TI-*nspire*™

Approximating Pi
by – Sandra Hocutt

Activity overview

Archimedes was a Greek mathematician who lived during the third century B.C. Among his contributions to mathematics was an early method for approximating pi – the ratio of the circumference to the diameter of a circle. In his method, Archimedes used regular polygons constructed inside and outside of circles. The perimeter of the polygon approximates the circumference of the circle. Thus pi is approximately the polygon perimeter divided by the diameter of the circle. Using Graphs and Geometry, the students will construct regular polygons and circumscribed circles. They will then take measurements and store them into a Lists and Spreadsheets application and make calculations to see how closely they approach pi.

Concepts
Regular polygons, circles, perimeter and circumference.

Teacher preparation
Students should know regular polygons, circles, and how to use the TI-nspire. Cabri Jr. knowledge transfers to TI-nspire graphs and geometry.

Classroom management tips
Students will be given assigned polygons. They will compare their results when finished.

TI-Nspire Applications
TI-Nspire and/or TI-Nspire CAS Graphs and Geometry and Lists and Spreadsheet applications will be used during this activity

Step-by-step directions
Step 1.
Open a new document. Remove the function line by pressing (ctrl)(G). Remove the axes by pressing (menu), 2:View, 4:Hide axes. Press (menu), 8:Shapes, 5:Regular Polygon, (enter). Move the cursor to the center of the screen and press (enter) to mark the center of the polygon. Move the cursor out to mark the outside of the polygon and press (enter) . To decrease the number of sides on the polygon, press the left arrow on the Nav-Pad. To increase the number of sides, press the right arrow.

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Grade level: secondary
Subject: mathematics
Time required: 45 to 90 minutes
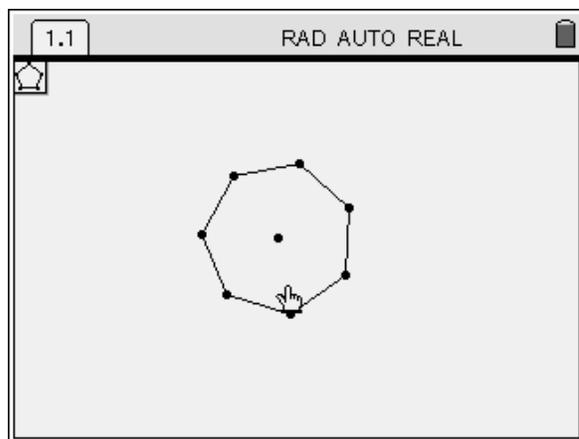
Step 2.
Press (menu), 6: Points and Lines, 5:Segment.
Move the cursor to one of the vertices on the
polygon to anchor the first endpoint, then to the
opposite side for the other endpoint. (If the
assigned polygon has an odd number of sides,
the second endpoint will be the center.)
Press (menu) 8:Shapes, 1:Circle. Use the center of
the polygon as the center of the circle and one
of the vertices as the outside of the circle.

If the polygon you were assigned has an odd
number of sides, you will need to construct a
diameter. First, (menu), 6: Points and Lines, 4:line.
Use the vertex with the segment as one
endpoint and the center as the other point.
Press (menu), 6: Points and Lines, 3: Point of
Intersection, to anchor the diameter on the
circle.
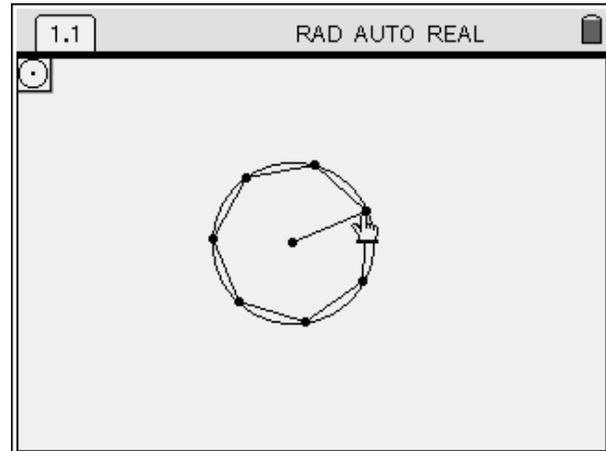
Step 3:
You will now measure the diameter, the
perimeter and the circumference. Once these
are measured, you will store each as a
variable. Label the circumference as c, the
diameter as d and the perimeter as p.

