



Graphing Calculator Guidelines Guidance for Transcription Using UEB

Developed by the Braille Authority of North America

**UEB Revisions completed by
Braille Literacy Canada
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answers to calculator commands. A long expression on a small screen may appear to be both left- and right-justified. The transcriber must decide from accompanying text if it is an answer to be transcribed as right-justified.

- 5.2.3 Where two or more consecutive lines are right-justified, each line will begin in the same cell.
- 5.2.4 Where word(s) or equation(s) are left- and right-justified on the same line, they are transcribed on the same line with three blank cells before the right-justified material.
- 5.2.5 Runovers are transcribed on the line below, indented one cell to the right of the beginning of the previous line.
- 5.3 Indicate highlighted text with the transcriber-defined typeform indicator, ⠠⠠⠠⠠, followed by the appropriate root for symbol, word, or passage and termination indicators.
- 5.4 Omit font indicators other than highlighting on text within a screen but retain print capitalization.
- 5.5 Symbols are not inserted to replace blank spaces in print.
- 5.6 When items in a horizontal list consist of two or more words, two spaces are inserted between each item.
- 5.7 Hyphens across columns are replaced with dot 5s in braille. (See Sample 3) A note on the Transcriber's Notes page explains the change to print. The note is placed at the site if this situation occurs only once in the document.
- 5.8 Horizontal lines separating sections of the screen run the width of the page. (See Samples 3 and 7)
- 5.9 Matrices are transcribed and aligned according to *UEB Guidelines for Technical Material*, Section 15.
 - 5.9.1 If big (multi-line) grouping signs are not used on the screen in print, use regular parentheses, brackets, etc. A blank line is not inserted preceding and following the matrix because it is not a spatial arrangement.
 - 5.9.2 If big (multi-line) grouping signs are used on the screen in print, big (multi-line) grouping signs are used in braille; a blank line is required preceding and following the matrix (a spatial arrangement), except immediately following an opening screen line or preceding a closing screen line.

- 5.10 Arrows, arrowheads, and comparison signs in screens are spaced away from surrounding text as in *UEB Guidelines for Technical Material*, Section 13. A space is inserted following a colon except when the colon applies to the following letter or word.
- 5.11 Necessary transcriber's notes are placed either before or after the screen, not within the screen.
- 5.12 Function tabs shown on the menu bar in the screen are not included in the braille unless they are highlighted for a particular reason.
- 5.13 A number following a solid cursor (represented in braille by a transcriber-defined shape indicator followed by a full cell) requires a numeric indicator.
- 5.14 All symbols specific to the graphing calculator must be listed on the Special Symbols page.

6 Exceptions to UEB Code Rules

In some situations exceptions to the Rules of UEB will be applied. These exceptions should be noted on the Transcriber's Notes page as outlined below. The note is placed at the site if this situation occurs only once in the document. (Sample transcriber's notes are shown in italics.)

- 6.1 The numbers in items like Y_1 ..., L_1 ..., $Plot_1$..., etc. are all identifiers. The limitations of the graphing calculator cause variations in type size and placement; (e.g., subscripts are not always shown as subscripts). In braille all these identifier numbers are shown as subscripts, whether following a letter or a word.

This variation should be qualified in a transcriber's note on the Transcriber's Notes page, stating the limitations and variations that appear in the various screens.

Suggested TN: *In the presentation of Graphing Calculator material, print type size variations and subscripts may not be shown. In braille all identifier numbers in items like L_1 , L_2 , ..., Y_1 , Y_2 , ..., $Plot_1$, $Plot_2$, ..., etc., are shown as subscripts.*

- 6.2 For the keystroke that shows $Y=$, no space is left before or after the equal sign.

Suggested TN: *In the presentation of Graphing Calculator material, no space is left before or after the equal sign in the $Y=$ keystroke.*

- 6.3 Blank lines are not inserted unless a blank line is shown on the calculator screen. This includes blank lines before and after a matrix not shown in big (multi-line) grouping symbols. Exceptions: Blank lines are inserted when a matrix is shown in big (multi-lined) grouping symbols. (See this Guideline, 5.9.1 and 5.9.2). When another screen is shown within a calculator screen, a blank line separates the screens.

7 Graphs

- 7.1 Calculator screens in print showing the graph lines can be done as a tactile drawing. If the calculator screen representation is a copy of an original print graph already shown previously in the text, the calculator screen representation may be omitted in braille. Indicate the omission with a transcriber's note at the point of omission.

- 7.2 When doing the tactile drawing of the graphing calculator screens:
 - 7.2.1 Make the outline of the box that indicates the screen very faint
 - 7.2.2 Be accurate with the intersection of graph lines and the axes and with the points on the lines
 - 7.2.3 Be consistent and even with scale marks on the axes
 - 7.2.4 Do not insert grid lines that are not shown in print
 - 7.2.5 Refer to the latest edition of *Guidelines and Standards for Tactile Graphics*.

SYMBOLS FOR GRAPHING CALCULATORS

The following symbols appear in the text and within graphing calculator screens. The first group of symbols (Section 8) should be listed on the Special Symbols page. The symbols of the second group (Section 9) do not necessarily have to be listed; inclusion may be an agency decision.

8 Symbols Listed on the Special Symbols Page:

8.1 General Symbols

- ⠠⠠⠠⠠⠠⠠⠠⠠ Graphing calculator screen indicator
- ⠠⠠⠠⠠ Highlight indicator placed before a word(s), numeral(s) or group of symbols highlighted on the screen. The effect of the highlight indicator is terminated by a space.

8.2 Calculator keystroke symbols (cursor indicators found in narrative). (See Sample 1)














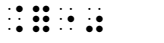
- ▲ ⠠⠠⠠⠠⠠⠠ (transcriber-defined solid shape indicator, up-pointing indicator)
- ▼ ⠠⠠⠠⠠⠠⠠ (transcriber-defined solid shape indicator, down-pointing indicator)
- ▶ ⠠⠠⠠⠠⠠⠠ (transcriber-defined solid shape indicator, right-pointing arrowhead)
- ◀ ⠠⠠⠠⠠⠠⠠ (transcriber-defined solid shape indicator, left-pointing arrowhead)

8.3 Symbols found within calculator screens:

- ▶ ⠠⠠⠠⠠⠠⠠ Right-pointing arrowhead
- ◀ ⠠⠠⠠⠠⠠⠠ Left-pointing arrowhead
- ▲ ⠠⠠⠠⠠⠠⠠ Upward-pointing arrowhead
- ▼ ⠠⠠⠠⠠⠠⠠ Downward-pointing arrowhead
- ▬ ⠠⠠⠠⠠⠠⠠ Solid cursor, either vertical bar, rectangle, or underline cursor (grade 1 indicator, full cell)
- ? ⠠⠠⠠⠠⠠⠠ Question mark







Do not use any of the two-cell symbols for arrows listed in GTM §13.1

8.4 Graph line styles (these symbols must be followed by a space):

		dotted line
		thin line
		thick line
		line with shading above
		line with shading below
		circle with small horizontal line adjacent and to the left: path, line of graph
		circle without small horizontal line in front; animate, animates or traces the edge of a graph without drawing a path or line

8.5 Graph Types

Plot Type

	Scatter
	xyLine
	Histogram
	ModBoxplot
	Boxplot
	NormProbPlot

When symbols for the graph types above appear in a screen, the name of the graph type used is enclosed in curly braces. Do not try to develop new symbols; do not draw them as tactile diagrams. (See Sample 12.)

Suggested TN: *When symbols for the graph types appear in a screen, the name of the graph type used is enclosed in curly braces.*

9 Symbols Not Listed on the Special Symbols Page

The symbols below are examples from this document that would need to be listed on the Special Symbols page.

