# ANYMATH KIT

## TEACHER'S GUIDE

# ANYMATH Kit

The AnyMath Kit was developed to give students and teachers a wide range of options for creating accessible math-related displays. The kit has the following components:

- A grid board with a low-profile hook-material surface, 20 x 20 squares;
- A board with a solid covering of hook material for general illustrations;
- A board with hook material for storing pieces;
- Two kinds of cord with contrasting colors, textures, and weights;
- Outline shapes, lines, and point symbols backed with loop material;
- Blank tiles and tiles with numbers, mathematical signs, and letters in large print and braille.

The kit components have several useful features:

## Boards

- The Grid Board and Blank Board fold so that you may use a full board or half board, depending on your purpose. The boards and the tape hinges are very durable, but you should encourage students not to force the boards too strongly in the non-folding direction.

- The midpoints of the non-folding edges of the grid board are marked with small notches to help you locate the center of the board easily.

- The Storage Board folds shut to contain and protect the pieces placed on it. The board will easily accommodate all of the tiles and point symbols, along with other items. The largest items (the outline shapes) should be stored in their packaging bag.

## Cords

Two kinds of cord, heavy and smooth, are provided for use in laying out lines, curves, and shapes. These have been selected for texture and color contrast and for their ability to hold securely in place on the hook material.

The heavier of the two cords is provided in pre-cut pieces that have been heat-sealed at their ends to prevent fraying. They may be reused many times without becoming too "fuzzy" to be read clearly.

The smoother cord is provided as a single piece which you or students may cut as needed.

- Because cords fray from repeated contact with the hook material, they are considered consumable (or replaceable) items. The heavier of the two cords is a kind commonly sold as "parachute cord" or “paracord” (although that term is sometimes used for other varieties of thin rope that do not stick to the AnyMath boards). The smoother cord is commonly known as "bracelet cord," "rattail," or "silky cord," and it can be bought inexpensively in many colors.

- To keep cords from fraying at the ends, you may tie a small knot at each end, or you may wrap a piece of tape around the cord and then cut through both tape and cord to leave a sealed tip.

## Shapes

Shapes (polygons and circles) are provided as outlines so that relationships or labels may be shown inside the shapes as well as outside. Using lengths of cord inside the shapes, for example, you can illustrate the medians of a triangle or a chord of a circle. The following shapes and quantities are included:

30-60-90° triangle, 1
45-60-75° triangle, 1
45-45-90° isosceles triangle, 1
60-60-60° equilateral triangle, 1
30-40-110° triangle, 1
30-40-110° triangle, 2 small
square, 1
rectangle, 1
trapezoid, 1
parallelogram, 1
hexagon, 1

4.5" diameter circle, 1
6" diameter circle, 2
ellipse, 1

- The midpoints of the sides of the polygons and quadrant points of the circles are marked with small bumps on the outer edges.

## Tiles

Because there are many different requirements for both numeric and letter labeling in math, the AnyMath Kit has label tiles in a variety of formats as listed here. Note that for braille indicators that have no print counterparts, abbreviations are used for the print labels on the tiles.

### Numerical tiles:

Numbers with # signs — 20 tiles (two each of 0 through 9)
Numbers without # signs — 50 tiles (five each of 0 through 9)
# sign — 5 tiles
. decimal sign — 7 tiles
( ) signs — 6 tiles (three of each symbol)
/ sign — 3 tiles

### Operation signs:

+ sign — 5 tiles
– sign — 10 tiles
× sign — 4 tiles
÷ sign — 4 tiles

### Relation signs:

= sign — 6 tiles
<> signs — 8 tiles (four of each symbol)

### Indicators:

Superscript (sup)/baseline (base) indicators — 6 tiles (three of each symbol)
Fraction open (fo)/fraction close (fc) — 6 tiles (three of each symbol)
Fraction bar (bar) — 4 rectangle tiles

### Letters:

Letters with capital sign — 7 tiles (one each of A, B, C, D, E, F, O)
Letters with Grade 1 indicator — 7 tiles (one each of a, b, c, d, e, x, y)
Letters with no sign — 38 tiles (one each of a through z; four extra x, y)
Capital sign (cap) — 2 tiles
Grade 1 indicator (Gr 1) — 2 tiles

### Multiple use:

Blank squares — 60 tiles
Blank rectangles — 12 tiles

+ Braille labels, whether one cell or two, are centered on the tile from left to right and positioned slightly below center from top to bottom.

+ Numbers and letters are further distinguished by the shapes of the tiles: Number tiles have an angled notch cut from the upper right corner, while letter tiles have a small tab protruding at the upper right.

+ The blank tiles have several uses. They may serve as counting units or markers; they may be used to fill an area (for instance, in graphing inequalities); and they may be used in making histograms or bar graphs.

Blank tiles are also provided so that you can make your own labels with them. Simply produce the braille signs you need on adhesive-backed film or paper, trim them to fit within the 5/8" square, and apply them to blank tiles (use the rectangle tiles for labels longer than two cells). Cut off the upper right corner of the tile for numbers or math signs, or cut the top edge leaving a tab for letter labels.

## X-Y axes and short strips

- The long, narrow plastic strips provide a quick way to lay out axes or number lines.

