

**ETC! Conference, February 2000**  
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**Ideas for student use of technology to learn grades 4-8 math concepts**

Internet Resources (these are sites that students could access as a part of a lesson)

<http://www.interest.com/hugh/calc/>

Hugh's Mortgage and Financial Calculators

There are several good ones here that can be used in grades 4-8 with some structure. There is a lunch savings calculator, What's a Million, Simple Savings Calculator, Mortgage Calculator, Lease Calculator.

<http://www.figurethis.org/index40.htm>

Figure This! Math Challenges for Families

A variety of problem-based challenges based on household items.

<http://library.advanced.org/tq-admin/month.cgi>

Fractal Tutorials. This is a winning ThinkQuest entry. There are 3 levels of tutorials here.

<http://math.rice.edu/~lanius/frac/>

Another Fractals site, appropriate for grades 4-8.

<http://www.accessone.com/~bbunge/Algebra/Algebra.html>

Interactive Algebra! This has Java-based activities that deal with factoring, equalities, inequalities, and graphing.

<http://eloan.com/>

E-loan. Lots of resources here for financing home purchases. Lots of good problem solving opportunities can be constructed, with students using this site to explore.

<http://www.learner.org/exhibits/statistics/>

Interactive site dealing with Statistics.

<http://www.wolinskyweb.com/measure.htm>

Websites that convert from one unit of measure to another.

<http://www.pbs.org/teachersource/math.htm?default>

PBS Teacher Source website. Has lots of great math ideas, some are interactive.

<http://math.rice.edu/~lanius/Patterns/>

Fractions concepts. Some material is interactive, other material could be printed.

### Slide Tessellations in HyperStudio

1. Select a color from the menu. Double-click the rectangle tool to draw a filled rectangle. If the shift key is held down as the shape is drawn, it will make a square.
2. Using the lasso, start along the top, wiggle the mouse around and exit the bottom of the square. Continue to draw with the lasso tool and connect it along the left side of the square so it meets where you first started drawing. The left section of the square will then be selected.
3. Hold the shift key (so it doesn't move up/down) and slide the chunk over to the right. Position the chunk on the right side, leaving no overlap and no gaps.
4. Repeat the process, wiggling from left to right and then sliding the piece up or down.
5. Now it's time to give your piece some character. Look at the figure. What does it look like to you? You can use the draw tools to decorate the figure. (Do not add anything to the outer edges of the silhouette.) You could also select the shape with the lasso select tool and then go to **Edit/Effects/HyperStudio effects** and choose the texturizer for a unique coloring. Another alternative is to go to **Edit/Effects/Gradients**.
6. Select the figure with the lasso. Hold the OPTION key to copy and then move to the side.
7. With one of the figures still selected, go to **Edit/Effects** in the menu and select "replace colors". A window will appear. You may replace one color for another. Select the colors you wish to replace. You may need to use the eye dropper tool if you want to replace more than one color and can not figure out which color is present.
8. Now there should be two figures, each with unique coloring. Draw around one shape using the lasso; hold OPTION down and copy by sliding the figure to the side. Lasso the other figure, hold OPTION down, slide the figure off and fit it into position up against the first figure. If it does not fit perfectly, review Steps 1 - 8 and try again. Continue this procedure until you have created a tessellation.

### Rotational Tessellations in HyperStudio

1. Draw a filled square. Use the lasso tool and draw squiggles that start along the top left edge of the square and end in the top right edge of the square. Continue drawing with the lasso to connect the left and right sides of the squiggle. A chunk along the square's top is selected.
2. Click and drag the selected piece to move it to an empty spot on the screen. Then select this shape with the rectangle select tool.
3. Go to **Edit/Effects/Scale & Rotate**. Rotate 90 degrees Clockwise and click OK.
4. Lasso the rotated piece and move it to the left side of the first shape until it fits together precisely. Steps 1-4 can also be repeated by drawing squiggles along the right side of the first rectangle, with the new shape being rotated 90 degrees Counter-Clockwise and sliding down.
5. Once the shape is drawn, use the rectangle select tool to select it. Then hold the OPTION key down and drag the new copied shape to the side. Color/design the shape. While still selected, Go to **Edit/Effects/Scale & Rotate**. Rotate 90 degrees Clockwise and click OK.
6. While the second shape is still selected, hold the OPTION key down and drag a copy of this shape to the side. Go to **Edit/Effects/Scale & Rotate** and rotate it 90 degrees. Repeat the process once more using this third shape.

7. Once 4 versions of the shape are created, each a rotated version of itself, use the lasso tool to select one at a time. Drag each shape and fit it into the whole.
8. Once all 4 pieces have been fit together, use the lasso tool to select the entire piece. Hold the OPTION key down to copy, and then fit this foursome into the appropriate spot. Continue until the card is tiled with the shape.