	⠠⠠⠠⠠⠠	Shape terminator
Δ	⠠⠠⠠⠠⠠⠠⠠	Capital Greek delta
θ	⠠⠠⠠⠠⠠	Lower-case Greek theta
Σ	⠠⠠⠠⠠⠠⠠⠠	Capital Greek sigma
σ	⠠⠠⠠⠠⠠	Lower-case Greek sigma
←	⠠⠠⠠⠠⠠⠠⠠⠠	Left-pointing arrow with shaft
→	⠠⠠⠠⠠⠠⠠⠠⠠	Right-pointing arrow with shaft (do not use the two-cell symbol for a simple right pointing arrow)
↑	⠠⠠⠠⠠⠠⠠⠠⠠	Up-pointing arrow with shaft
↓	⠠⠠⠠⠠⠠⠠⠠⠠	Down-pointing arrow with shaft
□	⠠⠠⠠⠠⠠⠠	Hollow box
■	⠠⠠⠠⠠⠠⠠⠠⠠	Solid box
◆	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	Parallelogram representing a solid diamond shape
*	⠠⠠⠠⠠⠠	Asterisk, meaning multiplication
.	⠠⠠⠠⠠	Decimal point, period
⋅	⠠⠠⠠⠠⠠	Dot multiplication sign
∫	⠠⠠⠠⠠	Integral
!	⠠⠠⠠⠠	Factorial
✓	⠠⠠⠠⠠⠠	Check mark
^	⠠⠠⠠⠠⠠	Caret (hat)

SAMPLES

Sample 1

To turn on the calculator, press $\boxed{\text{ON}}$. Some information may appear on the screen. In order to clear everything press: $\boxed{2\text{nd}} \boxed{+} \boxed{2}$. Press $\boxed{2\text{nd}} \boxed{+} \boxed{3} \boxed{2}$. At this point the screen is cleared but the cursor is also lost. Press $\boxed{2\text{nd}}$ and hold the $\boxed{\blacktriangle}$ key until the screen darkens and the cursor reappears.

The message "MEM CLEARED" will appear on the screen.

The display screen and the memory are now clear and ready for use.

Example 4: $\boxed{Y=}$ $\boxed{\blacktriangledown}$ $\boxed{\blacktriangledown}$ $\boxed{\blacktriangledown}$ $\boxed{2}$ $\boxed{X/T}$ $\boxed{+}$ $\boxed{3}$ $\boxed{\text{GRAPH}}$

What changed when you graphed Example 4? Why?

Sample 2

11. Calculator Notes

Some calculators, like the TI-83, handle operations with complex numbers. Press **MODE** and set the calculator as shown below left. Get to the home screen and enter the operation you wish to perform. Note that i is accessed by pressing **2nd** **□**. Press **ENTER** to obtain your answer. The screen, below center, shows the result of $(5 - 2i)(4 + 9i)$. Remember that you can convert decimal values to fractional values by pressing **MATH**, **ENTER** **ENTER**. You would want to do this when simplifying a question like $3 + i$ $4 - 5i$.

See the screen below right.

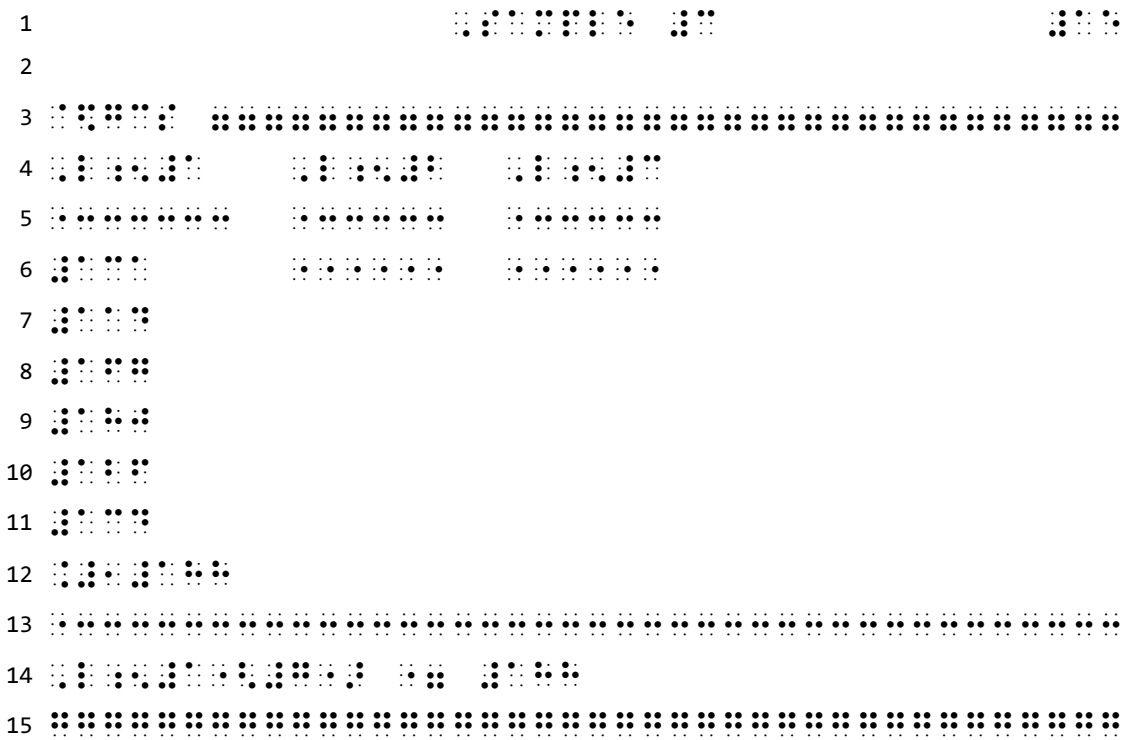
```
Normal Sci Eng
Float 0123456789
Radian Degree
Func Par Pol Seq
Connected Dot
Sequential Simul
Real a+bi re^θ i
Full Horiz G-T
```

```
(5-2 i)(4+9 i)
                38+37 i
```

```
(3+i)/(4-5 i)
.1707317073+.46...
Ans►Frac
      7/41+19/41 i
```


Sample 3

L1	L2	L3
131	-----	-----
114		
167		
180		
126		
134		
188		
L1(7) = 188		



- Line 3: Opening screen line (GC 4 and GC 4.1).
- Line 4: Identifiers are transcribed as subscripts (GC 6.1).
- Line 6: Hyphens across a column are replaced with guide dots (GC 5.7).
- Line 12: The number 188 is highlighted in the screen in print.
- Line 13: A separation line is inserted between the table and the final expression, as shown in print. The separation line is the width of the braille page (GC 5.8).
- Line 14: A space is inserted on either side of a comparison sign (GC 5.10).
- Line 15: Closing screen line (GC 4 and GC 4.1).

Sample 4

Follow the same procedure to enter the value of “ b ” and the value of “ c ”. When the values for “ a ”, “ b ”, and “ c ” have been entered, the first screen in the second row below appears. This screen tells us that one root is $3/4 + 2/5 i$, and asks us to press **ENTER** to view the other root. Doing so results in the second screen in the second row below. This screen tells us that the other root is $3/4 - 2/5 i$.

```
A IS
?400
B IS
?
```

```
A IS
?400
B IS
?-600
C IS
?289
```

```
REAL PART      3/4
IMAGINARY PART 2/5
                i
PRESS ENTER
TO SEE 2ND ROOT
```

```
REAL PART      3/4
IMAGINARY PART -2/5
                i
PRESS
ENTER TO REPEAT
CLEAR TO QUIT
```

3. Solving Graphically With A Graphing Calculator

Provided the quadratic equation has real roots, the equation can be solved graphically. Shown below is the graph of the quadratic function $y = x^2 - x - 12$. If we are trying to solve the equation $x^2 - x - 12 = 0$, then we merely need to examine the graph of $y = x^2 - x - 12$, and determine the x -intercepts--the x -coordinates of the points on the graph where y is 0. Clearly if we can find the x values for which y is 0, then we have found the x values for which $x^2 - x - 12 = 0$.