- The shorter strips are intended as dividers between different sections of tiles on the storage board. Of course, they may also be used as line segments or axes in smaller graphs when needed.

## Point symbols

- Three point symbols are provided in the kit—solid circles (30), dotted circles (30), and arrowheads/triangles (12). These may be used for various purposes, from filling areas to marking specific points.

# Use and Care of the AnyMath Kit

All items in the AnyMath Kit, with the exception of the thinner cord, are meant for long and repeated use, but there are some actions you can take to prolong the life of the materials. Following these suggestions will ensure that the items remain in good condition.

- The hook surface of the boards can be damaged through rough treatment. One way to mar the surface is to dig or scratch at it with a sharp implement. A less obvious kind of damage comes from repeatedly “ripping” the cords or other pieces in the kit off the board. This kind of quick tearing will weaken the grip of the hook material rapidly and can render sections of it ineffective. When introducing the kit to students, demonstrate how to pull items off the boards smoothly and easily, rather than tearing them off violently, to avoid this kind of damage.

- Using care with the cords in the kit will prolong their use, too. When placing cords on a graph, practice setting them with only as much contact as needed to keep them in place and readable. Likewise, remove them with a steady pull rather than yanking them up roughly. Although the cords may be perfectly usable after they've become fuzzy, it is preferable to keep them "smooth" as long as possible to provide a clearer presentation.

  Many students with blindness or visual impairment have had less practice in cutting with scissors than their sighted peers, which means that cutting appropriate lengths of cord when needed may pose a challenge. The key to cutting a cord effectively is to keep tension on it, which is typically done by holding the cord bent over on itself and applying tension with the lower blade of the scissors while cutting.

- The Storage Board can hold the whole assortment of tiles, strips, and point symbols provided in the kit, but it will be more practical to use if you only set out appropriate quantities of your most needed items on it. For example, if you seldom need the entire collection of blank tiles, or point symbols, you may leave some of them in their original bags. This makes it quicker to scan and locate items on the board and ensures that you have extras when pieces get lost.

- The short strips make useful section dividers on the Storage Board and can also help in arranging tiles in straight lines.

- The appearance of the hook material on the boards will benefit from occasional cleaning. You'll discover early on in using the boards that some clothing fabric attaches readily to the hooks!

  When a board does accumulate fibers or dirt from use, the recommended cleaning tool is a reusable lint roller. These rollers—the kind with a squishy, rubbery surface—are easy and effective to use when fibers are embedded in the hook material. They are inexpensive, washable, and commonly available at stores and online.

## Notes for Teachers

Graphing is a useful skill that is by nature abstract. A tangible graph can be every bit as informative to a tactile reader as a print graph is to a sighted reader, but always keep in mind that feeling is entirely different from seeing. Of the many options used to make visual graphs readable (such as colors, shading, fonts, angled perspectives, and so on), most are not applicable in the tactile realm, and it takes a good deal more time to apprehend spatial displays of data through touch than through sight.

A fundamental part of reading tactile graphs is an ability to seek information methodically and purposefully. Also look for students to show specific hand skills that are fundamental—such as the ability to count grid squares, track lines, locate the origin or other point of intersection, or hold one place while scanning another—before doing complex graphing tasks.

Students who are inexperienced in drawing and marking may also need repeated practice to place points and other items accurately (that is, to find and mark a location with one finger and then set the item in that same spot). When appropriate, encourage students to re-check their work in order to improve their accuracy.

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An important part of math instruction is asking students to show their understanding of concepts by turning in their work. The AnyMath Kit can be useful here when combined with both older and more recent technologies.

A tried-and-true method is to have students lay out a graph on the AnyMath board and then replicate it on copy paper or notebook paper for turning in. The paper is laid on top of the graph and fastened with a clip. The student then makes raised images on the paper by pressing down along both sides of each line (or curve) in the graph with a fingernail, effectively creasing the paper. (The thinness of the paper allows the student to feel and track the items through it.) While the resulting raised-line image does not show the background grid, it will be sufficient to show the shape and position of a student's graph and to give the student a tangible page to review.

In a similar way, you can teach students to rub over the tops of the lines with crayon to make lines that are more visible. Use one or two fingers on one hand to straddle the raised line (with the cord or other item underneath), then place the flat edge of the crayon up against the fingers and guide it along the "ridge," making sure to trace the line completely from beginning to end. With practice, this method can be used to produce a copy for review either visually or tactually.

Digital cameras are widespread, and allow the photographing of students' work. With some practice, many students will be able to photograph their diagrams on an AnyMath board using a smart phone and then electronically submit the photos to show their work. Several companies now offer rigid stands which position the camera properly for such a task, taking the guesswork out of the process.

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A final suggested use of the AnyMath Kit is as a platform for number games and puzzles. There are many number-based puzzles to be found online, most of which use a grid format. Sudoku, of course, is the most well-known of these, but there are numerous others which call upon logical thinking, attention, and scanning skills to solve, such as Kakurasu, Futoshiki, Skyscrapers, and Neighbors. Most of these can range in difficulty from easy to hard. An online search for Japanese number puzzles will yield lots of results; try out a variety with students to see which ones are most engaging. For these puzzles, the setups may be found online and transferred to the Grid Board for students to complete. These can offer interesting and exciting opportunities for building skills through play.

**ANYMATH Kit**



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