Guidelines and Standards for Tactile Graphics, November 2011

- BANA: www.brailleauthority.org, click "Code Books and Guidelines" on the left side of the page, then click on the link for Tactile Graphics in the middle of the page.
- BANA's Tactile Graphics page:
- Printable/Searchable PDF Version:
- Downloadable HTML Version:
- Online HTLM Version:

Braille Formats for Tactile Graphics

1. Running Head *
2. Blank line **
3. Heading – center
4. Blank line **
5. Caption – 7/5
6. Trans. Note – 7/5
7. Key: – 7/5
8. Blank line
9. Keyed items
10. Blank line
11. Tactile graphic

* Omit if Running Head is not used.
** Omit if no centered heading.
Where does the graphic go?

- after paragraph where mentioned
- not obvious? at the end of page
- move to print page where mentioned
  - Insert transcriber’s notes such as:
    - Figure 2.3 moved from page 123.
    - Figure 2.3 moved to page a121.

Left vs. Right Side Page

- Key and graphic together, right
- Single page key
  - Single page graphic, right
- **NEW!** Single page graphic, left
  - Multiple page key, right pages
  - multiple key pages are each single sided
Left vs. Right vs. ...

- Single and multiple page keys with
  - Single and/or multiple page graphics (layers or sections)
    - read section on complex diagrams
- Embedded braille dot graphics
  - leave a blank line before and after, treat like spatial material in Nemeth
    - number lines
    - digital clocks
    - keyed coins

Page Numbering

- Interpoint
  - blank pages have implied print and braille page numbers
    - page left blank before a tactile graphic
    - back side of tactile graphic page
- Single Sided
  - each page has a print and a braille page number
    - some pages are inserted as left side pages
Left Key, Right Graphic

- implied print and braille page numbers (red)
- key is single sided

Please read guidelines before attempting this!
**Numeric Indicator**

- **Omit**
  - Measuring tools
    - Barometer
    - Ruler
    - Protractor
    - Thermometer
    - Beaker
  - Number lines
  - Line plots
  - Cartesian graphs
  - Clocks

- **Include**
  - Pie charts
  - Histograms
  - Bar graphs
  - Line graphs
  - Scatter plots
  - Pictographs
  - Time lines
  - Latitude/Longitude

**Letter Indicator**

- Use letter indicator
  - Single lower case letter as label -- b
  - Uncapitalized letters corresponding to a short form word (ab, cd) if preceded and followed by a space (Warning, special rule for Nemeth code)

- Do not use letter indicator
  - Single upper case letter as label -- B
  - ab referring to the line segment from point a to point b

**Nemeth Exception**

No alphabetic keys allowed in the example below.
**Digital Clocks**
- Use number indicators in digital clocks!
- K-3rd grade, draw clock outline
  - leave 1/8” or more between braille and spur line
- 4th and up, use braille dot outline
  - This clock is a “Spatial Arrangement.” It is preceded and followed by a blank line. It does not need to be on a right side page.

**Analog Clocks**
- Numbers (1, 2, 3, ..., 12)
  - no numeric indicator
  - 1/8” outside tick marks
- Circumference
  - different texture than tick marks, hands
  - size
    - small if no minute tick marks (4/page)
    - large if minute tick marks are necessary (1/page)

**Analog Clocks**
- Tick marks – Hours
  - 3/8” to 1/2”, center on circumference line
- Tick marks – Minutes
  - include only if necessary
  - ¼”, center on circumference line
  - tactually distinct from hour tick marks
  - include tick mark for every minute
    - not just the relevant 5 minute interval
  - omit minute numbers
**Analog Clocks**

- **Hour Hand**
  - dotted or dashed, short
  - arrowhead
- **Minute Hand**
  - smooth line, long
  - no arrowhead
- **Second Hand**
  - finer smooth line
  - no arrowhead

**Analog Clock**

![Analog Clock Diagram](Slide 18)

**Spinners**

- Use numeric indicator
- Enlarge enough to feel segments
- Include pointer arrow
- Outline distinct from segment lines
- All labels go 1/8” outside spinner
  - replace color/texture with names of colors

![Spinners Diagram](Slide 19)

![Spinners Diagram](Slide 20)
Circle Graphs

- Use numeric indicator
- Enlarge enough to feel segments
- Okay to rotate slightly
- Labels go 1/8” outside each segment
  - OR use ¾” to 1 ½” lead lines
- Key lengthy labels
- Key listing starts at top and goes clockwise around graph
- Omit shading

Circle Graph

Money -- not tactile

- When identification of coins or bills and their values is being taught
  - do not illustrate images on coins or bills
  - real coins and bills should be used in class
- Use a transcriber’s note to tell how many twenty-dollar bills, ten-dollar bills, ... dimes, nickels, and pennies.
Money -- tactile

- When coins and bills are used for calculation.
- Bills
  - $1 for one dollar
  - $5 for five dollar
- Coins
  - penny
  - nickel
  - dime
  - quarter
  - half-dollar
- Money diagrams are “Spatial Arrangements” and are preceded and followed by a blank line.

