Tesselations

by – Amanda Hawkins

Activity overview

In this activity students will explore what causes some regular polygons to tesselate. They will explore sketches of regular polygons, measure the interior angles, and test to see whether the shapes tesselate.

Concepts

The regular triangle, quadrilateral, and hexagon tesselate because their angles are all factors of 360.

Teacher preparation

*This activity was designed to be used in a Middle School or High School Geometry unit. Prior to beginning the activity, students should know what a regular polygon is. It would probably make the conjecturing portion of the activity easier if student knew how to compute the interior angle of a regular polygon with the formula [(n-2)*180]/n. Refer to the screenshots on pages 5-6 for a preview of the student TI-Nspire document (.tns file).*

Classroom management tips

This activity is intended to be a student exploration. The teacher should plan to launch the activity with a something to get kids to begin to wonder which regular polygons will tesselate. This could be done in various ways such as asking kids to wonder why bees use hexagons rather than octagons, ask what shapes of tiles would cover a bathroom floor with no gaps or overlaps. Next, students will have a period of approximately 20-25 minutes of exploration. While students are working, it is expected that the teacher is walking around asking question such as what are you noticing about the various polygons?

During this time it would be wise for the teacher to carry a clipboard to record students conjectures and thoughts. These will be useful in the final wrap up discussion of this activity. After the students have worked together through the activity, the teacher should bring them back together to discuss the big ideas that they found. It is during this time, that the teacher should carefully select and sequence students ideas according to the clipboard notes she has been taking during the exploration. The discussion should center around the concepts highlighted above. After each exploration of a new polygon, there is a lists and spreadsheet page for students to fill out according to their observations. As the conclusion of the exploration, students are asked the share their conclusions about the activity. This would be a good page to have students share from during the discussion with justifications coming from previous pages.

TI-Nspire Applications

Graph & Geometry, Lists & Spreadsheets, and Notes.

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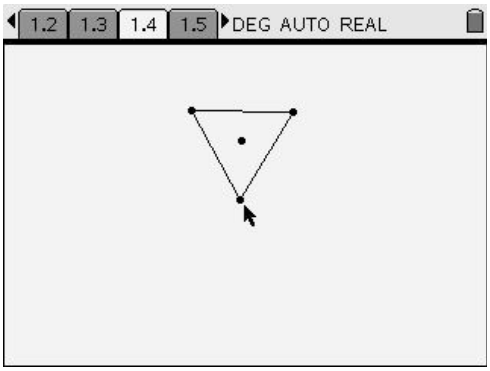
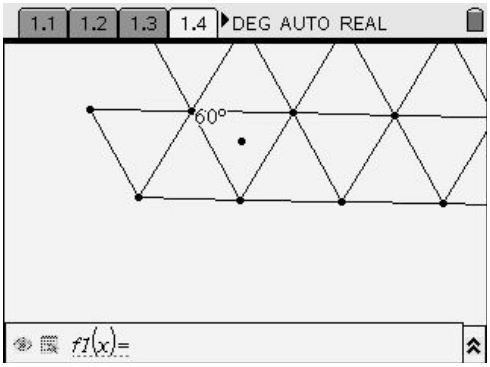
Step-by-step directions

On page 1.4, students will explore the equilateral triangle shown to the right. They are asked on page 1.3 to measure the interior angle and see if it tesselates using the reflection tool in the transformation menu. On page 1.5, students are expected to record in the table the angle measurement of the triangle and whether or not it tesselates the plane.





