

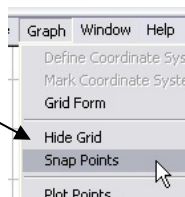
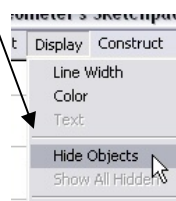
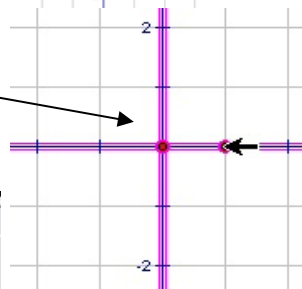
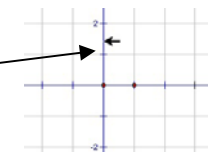
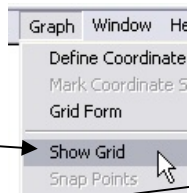
# Using a Computer to Explore Tiling Patterns



Work with a partner; open **Geometer's Sketchpad** and be sure the work space is maximized. This activity assumes you have completed the previous activities on "Nets" and "Congruent Figures".

**First,**  
you will need a grid upon which to work:

1. Click "**Graph**" > "**Show Grid**".
2. Be sure the selection tool (arrow) is on, and move it to one of the axes: the black arrow will change from angled to horizontal.
3. Click on the vertical axis, the horizontal axis, and the two points in the center—they will all highlight in pink.
4. Click "**Display**" > "**Hide Objects**" to show only the grid without the labeling.
5. Click "**Graph**" > "**Snap Points**" to make drawing and placing your squares a lot easier.



**Second,**  
build some polygons.

1. Keep things simple by building only two that will tile together.
2. An easy way to do this is to build a polygon such as a parallelogram or rectangle (or another simple shape that will tile), then split it into two pieces. That is what the following steps show.
3. Once you have the basic shape built, save your file: in case things go wonky, you'll be able to save a few steps.
4. When you get making the tiling patterns, save your tiling under a different name (use "File" > "Save As").

A reminder:  
**Put your name on your work!**

- Steps:
- a. Click the text tool (letter "A").
  - b. Click in a corner of the screen and drag to make a text box.
  - c. Type your names and class in the box.
  - d. When you re-select the selection tool (arrow) the text will highlight (turn pink): click somewhere on the screen to de-select the text.

### **A word about these directions:**

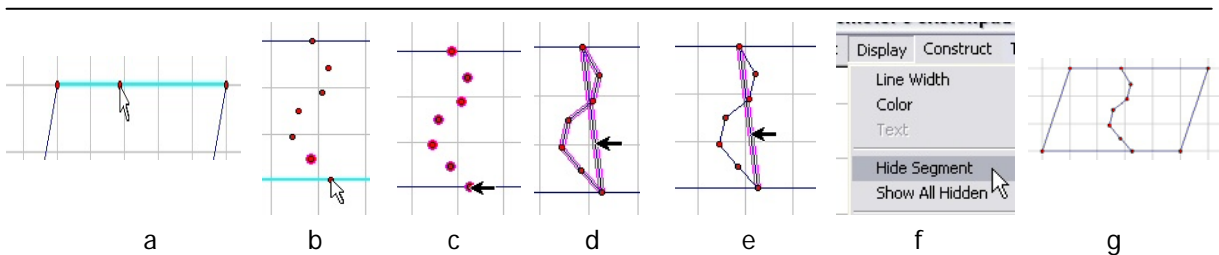
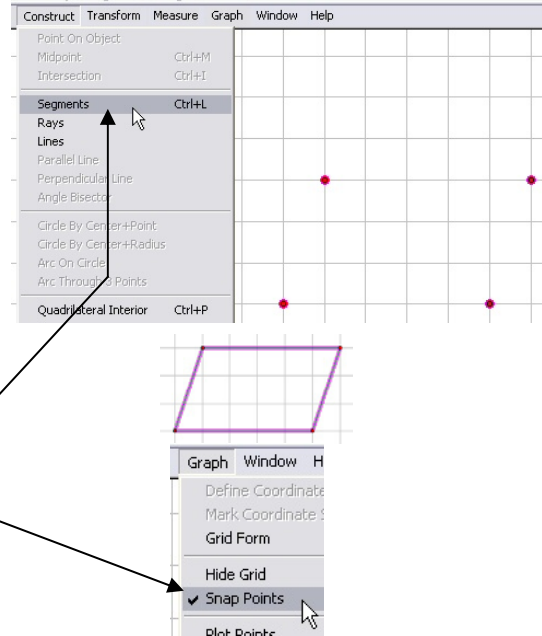
*These directions use only one example to show the steps of making a tile. You may choose any polygons you wish, and may have to change how you do things in order to get a pattern that works. Consider the following: do this tutorial as it is written in order to learn the skills, then branch out on your own to do something different.*