Money

Write the total value in dollars and cents.

$5.00, $5.25, $5.35, $5.40, $5.45, $5.46

Write the total value in dollars and cents.

Number Lines

- include arrowheads if shown in print
- always begin and end with an arrowhead or axis line
- no numeric indicator below axis line
  - numbers above the number line require a numeric indicator
Number Lines
- numeric and alphabetic labels go below number line.
- align dots 123 of ... with the tick mark
  - the first digit of a number
  - a square root sign
  - an opening fraction indicator
- + or - sign goes left of tick mark

Number Lines – K-3rd Grade
- draw number line (not braille dots)
- bold, shaded, colored parts of axis line should feel stronger
- tick marks ½” centered on axis line
- put circles on the axis line

Number lines – K-3rd Grade

Number Lines – 4th Grade +
- use braille symbols for number line
  - list symbols on Special Symbols page
  - OR when they are used
- draw arrows, loops, or lead lines
- put circles (distinctive markers) on line above axis line

Number lines – 4th Grade +
**Number lines – too large**
- start at the margin
- omit unused portions
- omit alternate labels, retain tick marks
- move labels down, use lead lines
- rotate to vertical
  - draw number line, \( \frac{1}{2} \)” wide tick marks
  - dots 25 of value align with tick mark
  - low numbers at the bottom

**Number lines – divided**
- start in cell 1
- blank line
- runover begins with coordinate mark
- no + or – sign on value
  - coordinate mark and value both in cell 3
- if value has + or -
  - coordinate mark in cell 4
  - + or - sign starts in cell 3
- tick marks do not need to align vertically

**Line Plots**
- Line plots are a series of dots or x’s above a number line.
- follow the number line rules
- use full cells for the dots or x’s
  - include a TN about the change

**Line Plots – K-3**

![Line Plot Example](image-url)
Line Plots – 4th +

Graphs – Lines
- Axis lines
  - include arrowheads shown in print
    1. arrowheads outside boundary of grid
    2. arrowheads reach edge of grid
  - retain zig zag omission indicator
- Tick marks
  - include only if shown in print
  - ½” centered on axis line
  - same line type as axis lines

Graphs – Grid Lines
- quietest lines on diagram
- ≥ 3/8” apart
- okay to omit some grid lines
- okay to add grid lines (none in print)
- grid lines should be recognizable within shaded areas

Graphs – More Lines
- Plotted lines
  - solid unless print shows dashed
  - dashed lines have math meaning
- Lead lines
  - keyed labels are preferred to lead lines for plotted lines and points
  - lead lines should be similar to grid lines
Graphs – Point Labels

- 1/8” away
  1. upper left
  2. upper right
  3. lower left
  lower right

Cartesian Graphs

- x-y graphs
- slightly different rules than line, bar, or point graphs

Cartesian Graph – Axis Labels

- x-axis label
  1. to the right of the axis line
  2. OR above x-axis line, near the right end

- y-axis label
  1. above axis line
  2. OR to the left of the y-axis line, near the top
- Origin: O or 0 as in print, below x-axis, left of y-axis
Cartesian Graphs – Axis Values

- **x-axis (horizontal)**
  - no numeric indicator
  - below x-axis
  - align dots 123 with grid/tick marks
  - - or + sign goes to the left of the tick mark

- **y-axis (vertical)**
  - no numeric indicator
  - left of y-axis
  - align dots 25 with grid/tick marks
  - Okay to omit some values

Cartesian Graph
Other Graphs* – Axis Values

- x-axis values (horizontal axis)
  - use numeric indicators for numbers
  - below x-axis
  - align dots 456 of value with grid/tick
  - + or - sign goes left of tick mark
- axis label
  - below all axis values
  - left justified with first axis value
  - if just “x” then right of axis line

* Line Graphs, Bar Graphs, Scatter Plots

Other Graphs* – Axis Values

- y-axis values (vertical axis)
  - use numeric indicators for numbers
  - left of axis line
  - align dots 25 of value with grid/tick
- axis label
  - above axis line
  - block in cell 1, runover if > 20 cells wide
  - if just "y" then above axis line

* Line Graphs, Bar Graphs, Scatter Plots

Line Graph
**Line Graph with Tick Marks**

![Line Graph with Tick Marks](image)