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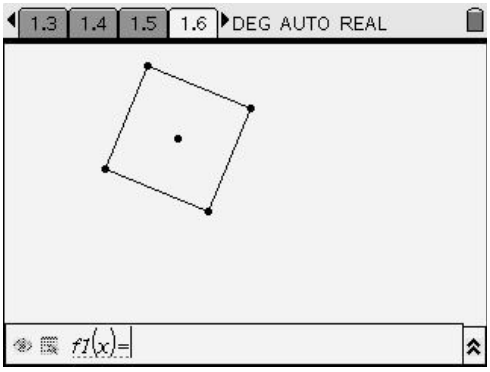
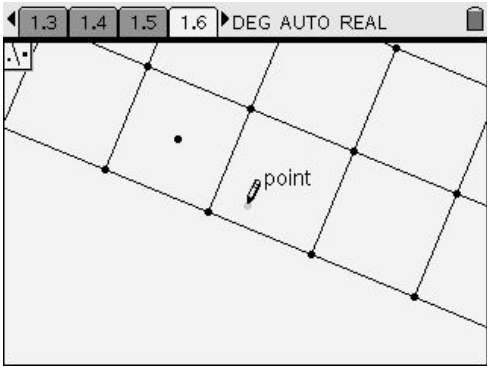
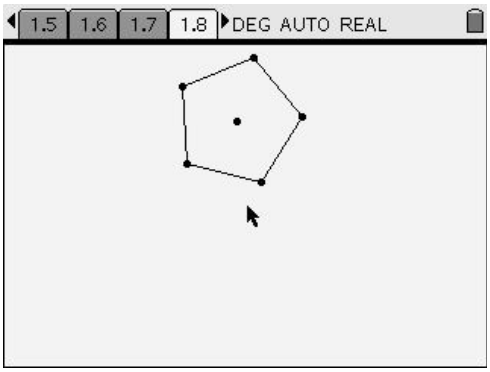
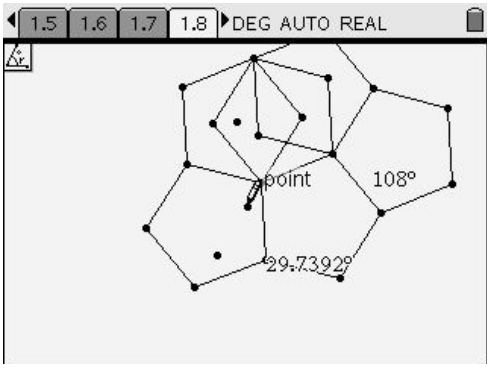
Students will continue this process through the various regular polygons.









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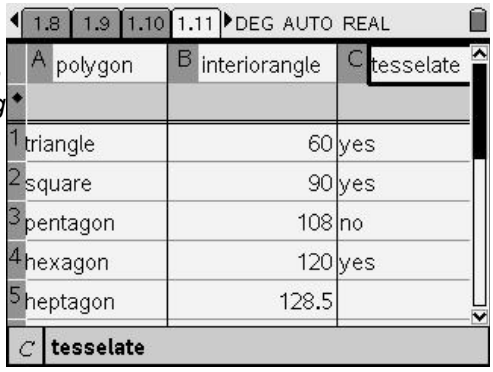
Once completing all of the regular polygons, students should have the whole table filled in as shown to the right on page 1.19. By this time, students may have already formed and discarded a variety of conjectures. At this point, they should work on revising or finalizing a conjecture about how the interior angles can be used to predict whether or not a regular polygon will tesselate.

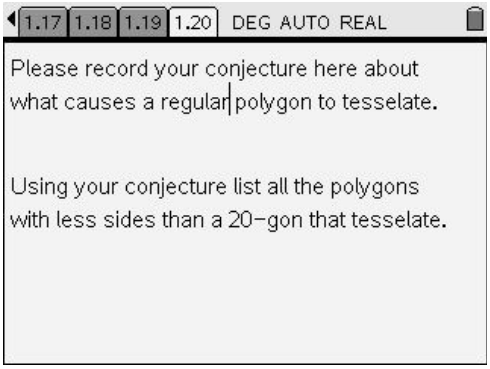


Various conjectures such as shown below are normal and should be encouraged. When students make a conjecture encourage them to move to the next polygon and test their conjecture out.

Any regular polygons with angles greater than 100 will not tesselate.

Any regular polygons with angles that end in 0, or angles that have a factor of 10 will tesselate.

Any regular polygons with even numbered angles, will tesselate.
On this last screen, students will be stating their final conjecture. The final conjecture should read:
All angles that are factors of 360 will have polygons that tesselate.



The other question on this screen is to list all of the polygons that tesselate.
The expected answer is a triangle, square, and hexagon. These three have factors of 60 (times 6), 90 (times 4), and 120 (times 3). The next factor pair is 180 times 2. However, 180 is too large of an angle for a polygon.

Beware that there is a possibility that a student might develop the conjecture that the reason why these polygons tesselate is that they are all multiples of 30. Encourage these students to loo at the numbers again in conjunction with the pictures and try to understand how these numbers make sense with the pictures.. Visually how are the 120's, 90's, and 60's coming together. For further hints, you might ask, how many triangles are coming together at one point. How about squares? How about hexagons? So how do these answers relate to their angles?