### Glide Tessellations in HyperStudio

1. Draw an isosceles triangle. To do this, select the line tool and then hold the shift key down while drawing the left side of the triangle. Let go of the shift key, return to the top of the triangle, and then hold the shift key down to draw the right side. Draw a straight line across the bottom to finish the triangle. Use the eraser to get rid of extraneous lines. Fill the triangle with a color.
2. Using the lasso tool, start at the top of the triangle. Wiggle the mouse around and end at the bottom left corner of the triangle. Continue holding the mouse and connect the line. This will select the left side of your triangle. Click to drag this section to the side.
3. Use the rectangle select tool to select this section. Go to **Edit** and select “Flip Upside Down.” This reflects the section.
4. Get the lasso tool and select the piece. Drag the piece so that it fits flush against the side of the triangle. Decorate the figure.
5. Select the whole shape with the lasso tool. Hold the OPTION key to duplicate. Drag the new shape to the side. Go to **Edit/Effects/Replace Colors** to choose contrasting colors from the original. You may need to replace more than one color.
6. Select this second shape using the rectangle select tool. Go to **Edit/Effects/Flip Upside Down**. Hold the OPTION key down to duplicate this shape.
7. Select the original shape with the rectangle select tool. Drag the copy to the side.
8. Use the lasso tool to fit the second shape into the first one. Repeat the process to tile the card.

### Spreadsheet Ideas (the formulas and functions below are formatted for Microsoft Excel)

- Use for graphing survey results
- Mean, median, mode, and range explorations  
**INSERT/FUNCTION**, choose Statistical.  
 =Average(FirstCellinRange>LastCellinRange)  
 =Median(FirstCellinRange>LastCellinRange)  
 =Mode(FirstCellinRange>LastCellinRange)

Students will need to sort the data numerically to find the range.

Highlight the data. Then go to the **Data** menu and select SORT. Choose the column/row to sort by and decide whether it should be ascending or descending.

- Make the spreadsheet display a number one larger than the preceding row.  
=A1+1 and then fill down (using the cell that contains the number "1" in place of "A1")
- Make the spreadsheet display multiples of 5.  
=A1\*5 and then fill down (using the cell that contains the number "5" in place of "A1")
- Use the random number generator to get data sets  
=RAND() is the function; can be filled down. This generates decimals between 0 and 1.  
To turn these numbers into whole numbers, you can multiply the cell by the number of choices that you would want students to have (if you want the range of possible numbers to be between 0 and 50, you would use =A1\*50). You may need to change the number of decimals being displayed.
- Have students use a spreadsheet for trial and error problems. Writing the formulas helps make connections to Algebra.  
Cy had 35 problems for homework. He received \$.10 for each correct answer and was fined \$.05 for each incorrect answer. Today Cy completed 10 problems correctly and had 25 wrong answers. How much did Cy earn or lose? Suppose all you knew was that Cy earned \$1.05; how many did he get correct?
- Compare perimeter and area. Change the scale factor of side length to compare perimeter, area, and volume when dimensions change.

- Mayan number system (base 20) conversions to Hindu-Arabic and vice versa.  
You could have students figure out the formulas to convert using any base system. Formulas for converting from the Hindu-Arabic to the Mayan system are:

Hindu-Arabic	Row 1	Row 2	Row 3
31	=A2-((C2*20)+(D2*18*20))	=INT((A2-360*D2)/20)	=INT(A2/360)

The formula for converting from Mayan to Hindu-Arabic is:

Mayan Number				
Row 1	Row 2	Row 3	Row 4	Hindu-Arabic
				=A3+(B3*20)+(C3*18*20)+(D3*18*20*20)

- Finding  
Have students measure the circumference and diameter of various circular objects. Then Enter the information into a spreadsheet, which performs the calculation. (To find the diameter of the circle, draw a segment that touches the circle in 2 places—a chord—then from one point of intersection, draw a right angle. Continue the line that forms the right angle until it meets the outside of the circle. Connect the chord's first point to this third point. This will be the diameter.)

Group Name	Circle #	Circumference	Diameter	C/D
				=C2/D2

You can also draw a line graph of the ratio of the circumference to the diameter.

- Use the spreadsheet to graph linear equations

- Help students learn about percents by working with interest rates and depreciation.

If you start with \$1000 and earn 5% interest per year, how much will you have after 10 years?

Assume that interest is calculated only at the end of the year.

Year	Principle	Total with Interest
1	\$1000	=1.05*B2

What happens if you invest an additional \$1000 at the end of each year?

Year	Principle	Total with Interest
1	\$1000	=1.05*B2
2	=C2+1000	=1.05*B3

If you bought a car for \$15,000 and its value depreciates by 15% per year, what is the car's value after 10 years? When will the car's value equal zero?

=CellContainingTheInitialCarValue\*.85

- Nutrition

Have students keep track of what they eat for a period of days. The spreadsheet can be used to calculate the percent of calories that come from fat, protein, and carbohydrates.

Day	Meal	Food Item	# of servings	Calories per Serving	Total Calories	Fat Grams per serving	Protein Grams per serving	Carbohydrate grams per serving	% of Calories from Fat	% of Calories from Protein	% of Calories from Carbohydrates
					=D2*E2				=9*(G2/F2)	=4*(H2/F2)	=4*(G2/I2)