The graph of $y = x^2 - x - 12$ is drawn using the window created by pressing **ZOOM** **6** as shown below.

```
Y1=X^2-X-12
Y2=
Y3=
Y4=
Y5=
Y6=
Y7=
Y8=
```

```
ZOOM MEMORY
1:ZBox
2:Zoom In
3:Zoom Out
4:ZDecimal
5:ZSquare
6:ZStandard
7↓ZTrig
```


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

Line 17: Use the calculator keystroke indicator to open a keystroke and the termination indicator to close. (GC 2.2). No spaces are inserted between keystrokes (GC 2.5).

1 12
2 13
3 14
4 15
5 16
6 17
7 18
8 19
9 20
10 21
11
22
23
24
25

- Lines 1 and 12: Opening screen line (GC 4 and GC 4.1).
- Line 1: A top box line can appear on line 1 when a running head is not used (BF).
- Line 2: The equal sign is highlighted in the calculator screen in print.
- Lines 2-9: Identifiers are transcribed as subscripts (GC 6.1).
- Lines 3-9: Symbols are not inserted to replace blank spaces in print (GC 5.5).
- Lines 10 and 21: Closing screen line (GC 4 and GC 4.1).
- Lines 11 and 22: A blank line is required (GC 4.3).
- Line 13: "ZOOM" is highlighted in print (GC 5.3). Retain full capitalization (GC 5.4).
- Lines 14-20: Retain print capitalization (GC 5.4) and use contractions within a screen (GC 5.1).
- Line 19: "6:" is highlighted in print (GC 5.3).
- Line 20: Down-pointing arrow with shaft (GC 9).

Sample 5

To find the matrix product 01 , press $\text{[MATRIX]}, \text{[1]}, \text{[x]}, \text{[MATRIX]}, \text{[2]}, \text{[ENTER]}$. The following screens result.

```
[A]*[B]
```

```
[A]*[B]
  [[-80 56 ]
   [51  -32]]
```

To square matrix D , press $\text{[MATRIX]}, \text{[4]}, \text{[^]}, \text{[2]}, \text{[ENTER]}$. The following screens result.

```
[D]^2
```

```
[D]^2
  [[14 16 18 ]
   [-26 -31 -36]
   [38 46 54 ]]
```

3. To Store A Result

If we wish to store the result of D^2 , and we already have the answer to D^2 , as in the screen below left, simply press $\text{[STO]}, \text{[MATRIX]}, \text{[5]}, \text{[ENTER]}$ which results in the screen below left. Of course we chose matrix E as the place to store the answer to D^2 , because E was not currently being used for any other purpose. To see if matrix E really does contain the result of D^2 , press $\text{[MATRIX]}, \text{[5]}, \text{[ENTER]}$. This results in the screen below right and confirms that E now does hold the answer to D^2 .

```
[[14 16 18 ]
 [-26 -31 -36]
 [38 46 54 ]]
Ans→[E]
[[14 16 18 ]
 [-26 -31 -36]
 [38 46 54 ]]
```

```
[[14 16 18 ]
 [-26 -31 -36]
 [38 46 54 ]]
[E]
[[14 16 18 ]
 [-26 -31 -36]
 [38 46 54 ]]
```

6. Converting From Decimal To Fractional Form

When we ask the calculator to determine the value of $\frac{3}{4} - \frac{2}{5} - \frac{7}{10} \frac{1}{2} \quad 1 \ 0 \ -4 \ 3 \ \frac{3}{5} \ -2$, it gives the result with decimal values (below left).

The three dots indicate that part of the answer matrix cannot be seen on the screen. By using the right arrow key we can see the other entries (below center and right).

```
[A][B]
[[-.5333333333] ...
[.8 ...
```

```
[A][B]
... -.24 -1.86666 ...
... .3 1.8 ...
```

```
[A][B]
... -1.866666667]
... 1.8 ]]
```



```

1 [Braille characters]
2 [Caret]
3 [Right-justified matrix]
4 [Right-justified matrix]
5 [Right-justified matrix]
6 [Closing screen line]
7 [Blank line]
8 [Right-justified matrix]
9 [Right-justified matrix]
10 [Right-justified matrix]
11 [Right-justified matrix]
12 [Right-justified matrix with arrows]
13 [Right-justified matrix with arrows]
14 [Right-justified matrix with note]
15 [Right-justified matrix with note]
16 [Right-justified matrix with note]
17 [Right-justified matrix with note]
18 [Right-justified matrix with note]
19 [Right-justified matrix with note]
20 [Right-justified matrix with note]
21 [Right-justified matrix with note]
22 [Right-justified matrix with note]
23 [Blank line]
24 [Blank line]
25 [End of screen]

```

Line 1: Opening screen line (GC 4 and GC 4.1).

Line 2: Caret.

Lines 3-5: This is a right-justified matrix in print and is indented four cells (GC 5.2.2).

Big (multi-line) grouping signs are *not* used in print so each line of "text" is transcribed as a separate line and no blank lines before and after are required (arrangement is *not* spatial) (GC 5.9.1).

Line 6: Closing screen line (GC 4 and GC 4.1).

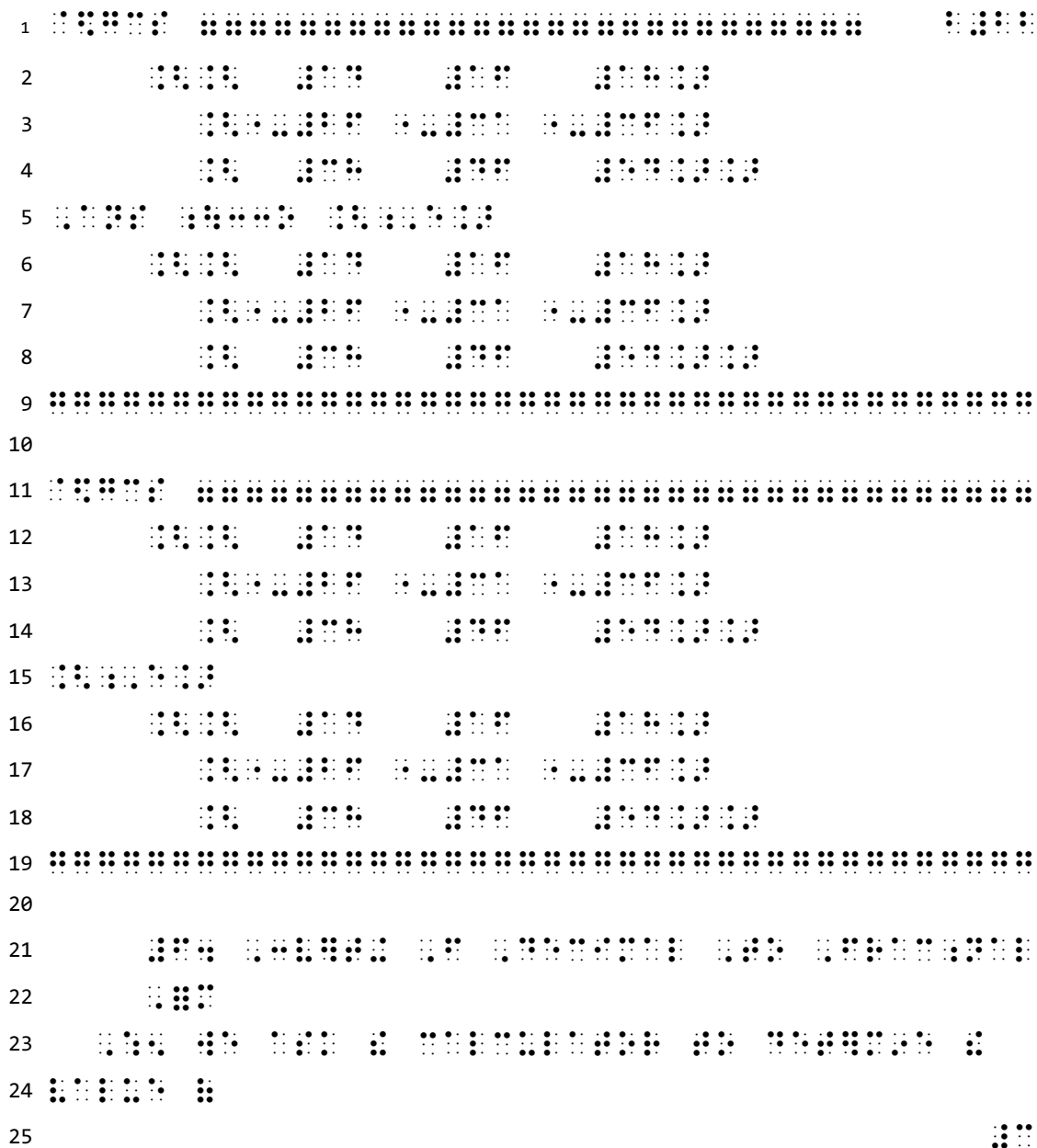
Line 7: A blank line is required (GC 4.3).

