

Create Tessellations with Excel

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WHY A TECHTORIAL?

What will I learn today?

You will learn how to help students create tessellations using Microsoft Excel.

What hardware and/or software does the techtorial apply to?

The techtorial applies to Microsoft Excel.

Which National Educational Technology Standards for Teachers does the techtorial address?

The techtorial will help teachers accomplish standard II.A. in particular.

The International Society for Technology in Education (ISTE) has developed a set of National Educational Technology Standards for Teachers. Standards or Performance Indicators are included for each techtorial to help teachers and administrators improve technology proficiency. For a complete description of the standards indicated, go to [NETS for Teachers](#).

CREATE TESSELLATIONS WITH EXCEL

What's a tessellation? Tessellations are patterns of a repeated shape arranged so they cover a complete plane leaving no space. A checkerboard is a tessellation, as are the [Student Tessellations](#) at this Math Forum site. The work of the graphic artist [M.C. Escher](#), which might be familiar to some students, contains many examples of tessellations.

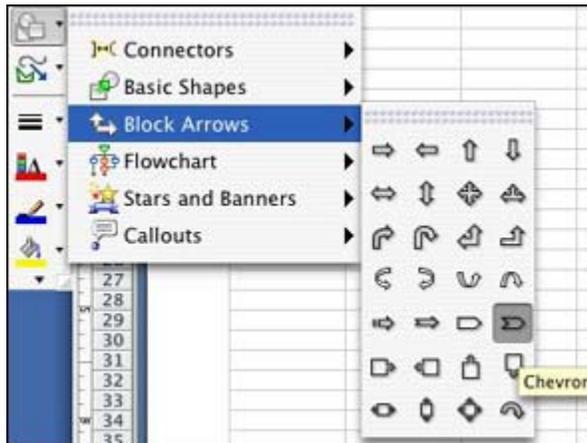
Tessellations are not just pretty to look at; they are a great way to teach such concepts as reflection, rotation, and translation. And...they're fairly easy to make. Walk your middle or high school students through the steps below to create their own tessellation with Excel.

Note: See [Where's the Math](#) for some lesson ideas and pedagogical background.

STEP ONE: CREATE THE BASIC POLYGON

Have students follow the steps below to create the basic polygon they will use in their tessellations.

- Open Microsoft Excel.
- Click View>Toolbars>Drawing.
- Click File>Page Setup; click the button next to Landscape (for page orientation); and then click OK.
- On the Drawing toolbar, find the Autoshapes button, click it, click Basic Arrows, and choose the chevron

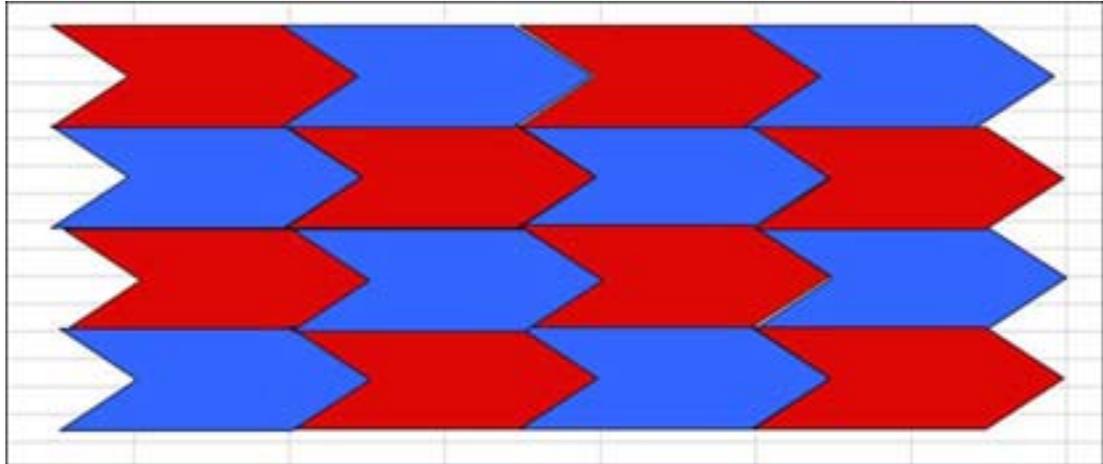


- Draw a chevron on the spreadsheet. Make it about two columns wide and four rows tall. Leave it white with a black border.
- Save your work. (Be sure to tell students where to save it and what to name the file.)

STEP TWO: CREATE THE TESSELLATION

Have students follow the steps below to create their tessellation.