## Making the Polygons:

### Start with the basic shape -

*(Note: a parallelogram is done here only as an example. You choose what works for you.)*

1. Use the point tool to construct the vertices of your polygon.
2. Select all of the points (click individually, or marquee-select by clicking above and to the left, and dragging the arrow down to include all points).
3. From the menu bar: "Construct" > "Segments" to build your parallelogram.
4. "Graph" > "Snap Points" to turn off "snap points" (this will make it easier to do the next step; if you want, you can leave it on but you will have less freedom of choice where to mark your next points).



### Next, divide your first polygon into two parts:

1. Use the point tool: position it on an edge (the edge will turn blue, image a above); click so the first point is on an edge; click in an interesting curve across the middle of the polygon (image b above) until your last point is on the opposite side (that side will turn blue when you're right on it, image b above).
2. Choose the selection tool, and select all of the points you just made (image c above).
3. From the menu bar, click "Construct" > "Segments". You might get just the curve made and highlighted, or you might get an extra line as in image d above. If you don't get the extra line, when you de-select you should have something like image g above.
4. If you got the extra line, do this to get rid of it: de-select everything, then select the extra line (see image e above); finally, on the menu bar, click "Display" > "Hide Segment" and you should end up with a finished design like image g.

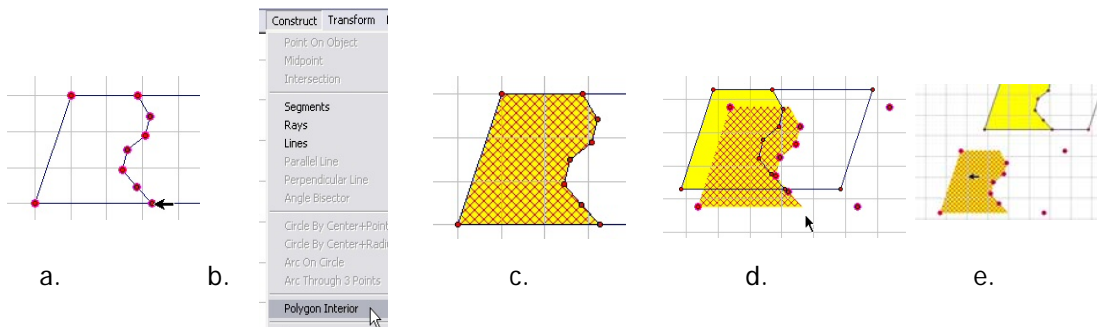


Remember to save, save, save!  
Refer back to the second step on page 1, bullets 3 and 4.

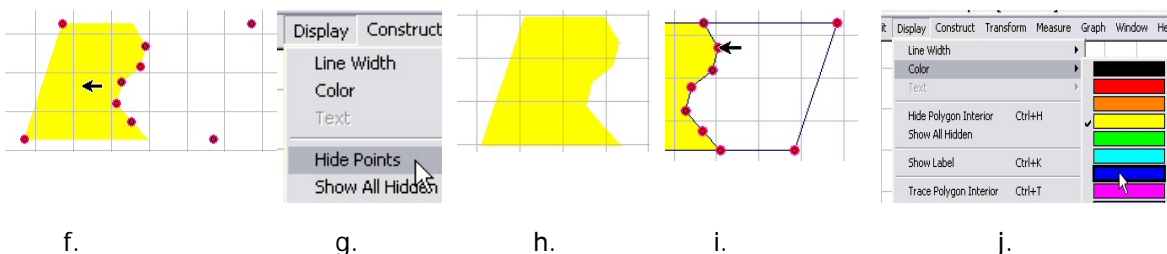


**You're now ready to construct your tiles:**

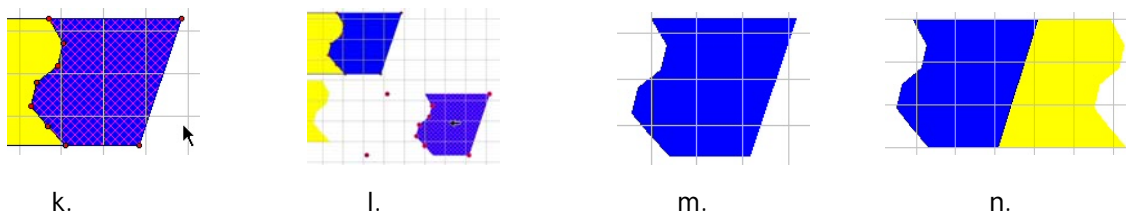
1. Select the points of the curve and one side of your polygon (see image a below)
2. From the menu bar: "Construct" > "Polygon Interior" (see images b and c)
3. Leave the interior selected (cross-hatched as in image c below) - copy and paste the interior: the copy will overlap the original as in image d below.
4. Leave the copy selected, and drag it out of the way of the original polygon (image e below).