Lines 12 and 13: Use the calculator keystroke indicator to open a keystroke and the termination indicator to close. In this example, brackets indicate keystrokes (GC 2.1 and GC 2.2).

Keystrokes are spaced because they are separated by commas (GC 2.5). Retain fully capitalized words in keystroke commands (GC 2.3). Use no contractions in words within a keystroke (GC 2.4).

Line 12: Transcriber-defined right-pointing arrowhead (GC 8.2).

Lines 14, 20, and 21: Embedded transcriber's note explaining location of screen.



Lines 1 and 11: Opening screen line (GC 4 and GC 4.1).

Line 1: A top screen line can appear on line 1 when a running head is not used (BF).

Lines 2-4, 6-8, 12-14, and 16-18: These are right-justified matrices in print and are indented four cells (GC 5.2.2). Big (multi-line) grouping signs are not used in print so each line of "text" is transcribed as a separate line and no blank lines before and after are required (arrangement is not spatial) (GC 5.9.1).

Line 5: Right-pointing arrow with shaft (GC 9).

Lines 9 and 19: Closing screen line (GC 4 and GC 4.1).

1 ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠

2 ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

3

4 ⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

5 ⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

6

7 ⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

8 ⠠⠠⠠

9 ⠠⠠⠠

10 ⠠⠠⠠⠠ ⠠⠠

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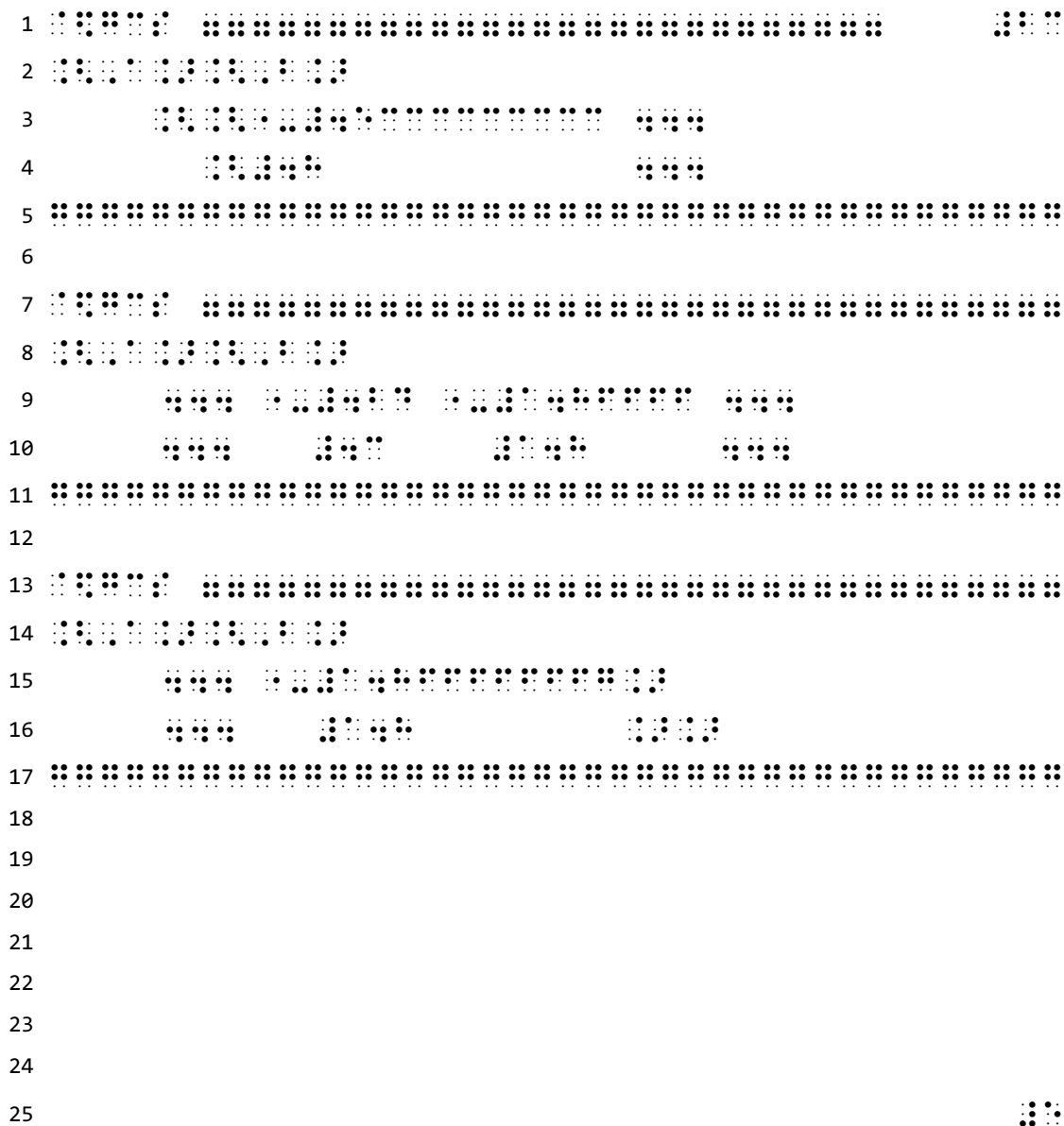
23

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Lines 1 and 2: This is a matrix within text and big (multi-line) grouping signs are used. This spatial arrangement requires a blank line before and after (GC 5.9.2).

Lines 7 and 11: Embedded transcriber's note explaining location of screen.



Lines 1, 7 and 13: Opening screen line (GC 4 and GC 4.1). A top screen line can appear on line 1 when a running head is not used (BF).

Lines 3-4, 9-10 and 15-16: This matrix is the rest of the answer to the multiplication of $[A][B]$ and is right-justified in print. It begins four cells to the right of the beginning of the line above (GC 5.2.2). The matrix is terminated with closing brackets on the last screen. Big (multi-line) grouping signs are not used in print (GC 5.9.1).

Lines 5, 11, and 17: Closing screen line (GC 4 and GC 4.1).