- Click View>Zoom, select 150 percent (or greater) and click OK.
- Press CTRL D (Mac: Apple/Command Key and D) to duplicate the chevron. (That both copies and pastes in only one step.)
- Duplicate the chevron 15 times.
- Arrange the chevrons in a pattern so they are end-to-end and row-upon-row, with no spaces in between. (There should be four chevrons on each of four rows.)
- Use the paint can icon on the Drawing toolbar to color the polygons. (Alternate two colors for best effect.) Hint: Hold down the shift key while selecting every other polygon, and then click a color to quickly paint half the polygons.
- The complete tessellation will look something like this:



- Save your work!

STEP THREE: CREATE A TESSELLATION WITH YOUR OWN POLYGON

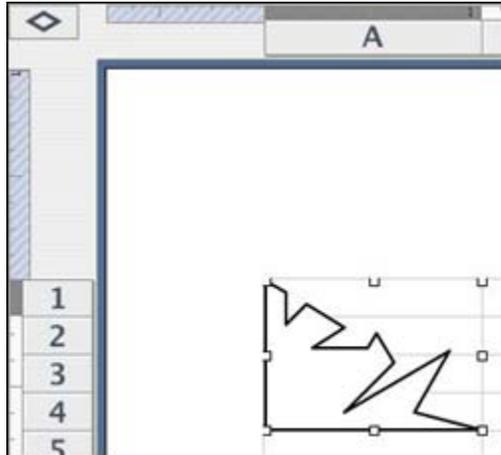
As you can see, it's pretty simple to create a tessellation with regular polygons. But what about irregular ones? Follow the steps below to create a shape all your own and then make a very individualized tessellation from it!

- Click Sheet 2 at the bottom of your spreadsheet. You now have a clean slate to work on.
- Click View>Zoom>200 percent, and then click OK. (You need to be very close up for this!)
- Click the Lines tool on the Drawing toolbar, and then click Freeform.



- The freeform tool allows you to create a polygon with straight lines. We want to draw a three-sided polygon with two straight sides and one jagged side. So, holding down the shift key (which keeps the lines straight), draw a line from the top left corner of cell A1 to the bottom left corner of cell A4.
- Don't stop yet! Keep drawing to the far right corner of cell A4.

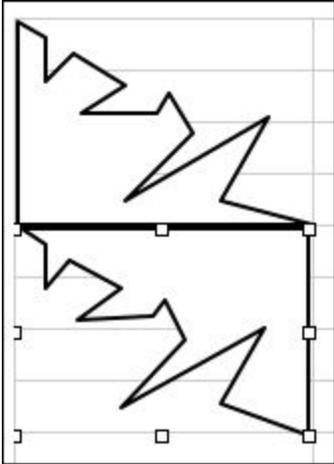
- Don't stop yet. This is the fun part! Draw a zigzag pattern of your own choice -- one that eventually will connect your last line's endpoint to your first line's starting point.
- When you've connected the end of the zigzag line to the starting point...click. Your polygon should look something like this:



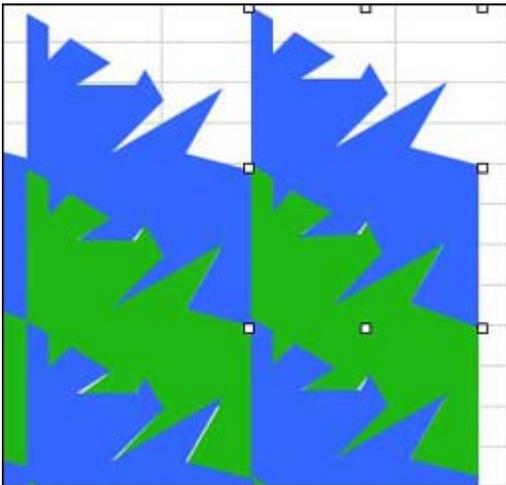
STEP THREE: CONTINUED

Next, to complete the tessellation, you need to make a mirror image of the polygon:

- Click the Freeform line again and draw a straight line from the top left corner of A1 to the top right corner, then down to the bottom right corner of A4.
- Now, follow EVERY zig and zag you made previously. Be as exact as possible. Click when the line is completed.
- You should have two polygons one on top of the other, and connected at the jagged edge. Click and drag the top polygon to just below the bottom one, carefully lining up the straight horizontal edges of the polygons.



- Hold down the shift key and click both polygons.
- Click the first icon on the Drawing toolbar (the word Draw on a PC; the blue A on a beige square on a MAC), and then click Group. Your two polygons have become one!
- Remove the border by clicking the line paint tool and selecting No Line.
- Now, it's time to tile! Repeat step two of the techtorial to duplicate the polygon. Your page should look something like this:



Save your work.

TELL ME MORE!

Where can I find more information about tessellations?

Check out the lesson plan [Introducing Tessellations](#) for ideas on how to use this techtorial in your classroom!