**Line Graph – Outside Tick Marks**
- Some examples show tick marks only outside axis lines. Less “cluttered.”

![Line Graph – Outside Tick Marks](image)

**Graphs – Origin**
- on line graphs, bar graphs, scatter plots
- single 0 in print applies to both axes
- below horizontal axis
- above horizontal axis labels
- left of vertical axis
- right of vertical axis labels
Graph, with origin 0

Scatter Plot
- plotted points
  - white space not required around points
  - points may be as small as 1/8”
  - okay to overlap points
- retain number and position of points
- grid lines can sometimes be omitted

Scatter Plot – Labels
- vertical label above axis line
  - label blocked in cell 1 (< 21 cells wide)
  - draw vertical axis below in cell 3
- vertical label beside axis line
  - label blocked in cell 1 (< 21 cells wide)
  - centered vertically on axis line
  - 1/8” blank space before axis line
- horizontal axis label
  - label starts below vertical axis line
Mice versus Men Scatter plot
- "Mice" starts in cell 1, either above the axis or to the left of the axis.

Scatter Plot

Bar Graphs
- use numeric indicator
- retain orientation if possible
- If rotated, insert transcriber's note
  - In print, bars are shown vertically. In braille, the bars are shown horizontally.
- key bar textures if necessary
- key listing of bars in order
  - top to bottom
  - left to right
Bar Graphs – Lines
- grid lines
  - 3/8” apart
  - quiet, least distinct lines on graph
  - only those perpendicular to bars
- axis lines
  - louder than grid lines
- tick marks
  - if shown in print
  - 1/2” long, centered on axis line

Bar Graphs – Vertical Bars
- vertical axis label
  - above axis line, blocked (cell 1)
  - < 21 cells wide
  - OR "to the top left of the axis line"
- vertical axis values
  - decimal align numeric labels
  - align dots 25 of values with grid lines
- bar labels
  - center bar label on width of bar, below graph
  - alternate labels on line below, lead lines

Vertical Bar Graph
Key Left, Bar Graph Right

Bar Graphs – Horizontal bars

- horizontal axis values
  - below axis line
  - align dots 456 with grid lines
  - alternate values on line below, lead lines
- horizontal axis label
  - below axis values
  - left justified with first axis value
- bar labels *
  - left align and block text labels
  - use guide dots (space, 3+ guide dots)
  - place value align numeric labels
  - center labels vertically on each bar

* Different rules apply to braille dot only bar graphs!
**Horizontal Bar Graph**

```
FAVORITE CAVE ANIMALS

Cave Animal
Crayfish
Salamander

Number of Children
```

**Double Bar Graph**
- Key the bar texture/meanings
- Okay if paired bars touch

**Bar Graphs – Braille Dot Only**
- grades 4 +
- simple graphs with whole units
- read pages 6-45 through 6-47 of the guidelines

**Horizontal Bar Graph**
**Histogram**
- bar graph divided into equal intervals
- follow the rules for bar graphs
  - EXCEPT bars must touch each other

**Pictographs**
- K-3rd grade
  - must be tactile graphic
  - replace complex pictograph shapes with simple geometric shapes
- 4th grade and up
  - may be embossed braille dot graphic
  - use full cell for shapes

**Pictographs**
- put print key before pictograph 1/3
  - Each • = 1,000 students
  - no TN indicators necessary
- if no print key, use a transcriber's note in 7/5 to describe the symbol(s) used

**Pictographs**
- row headings 1/3
- blank cell after longest row heading
- use guide dots after short headings (space then 3 or more guide dots)
- begin pictures or symbols
- one blank cell between each picture or symbol

**Pictographs – Embossed**
- shapes must be whole or half
- • represents a whole unit
- • represents a half unit
- pictograph in boxes may retain the top and bottom lines

**Pictograph**

![Pictograph Example](image-url)
**Pictographs – Tactile**
- tactile pictographs are required:
  - when partial units are shown
    - EXCEPTION: half units can be embossed
  - for K-3rd grade
- omit box lines

**Counting Symbols – K-3rd**
- K-3rd grade, use simpler solid shapes
  - squares
  - circles
  - triangles
- 1/4” spacing between shapes
- 3/4” spacing between groups of shapes
- follow print for random vs. regular spacing of counting symbols

**Counting Symbols – 4th +**
- ∷ represents an object
- ∴ represents half an object (dots 123)
  - if surrounding text refers to actual print object, then explain change in TN.