Sample 6

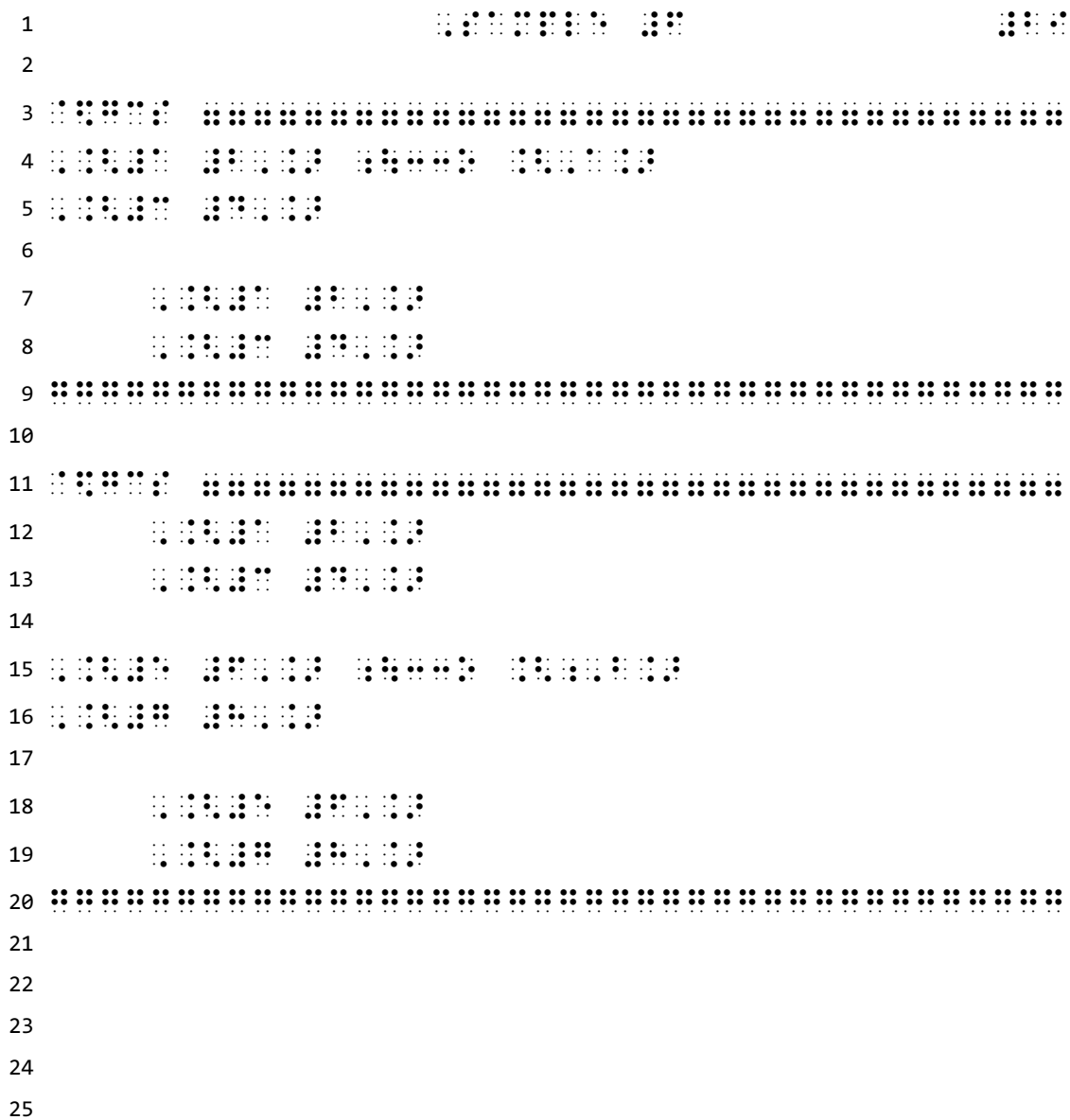
$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \rightarrow [A]$$
$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

$$\begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix} \rightarrow [B]$$
$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$
$$\begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$
$$\begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$$

augment < [A], [B] >

$$\begin{bmatrix} 1 & 2 & 5 & 6 \\ 3 & 4 & 7 & 8 \end{bmatrix}$$



Lines 2, 10, and 21: A blank line is required (GC 4.3).

Lines 3 and 11: Opening screen line (GC 4 and GC 4.1).

Lines 4 and 5, 15 and 16: Matrices are transcribed and aligned according to UEB Guidelines for Technical Materials, Section 15, (GC 5.9). Big (multi-line) grouping signs are used. This spatial arrangement requires a blank line before and after (GC 5.9.2).

Lines 4 and 15: Right-pointing arrow with shaft (GC 9).

Line 6: The matrices are spatial and require blank lines before and after except immediately following an open screen line or preceding a closing screen line (GC 5.9.2).

Lines 7 and 8: This matrix is the answer [A] and is right-justified in print. It begins four cells to the right of the beginning of the line above (GC 5.2.2). Big (multi-line) grouping signs are used (GC 5.9.2).

Lines 9 and 20: Closing screen lines (GC 4 and GC 4.1).

Lines 12 and 13: This matrix is the answer [A] (repeated from the previous screen).

Lines 14 and 17: Blank lines are required (GC 5.9.2).

Lines 18 and 19: This matrix is the answer [B] and is right-justified in print. It begins four cells to the right of the beginning of the line above (GC 5.2.2). Big (multi-line) grouping signs are used (GC 5.9.2).

Sample 7

1.

```
Y1=1000000(0.999
9)^(12X)
Y2=
Y3=
Y4=
Y5=
Y6=
Y7=
```

2.


```
TABLE SETUP
TblMin=0
ΔTbl=1
Indpnt: Auto Ask
Depend: Auto Ask
```

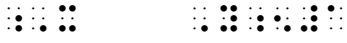
3.


X	Y1	
0	1E6	
1	998801	
2	997603	
3	996406	
4	995211	
5	994018	
6	992826	
X=0		


1 $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{5}$ $\frac{1}{6}$ $\frac{1}{7}$ $\frac{1}{8}$ $\frac{1}{9}$ $\frac{1}{10}$
2
3 1:2345678910111213141516171819202122232425
4 1:2345678910111213141516171819202122232425
5 1:2345678910111213141516171819202122232425
6 1:2345678910111213141516171819202122232425
7 1:2345678910111213141516171819202122232425
8 1:2345678910111213141516171819202122232425
9 1:2345678910111213141516171819202122232425
10 1:2345678910111213141516171819202122232425
11 1:2345678910111213141516171819202122232425
12 1:2345678910111213141516171819202122232425
13
14 1:2345678910111213141516171819202122232425
15 1:2345678910111213141516171819202122232425
16 1:2345678910111213141516171819202122232425
17 1:2345678910111213141516171819202122232425
18 1:2345678910111213141516171819202122232425
19 1:2345678910111213141516171819202122232425
20 1:2345678910111213141516171819202122232425
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- Lines 3 and 14: Opening screen line (GC 4 and GC 4.1). Screen number is inserted into the opening screen line (GC 4.5).
- Line 4: The equal sign is highlighted in the calculator screen in print.
- Lines 4 and 6-11: Identifiers are transcribed as subscripts (GC 6.1).
- Lines 4 and 5: Start and stop text lines as they are shown in print (GC 5.2).
- Line 5: The numeric indicator is required at the beginning of a braille line. Caret (GC 9).
- Lines 6-11: Symbols are not used to replace blank spaces shown in print (GC 5.5).
- Lines 12 and 20: Closing screen line (GC 4 and GC 4.1).
- Lines 13 and 21: A blank line is required (GC 4.3).
- Line 15: Retain print capitalization (GC 5.4).
- Lines 16, 18 and 19: Use contractions within a screen (GC 5.1).
- Line 17: Uppercase Greek delta.
- Lines 18 and 19: The word "Auto" is highlighted on both lines.

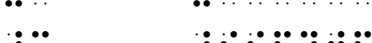
1 

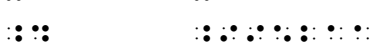
2 

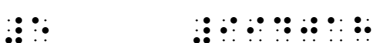
3 

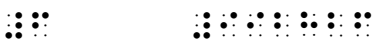
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- Line 1: Opening screen line (GC 4 and GC 4.1). A top box line can appear on line 1 when a running head is not used (BF). Screen number is inserted into the opening screen line (GC 4.5).
- Line 2: Identifiers are transcribed as subscripts (GC 6.1).
- Line 4: The number 0 is highlighted in the calculator screen in print.
- Lines 2-12: The table is formatted according to Braille Formats guidelines.
- Lines 4-10: The numbers in the second column are left-justified as in print.
- Line 11: A separation line is inserted between the table and the final expression, as shown in print. The separation line is the width of the braille page (GC 5.8).
- Line 12: An empty cell is inserted before and after the comparison sign (GC 5.10).
- Line 13: Closing screen line (GC 4 and GC 4.1).

Sample 8

If you are using a TI-83 calculator, the steps are similar. The screen by screen displays are shown below. Access n using the $\boxed{X,T,\theta,n}$ key.

