$;
40 GOTO 30

STRING PACKING

Type in this program. Be sure to enter NEW first.

10 A$ = "CAMP "
20 B$ = "FUN "
30 C$ = "IS "
40 D$ = "COMPUTER "
50 E$ = D$ + A$ + C$ + B$
60 PRINT E$

Line 50 connects the words to form ____________________________________________.
ANIMATION

Type in this program. Be sure to enter NEW first.

```
10 PCLEAR 8
20 FOR P = 1 TO 8
30 PMODE 0.P
40 PCLS
50 LINE (128, 0) - (138, 10 + (P - 1) * 15), PSET
60 CIRCLE(128, P * 15), 15
70 NEXT P
200 INPUT "WHAT PAGE (1 - 8)"); P
210 PMODE 0.P: SCREEN 1,0
220 FOR T = 1 TO 500: NEXT T
230 GOTO 200
```

When this program is RUN, lines 10 through 70 create a different picture on each of the eight graphic pages. Lines 200 through 230 will display those pages one at a time.

Add these lines to the program in memory:

```
80 FOR P = 1 TO 8: GOSUB 110: NEXT P
90 FOR P = 7 TO 1: STFP = 2: GOSUB 110: NEXT P
100 GOTO 80
110 PMODE 0.P
120 SCREEN 1,0
130 FOR T = 1 TO 10: NEXT T
140 RETURN
```

Lines 80 and 90 tell the computer which pages to display. Lines 110 through 140 display the pages on the screen.
COLOR LOGO

LESSON 4
OBJECTIVES

Upon successful completion of this lesson, you will be able to:

1. Answer the question "What is LOGO?"
2. Explain the four modes of LOGO operation.
3. Understand the meaning of a procedure.
4. Enter and run a LOGO procedure.

INTRODUCING LOGO

LOGO is a ________________ that can be used to draw pictures with a shape
called a ________________.

We give the ________________ instructions to move in different ways. The
instructions to the TURTLE are called a _________________.

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**MODES IN LOGO**

LOGO is divided into sections that do specific jobs.

These sections are called _______________________.

The MODES are called _______________________,

____________________, and _______________________.

---

**STARTING LOGO**

Turn on the television set.

Select the proper channel (3 or 4).

Set the antenna switch to "COMPUTER."

Insert the ___________________________ into the slot on the right side and with the _______________________.

Turn on the computer.

LOGO will be executed automatically.
INTRODUCING THE TURTLE

Your screen should display:

COLOR LOGO COPYRIGHT 1982
LARRY KHEHIATY & GEORGE GERHOLD
LICENSE TO TANDY CORP
ALL RIGHTS RESERVED

LOGO:

To get into the RUN MODE, press ________________

SOME TURTLE COMMANDS

Enter each of the following commands:

__________________________________________

__________________________________________

__________________________________________

__________________________________________

__________________________________________

__________________________________________

__________________________________________
PROCEDURES

Press ___________________ to enter the EDIT MODE.

Enter ___________________ on one line.

Enter ___________________.

Enter ___________________ on a line by itself to end the procedure.

Press ___________________.

Press ___________________ to enter the RUN MODE.

Enter ___________________ to execute the procedure.

Enter ___________________ several more times.
PROCEDURES
(CONT'D)

Press ___________________ to enter the EDIT MODE.

Press ___________________ until you see END on the screen.

Press ___________________ to enter a blank line.

Enter ___________________.

Enter ___________________.

Enter ___________________.

Press ___________________.

Press ___________________.

Enter ___________________.
PROCEDURES
(CONT'D)

Press ______________ to enter the EDIT MODE.

Enter ____________________.

Enter ____________________.

Press ______________

Enter ____________________.
THE DOODLE MODE

The DOODLE MODE lets you ___________________________ with special keys.

From the RUN MODE, press _______________ to enter the DOODLE MODE.

When you see a "=" sign, enter a _______________ for the procedure.

<table>
<thead>
<tr>
<th>KEY</th>
<th>MEANING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Clear Screen</td>
</tr>
<tr>
<td>2</td>
<td>Home TURTLE</td>
</tr>
<tr>
<td>3</td>
<td>Pen Up (no trail)</td>
</tr>
<tr>
<td>4</td>
<td>Pen Down (leave trail)</td>
</tr>
<tr>
<td>5</td>
<td>Sharp Right Turn</td>
</tr>
<tr>
<td>6</td>
<td>Sharp Left Turn</td>
</tr>
<tr>
<td>7</td>
<td>Forward Small Amount</td>
</tr>
<tr>
<td>8</td>
<td>Forward Large Amount</td>
</tr>
<tr>
<td>9</td>
<td>Small Right Turn</td>
</tr>
<tr>
<td>0</td>
<td>Small Left Turn</td>
</tr>
</tbody>
</table>
OTHER FEATURES

Some additional features of COLOR LOGO are:

Variables

Multiple TURTLES

Speed control

Different COLOR SETs

Different PEN colors

Make the TURTLE visible or invisible

Use input from the joysticks

Define a different TURTLE shape

F and ELSE conditional statements

And much, much more!
THANK YOU FOR ATTENDING

TRS-80

BASIC COMPUTER CAMP