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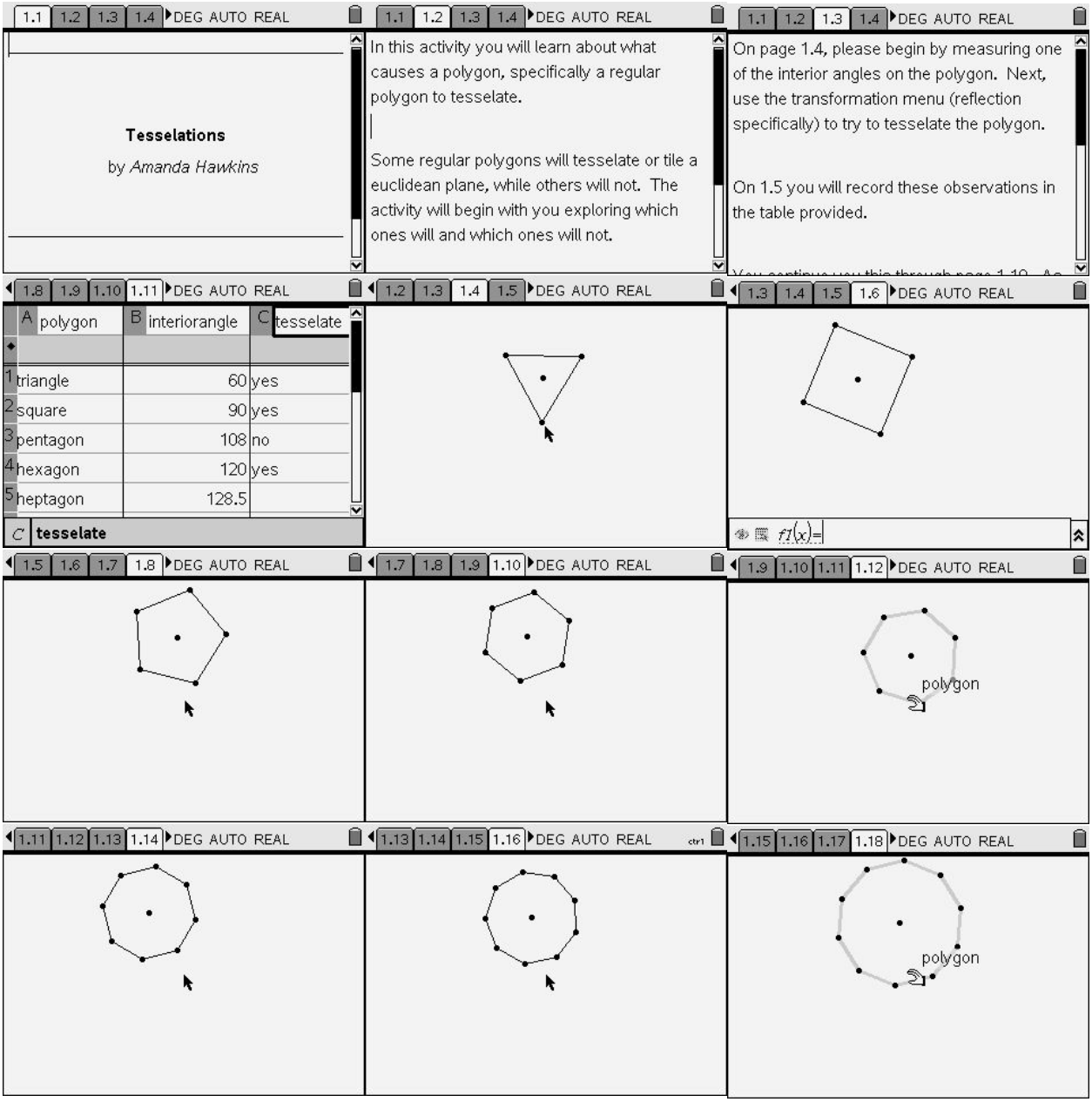
Student TI-Nspire Document

tessselation.tns



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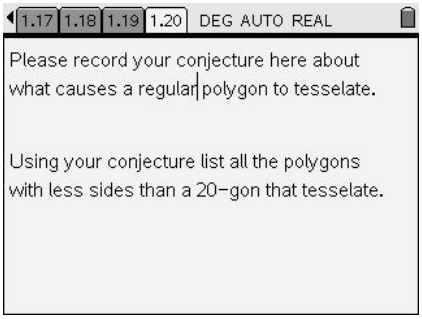

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