**Counting Symbols – 4th +**
- 1 blank cell between symbols
  - runover to a new line counts as a required space
- 3 blank cells between groups of symbols
Counting Symbols
- no space between punctuation or grouping signs and counting symbols

(■ ■ ■) + (■ ■) =

- leave one blank cell between objects or groups of objects and signs of operation or comparison

■ ■ ■ ■ + ■ ■ =

1's, 10's, 100's – K-3rd
- unit block 3/8" square (1 cm)
- group as in print
  - 1/4" between blocks
  - 3/4" between groups
- top align +, -, = signs
  - leave 1/4" before and after

1's, 10's, 100's – 4th +
- key counting objects
  - on for one
  - tn for ten
  - hn for hundred
  - th for thousand
- 1 cell between objects
- 3 cells between groups
- 1 cell between counting objects and +, -, =, etc.

Counting Groups 10\textsuperscript{th}, 100\textsuperscript{th}
- draw grids for 10ths and 100ths
  - 3/8" squares
- group as in print
  - 1/4" between grids
- indicate shaded squares with a single raised dot (about 1/8"")
- top align +, -, = signs, leave 1/4" between counting group and signs
Counting Groups

In 1 and 2, write a fraction and a decimal for each shaded part.

Slide 82

Counting Groups

In 1 and 2, write a fraction and a decimal for each shaded part.

Slide 83

Measuring Tools

- omit numeric indicator!
  - Thermometer
  - Barometer
  - Ruler
  - Protractor
  - Beaker

Thermometer

- degree sign can go above values
- tube ≥ 3/8" wide
- tick marks on the left, outside tube
- other labels on the right, outside thermometer
  - 1/2" lead line touches thermometer
  - (printed examples show 1/2" lead lines, rules say 3/4" long lead lines)

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Slide 85
**Thermometer**
- both C and F, show one on each side
  - values on left are right aligned
  - values on right are left aligned
  - that is, all the numbers are crammed in towards the thermometer

**Thermometer – Tick Marks**
- enlarge, tick marks ≥ 1/8” apart
  - double space braille for 4 minor tick marks
  - single space braille for 1 minor tick mark
- tick marks touch thermometer
  - major tick marks 1/2” long
  - minor tick marks 1/4” long, quieter
- 1/8” between value and tick mark
  - align dots 25 with tick marks
**Beaker**

**Rulers & Protractors**
- accuracy ± 1/4", ± 5 degrees
- no numeric indicator
- tick marks
  - major tick marks for whole units are longer than minor tick marks for fractions
  - align dots 123 of value with tick marks
  - inches or cm brailled under left end of ruler

**Rulers**
- object to be measured
  - do not scale unless smaller than 1/4" *
  - raised 1/16"
  - 1" blank on either side of a line
  - 1" blank on all sides of a shape

* Small objects for measurement must be scaled up and a TN added such as: In braille, the print image has been enlarged to 10 times the actual size.

**Rulers**
- endpoint lines (lines from object to ruler)
  - 3/8" to 1/2" long
  - no arrowheads
  - different texture than other lines on diagram
- Object + Ruler
  - okay to enlarge both proportionately to show small increments.
  - include a TN if you enlarge the ruler and diagram
Protractors
- Angles to be measured
  - 3\(^\circ\) rays
  - raised 1/16"
  - 1" blank on both sides of a shape

3-D Shapes
- Solid lines for visible lines
- Dashed or dotted lines for hidden lines
  - TN: In these 3-dimensional diagrams, the "hidden lines" are shown as broken lines.
  - Or include visible and hidden lines on the Graphic Symbols page
- Enlarge, retain proportions
- Limit use of shading

3-D Shapes – Orthographic *
- Mat Plan
  - TN: Cube structures using stacked columns.
  - draw top view
  - label front, back, left, right
  - braille the number of blocks in each vertical column on each block

* Think block diagrams.

3-D Shapes – Orthographic
- Layering Method
  - TN: Stacked cubes in 3 layers.
  - Layer 1, bottom
  - Layer 2
  - Layer 3, top
  - for each layer, draw shaded blocks
  - label each layer with front, back, left, right

3-D Shapes – TN Page
In braille, cubes may be presented from a top view in either column or layer form. When a solid structure is shown in print, only a base layer will be shown, with a number designating the total cubes stacked in each column. When the print structure is shown with one or more cubes missing (below an upper level), each layer will be shown in order from bottom to top. The shaded area represents the position of a cube.
**Venn Diagrams**
- retain shape (circle or ellipse)
- use different line type for each shape
- lead line breaks circle
- key to avoid lead lines
- use numeric indicator

**Box-and-Whisker Plots**

**Stem & Leaf Diagrams**
- These are covered in the guidelines, but we are out of time.
- Please fill out your evaluation forms.
- Thank you for coming today!