1.

```
Normal Sci Eng
Float 0123456789
Radian Degree
Func Par Pol Seq
Connected Dot
Sequential Simul
Real a+bi re^θi
Full Horiz G-T
```

2.

```
Plot1 Plot2 Plot3
nMin=1
u(n)=2*n
u(nMin)=
v(n)=
v(nMin)=
w(n)=
w(nMin)=
```


Sample 9

(Sample from TI-84 Manual)

1. Press **MODE**. Press $\downarrow\downarrow\downarrow\downarrow\downarrow$ **ENTER** to select **Par** mode.
Press $\downarrow\downarrow\downarrow$ **ENTER** to select **Simul** for simultaneous graphing of all three parametric equations in this example.

```

NORMAL SCI ENG
FLOAT 0123456789
RADIAN DEGREE
FUNC PAR POL SEQ
CONNECTED DOT
SEQUENTIAL SIMUL
REAL a+bi re^θi
FULL HORIZ G-T
      ↓NEXT↓
  
```

2. Press $\downarrow\downarrow\downarrow\downarrow\downarrow\downarrow\downarrow$ **ENTER** to go to the Format Graph screen. Press $\downarrow\downarrow\downarrow\downarrow$ **ENTER** to select **AxesOff**, which turns off the axes.

```

      ↑BACK↑
MATHPRINT CLASSIC
n/d Un/d
ANSWERS: AUTO DEC FRAC
GOTOFORMATGRAPH: NO YES
STATDIAGNOSTICS: OFF ON
STATWIZARDS: ON OFF
SETCLOCK 09/02/10 10:41AM
  
```

```

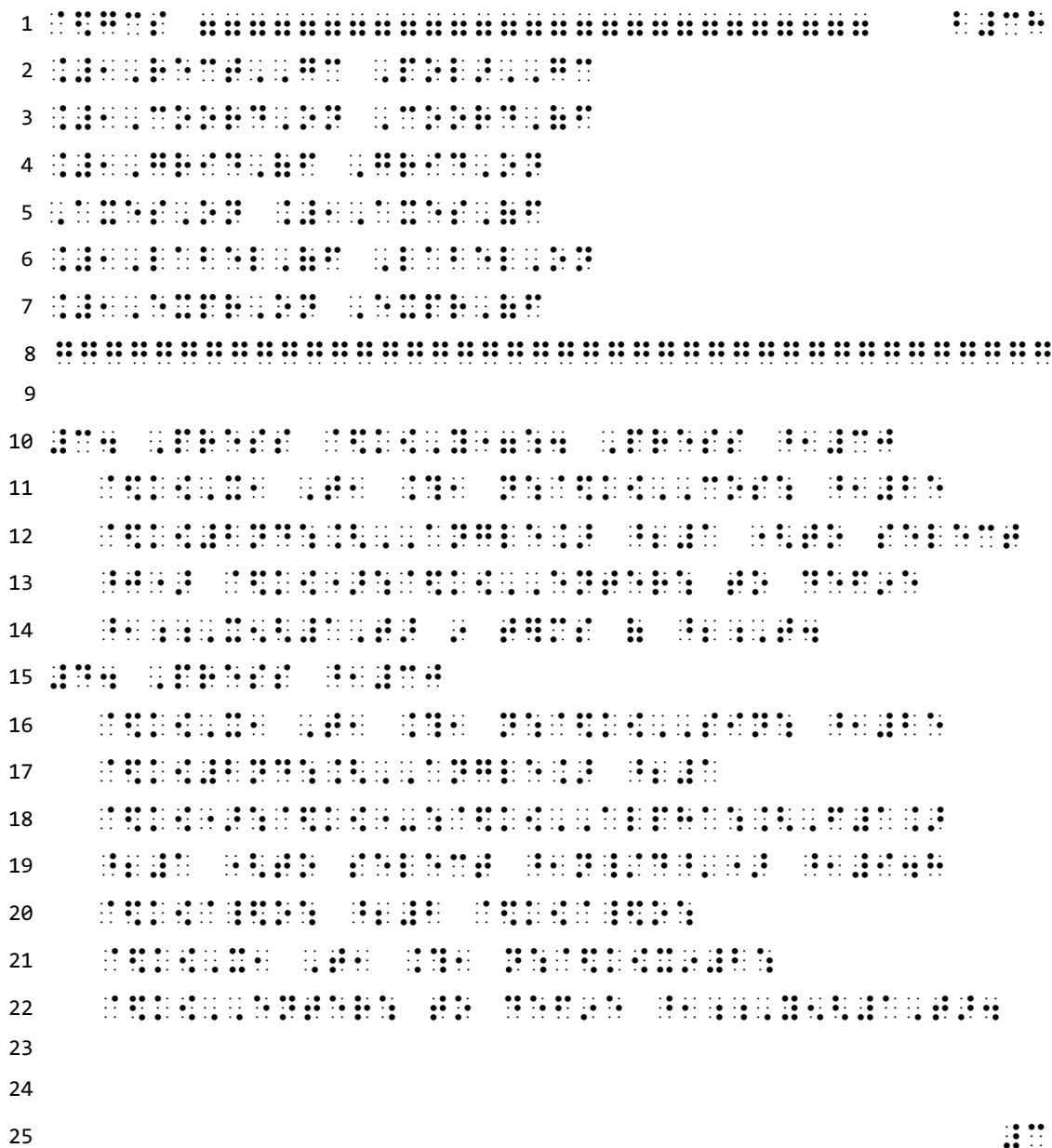
RectGC PolarGC
CoordOn CoordOff
GridOff GridOn
AxesOn AxesOff
LabelOff LabelOn
ExprOn ExprOff
  
```

3. Press **Y=**. Press **30** $\langle X,T,\theta,n \rangle$ **COS** **25** **2nd** **[ANGLE]** **1** (to select $^\circ$)
 $\langle \rangle$ **ENTER** to define **X1T** in terms of **T**.
4. Press **30** $\langle X,T,\theta,n \rangle$ **SIN** **25** **2nd** **[ANGLE]** **1** $\langle \rangle$ **[-]** **[ALPHA]** **[F1]** **1** (to select **n/d**)
9.8 $\langle \rangle$ **2** $\langle \rangle$ $\langle X,T,\theta,n \rangle$ **x²** **ENTER** to define **Y1T**.

```

Plot1 Plot2 Plot3
∴X1T=30Tcos(25°)
Y1T=30Tsin(25°)
∴X2T=
Y2T=
∴X3T=
  
```


Line 22: The word "NEXT" and the down-pointing arrows with shafts are centered as in print.
Line 23: Closing screen line (GC 4 and GC 4.1).



Line 1: Opening screen line (GC 4 and GC 4.1). A top box line can appear on line 1 when a running head is not used (BF).

Lines 2-7: Highlighted terms or numbers on the screen are indicated (GC 5.3). Retain print capitalization (GC 5.4) and use contractions within a screen (GC 5.1).

Line 8: Closing screen line (GC 4 and GC 4.1).

Line 9: A blank line is required (GC 4.3).