5. Click on the interior so it de-selects, but leaves the points highlighted (image f below)
6. Choose: "Display" > "Hide Points" (image g below) to get just the interior in color (image h)
7. Now repeat the above steps with the other part of the polygon: select the points (image i), and construct the polygon interior — when the interior shows, cross-hatched, change the color using "Display" > "Color" > [choose a color from the drop-down menu]. (Image j)




8. You now have a two-tone original (image k below). Use the select tool to select just the interior, and copy/paste it like you did the first one above.
9. Move the copy out of the way of the original (image l); de-select it (image m).
10. Select the copy and move it so it matches against the opposite side of the first polygon (image n).

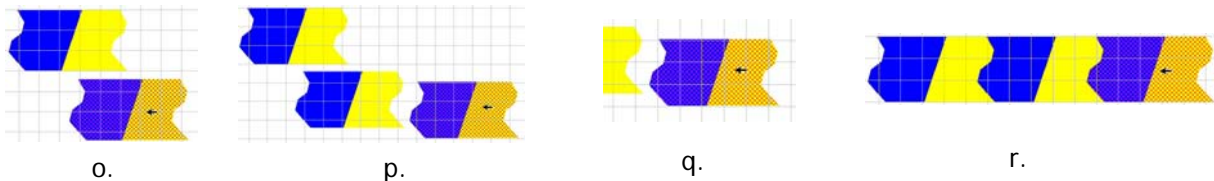




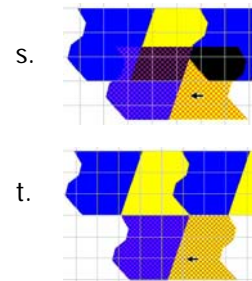
Remember to save, save, save!  
Refer back to the second step on page 1, bullets 3 and 4.



11. Select the new polygon (the two-tone one with the weird shape) (use marquee-select), and copy-paste to get a duplicate. Move it out of the way of the original (image o below).
12. Make several more copies: move each one out of the way of the others (image p below).
13. Select one of the copies (image q) and slide it so it matches against one of the other shapes: repeat this with other copies until you get a “string” of tiles (image r)

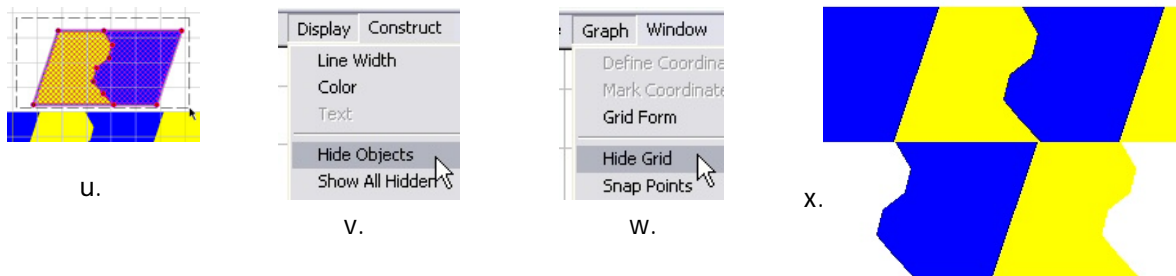


14. Paste again (you don't need to copy anything—the computer “remembers” the last thing you copied, so when you hit “Paste” right now, you get the same copy as you did in steps 11 and 12 above (image s, right).
15. Make more copies, and slide each copy out of the way before you make another copy.
16. Select one copy at a time, and move it below the first row (image t, right). Repeat until you get a pleasing tile pattern.




Almost done! Now for some “housecleaning”:

17. Hide your original polygon by selecting it (image u below) then “Display” > “Hide Objects” (image v).
18. Hide the grid so it doesn't interfere with your design (“Graph” > “Hide Grid”, image w below).
19. With the grid hidden, your tiling design looks very impressive (image x is a partly-made one).



### Finishing touches:

- Use the text tool  to make a text box: type your name into the text box.
- SAVE your work, then print it out — remember to use “File” > “Print Preview” first, to be sure it fits on a sheet.
- If the design doesn't fit onto one sheet, click “File” > “Page Setup” to change the paper to “Landscape” orientation. Then re-try “Print Preview” to see if it fits better.

### Challenge:

Try rotating copies instead of sliding them. What kinds of effects can you get with rotations?