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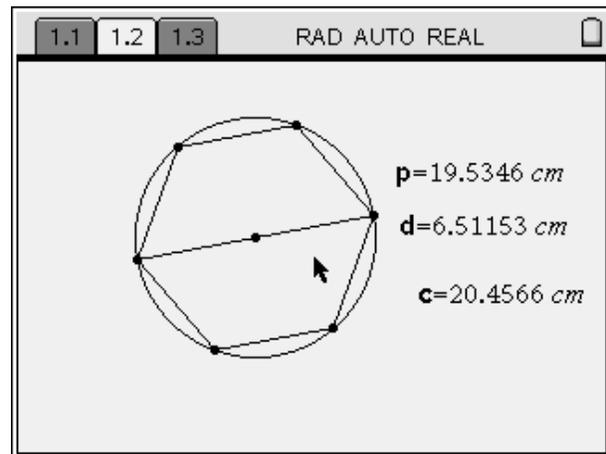
Step 4.
Create a new page. Do this by pressing 3:
Lists and Spreadsheets.
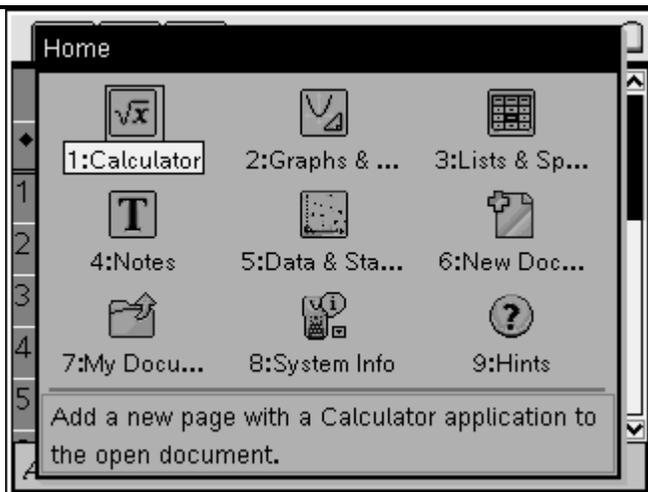
Step 5.
Label the columns cir, dia, per, cir/d, and per/d.

In the cell beneath the label for column a, press
(menu), Actions, Data Capture, 2: Manual Capture.
Link to cir.

Repeat for columns b and c, linking to dia and
per.

For column d, in the space beneath the label,
type, (=) cir/dia. For column e, type (=) per/dia.

To populate the columns, go back to the
graphs and geometry page, press (ctrl)(.)

Grab one of the vertices and move it to another
location. Notice that this changes the
measurements. Press (ctrl)(.). Repeat this process
several times.
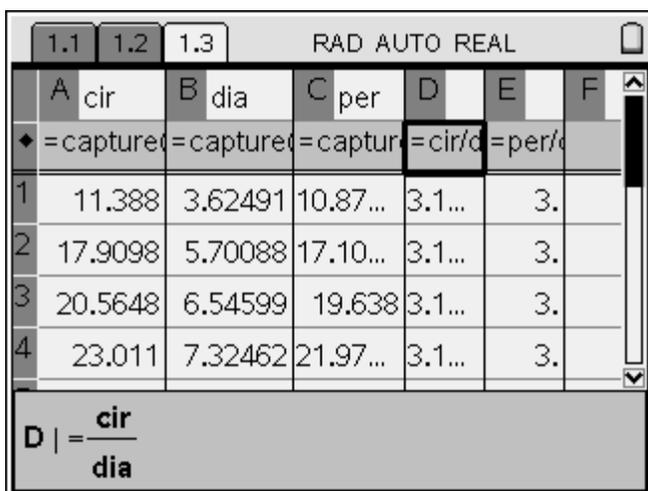
Assessment and evaluation
Have students compare their columns D and E. Whose polygon has the closest approximation to pi?

Student TI-Nspire Document
None. Students will create the above document.