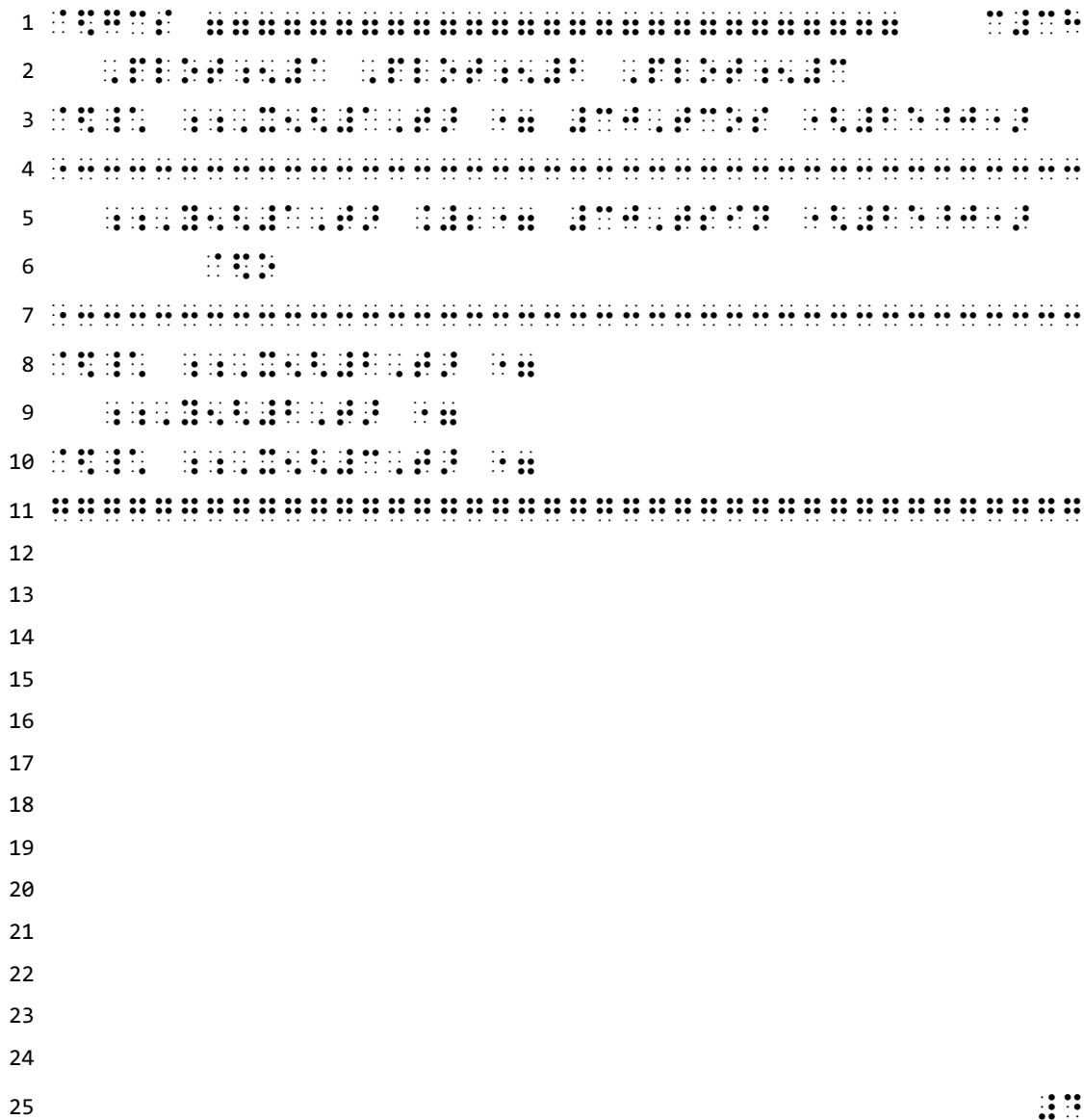
Line 10: Use the calculator keystroke indicator to open a keystroke and the termination indicator to close. Follow capitalization (GC 2.1, GC 2.2 and GC 2.3). For the keystroke that shows $Y=$, no space is left before or after the equal sign (GC 6.2).

Lines 11 and 16: No spaces are left between keystrokes or between items within keystrokes unless they are separated by commas (GC 2.5). No Grade 1 indicators are used within keystrokes (GC 2.4).

Line 12: The word ANGLE in brackets is a keystroke so it is unspaced from the keystroke before it (GC 2.5).

Line 14: **X1T** and **T** are emphasized in print and are replicated in a screen (GC 3). **1T** is a subscript of **X**.

Line 22: **Y1T** is emphasized in print and is replicated in a screen (GC 3). **1T** is a subscript of **Y**.



- Line 1: Opening screen line (GC 4 and GC 4.1). A top box line can appear on line 1 when a running head is not used (BF).
- Line 2: The identifying numbers on Plot in the screen are shown as subscripts. The subscript indicator must be used on a subscript to a word (GC 6.1).
- Lines 2, 5 and 9: Lines indented on the screen are two cells to the right of the beginning of the previous line (GC 5.2.1).
- Lines 3, 8 and 10: Line styles are at the left margin and are spaced from the expressions that follow (GC 8.4).
- Lines 4 and 7: Horizontal lines separating sections of the screen run the width of the page (GC 5.8).
- Line 6: Right-pointing arrowhead is left-justified in the print screen. Transcription begins four cells to the right of the beginning of the line above (GC 5.2.2).
- Lines 8-10: Symbols are not inserted to replace blank spaces in print (GC 5.5).
- Line 11: Closing screen line (GC 4 and GC 4.1).

Sample 10

In Exercise 51–54, use the $\boxed{Y=}$ screen to write the equation being solved. Then use the table to solve the equation.

51.

	Plot1	Plot2	Plot3
$\text{Y1} =$	$3(X-4)$		
$\text{Y2} =$	$3(2-2X)$		
$\text{Y3} =$	X	Y1	Y2
$\text{Y4} =$	-3	-21	24
$\text{Y5} =$	-2	-18	18
$\text{Y6} =$	-1	-15	12
$\text{Y7} =$	0	-12	6
	1	-9	0
	2	-6	-6
	3	-3	-12
	X=-3		

Sample 11

The horizontal component vector is defined by X_{3T} and Y_{3T} .

6. Press **[VARS]** **[▶]** **2**, and then press **1** **[ENTER]** to define X_{3T} . Press **0** **[ENTER]** to define Y_{3T} .

```
Plot1 Plot2 Plot3
Y1T=30Tsin(25°)
-9.8/2T²
·X2T=0
Y2T=Y1T
·X3T=X1T
Y3T=0
·X4T=
```

7. Press **[◀]** **[◀]** **[▲]** **[ENTER]** to change the graph style to ∇ for X_{3T} and Y_{3T} . Press **[▲]** **[ENTER]** **[ENTER]** to change the graph style to ∇ for X_{2T} and Y_{2T} . Press **[▲]** **[ENTER]** **[ENTER]** to change the graph style to ∇ for X_{1T} and Y_{1T} . (These keystrokes assume that all graph styles were set to \cdot originally.)

```
Plot1 Plot2 Plot3
∇X1T=30Tcos(25°)
Y1T=30Tsin(25°)
-9.8/2T²
∇X2T=0
Y2T=Y1T
∇X3T=X1T
```

8. Press **[WINDOW]**. Enter these values for the window variables.

Tmin=0	Xmin=-10	Ymin=-5
Tmax=5	Xmax=100	Ymax=15
Tstep=.1	Xscl=50	Yscl=10

```
WINDOW
↑Tstep=.1
Xmin=-10
Xmax=100
Xscl=50
Ymin=-5
Ymax=15
Yscl=10
```

9. Press **[2nd]** **[FORMAT]** **[▼]** **[▼]** **[▶]** **[ENTER]** to set **AxesOff**, which turns off the axes.

```
RectGC PolarGC
CoordOn CoordOff
GridOff GridOn
AxesOn AxesOff
LabelOff LabelOn
ExprOn ExprOff
```


Line 19: Closing screen line (GC 4 and GC 4.1).

Lines 21 and 22: Use the calculator keystroke indicator to open a keystroke and the termination indicator to close (GC 2.1, GC 2.2 and GC 2.3). No spaces are left between keystrokes (GC 2.5).

Line 23: See Graph Line Styles (GC 8.4).

Lines 23 and 24: Retain emphasis on **X_{3T}** and **Y_{3T}**. Show **3T** as a subscript to **X** and **Y** (GC 3).

Line 25: Use the calculator keystroke indicator to open a keystroke and the termination indicator to close. Retain capitalization (GC 2.1, GC 2.2 and GC 2.3). No spaces are left between keystrokes (GC 2.5).

1 $\frac{1}{2}x^2 + 3x - 4$

2 $\frac{1}{2}x^2 + 3x - 4$

3 $\frac{1}{2}x^2 + 3x - 4$

4 $\frac{1}{2}x^2 + 3x - 4$

5 $\frac{1}{2}x^2 + 3x - 4$

6 $\frac{1}{2}x^2 + 3x - 4$

7 $\frac{1}{2}x^2 + 3x - 4$

8 $\frac{1}{2}x^2 + 3x - 4$

9

10 $\frac{1}{2}x^2 + 3x - 4$

11 $\frac{1}{2}x^2 + 3x - 4$

12 $\frac{1}{2}x^2 + 3x - 4$

13 $\frac{1}{2}x^2 + 3x - 4$

14

15 $\frac{1}{2}x^2 + 3x - 4$

16 $\frac{1}{2}x^2 + 3x - 4$

17 $\frac{1}{2}x^2 + 3x - 4$

18 $\frac{1}{2}x^2 + 3x - 4$

19 $\frac{1}{2}x^2 + 3x - 4$

20 $\frac{1}{2}x^2 + 3x - 4$

21

22 $\frac{1}{2}x^2 + 3x - 4$

23 $\frac{1}{2}x^2 + 3x - 4$

24

25 $\frac{1}{2}x^2 + 3x - 4$

Lines 1 and 5: Graph Line Styles are listed in GC 8.4.

Line 2: Retain emphasis on **X2T** and **Y2T**. Show **2T** as a subscript to **X** and **Y**.

Lines 3 and 4: Use the calculator keystroke indicator to open a keystroke and the termination indicator to close. Retain capitalization (GC 2.1, GC 2.2 and GC 2.3). No spaces are left between keystrokes (GC 2.5).

Lines 9 and 21: A blank line is required (GC 4.3).

Line 10: Opening screen line (GC 4 and GC 4.1).

Line 11: The identifying numbers on *Plot* in the screen are shown as subscripts. The subscript indicator must be used on a subscript to a word (GC 6.1).

Lines 11, 15, and 18: Lines are indented on the graphing screen two cells to the right of the beginning of the line above (GC 5.2.1).

Line 14: Blank line shown in print (GC 6.3).

Lines 12, 17 and 19: Graph line styles are at the margin and each symbol is followed by a blank cell (GC 8.4).

Lines 12, 15 and 17-19: Equal sign is highlighted (GC 5.3).

Lines 15 and 16: Start and stop text lines as they are shown in print (GC 5.2).

Line 20: Closing screen line (GC 4 and GC 4.1).

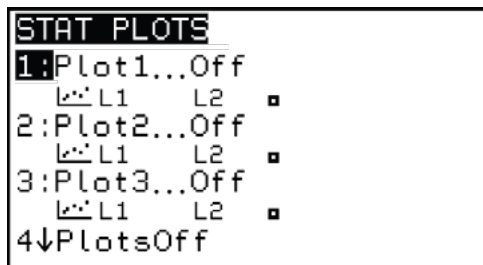
1 [FORMAT] is a keystroke and is unspaced from keys preceding it (GC 2.1 and 2.5).
 2 Use the calculator keystroke indicator to open a keystroke and the termination indicator to
 3 close. Retain capitalization (GC 2.1, GC 2.2 and GC 2.3). No spaces are left between keystrokes
 4 (GC 2.5). **AxesOff** appears in text surrounding a screen. Emphasis must be retained and contractions
 5 can be used (GC 3 and GC 5.1).
 6 A blank line is required (GC 4.3).
 7 Opening screen line (GC 4 and GC 4.1).
 8 Highlighted terms or numbers on the screen are indicated (GC 5.3). Retain print
 9 capitalization (GC 5.4) and use contractions within a screen (GC 5.1).
 10 Closing screen line (GC 4 and GC 4.1).
 11
 12
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 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25

Line 1: [FORMAT] is a keystroke and is unspaced from keys preceding it (GC 2.1 and 2.5).
 Lines 1-3: Use the calculator keystroke indicator to open a keystroke and the termination indicator to
 close. Retain capitalization (GC 2.1, GC 2.2 and GC 2.3). No spaces are left between keystrokes
 (GC 2.5).
 Line 4: **AxesOff** appears in text surrounding a screen. Emphasis must be retained and contractions
 can be used (GC 3 and GC 5.1).
 Lines 5 and 14: A blank line is required (GC 4.3).
 Line 6: Opening screen line (GC 4 and GC 4.1).
 Lines 7-12: Highlighted terms or numbers on the screen are indicated (GC 5.3). Retain print
 capitalization (GC 5.4) and use contractions within a screen (GC 5.1).
 Line 14: Closing screen line (GC 4 and GC 4.1).

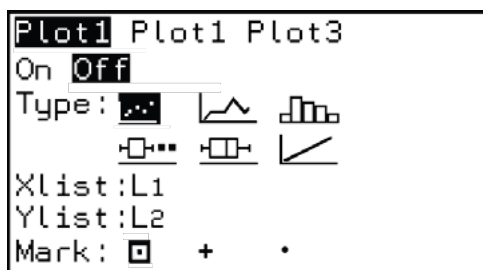
Sample 12



To define a plot, follow these steps.

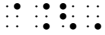


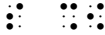

1. Press $\boxed{2\text{nd}}$ [STAT PLOT]. The STAT PLOTS menu is displayed with the current plot definitions.


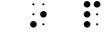


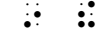





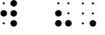

2. Select the plot you want to use. The stat plot editor is displayed for the plot you selected.




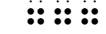



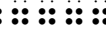

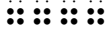
1  



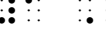

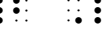

2     



3      


4    


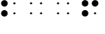

5



6        




7      


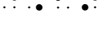


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- Line 1: This sample uses a running head.
- Lines 2-4: Transcriber's note explaining use of words to describe the icons.
- Lines 5 and 20: A blank line is required (GC 4.3).
- Line 6: Opening screen line (GC 4 and GC 4.1).
- Line 7: The identifying numbers on *Plot* in the screen are shown as subscripts. The subscript indicator must be used on a subscript to a word (GC 6.1).
- Lines 7, 8, 10 and 18: Highlighted items on the screen are indicated (GC 5.3).
- Lines 10-15: The plot types are named rather than drawn (GC 8.5). The list is transcribed in cell 2 as a runover to *Type* (GC 5.2.5) The names of these types are shown in braces.
- Lines 10 and 15: Blank lines normally required for a list are not inserted in a graphing calculator screen unless they are shown in print (GC 6.3).
- Line 19: Closing screen line (GC 4 and GC 4.1).

Sample 13

Solution:

Keystrokes

2nd **QUIT**

F1 **8** :Clear Home **CLEAR**

◆ **Y=**

CLEAR **X** **^** **2** **ENTER**

CLEAR **.5**

X **^** **2** **ENTER**

CLEAR **2** **X** **^** **2**

ENTER

CLEAR **(-)** **1.5** **X** **^** **2**

ENTER

▲ **▲** **▲** **▲** **2nd** **F6**

2 :Dot

▼ **2nd** **F6** **1** :Line

▼ **2nd** **F6** **4** :Thick

▼ **2nd** **F6** **1** :Line

Screen Display

F1 Tools	F2 Zoom	F3 Edit	F4 ✓	F5 All	F6 Style		
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^PLOTS

✓y1=x²

✓y2=.5·x²

✓y3=2·x²

✓y4=-1.5·x²

y5=

y5(x)=

MAIN RAD AUTO FUNC

F1 Tools	F2 Zoom	F3 Edit	F4 ✓	F5 All	F6 Style		
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^PLOTS

✓y1=x²

✓y2=.5·x²

✓y3=2·x²

✓y4=-1.5·x²

y5=

✓1:Line
2:Dot
3:Square
4:Thick
5:Animate
6:Path
7:Above
8:Below

y1(x)=x²

MAIN RAD AUTO FUNC

Lines 16-22: Lines are indented in print. Transcribe two cells to the right of the beginning of the previous print line (GC 5.2.1).

Line 23: Closing screen line (GC 4 and GC 4.1).