

Investigating the Angles of a Triangle

Activity overview The following will find the sum of the interior angles of a triangle and the sum of the remote interior angles of a triangle.

Creating the TI-Nspire Document

1. Open a new document by pressing Home Key  and selecting 5: New Document, (Figure 1).
2. Select 2:Add Graphs & Geometry (Figure 2).

You might need to change the Document Settings from Radians to Degrees for this activity. To do this press  and select 8: System Info, then 1: Document Settings. (Figure 3)

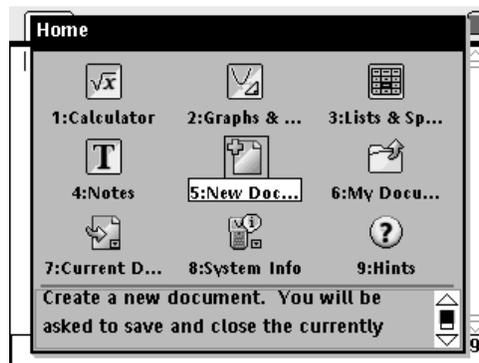


Figure 1

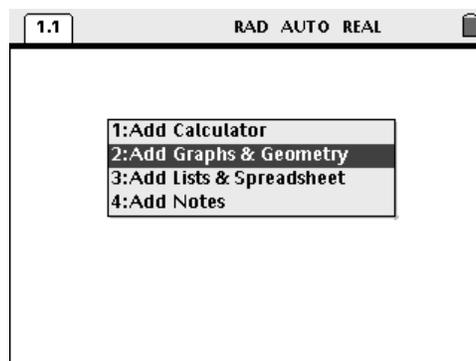


Figure 2

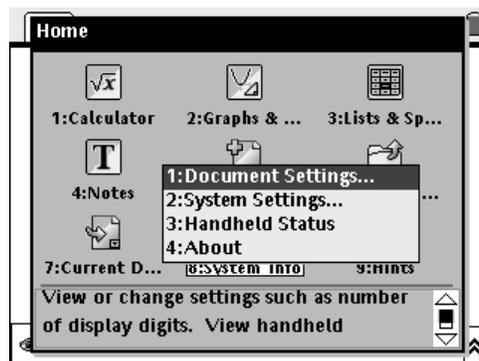


Figure 3

tab to move through the fields. Press the **▼** on the NavPad to change Radians to Degrees (Figure 4)

Click OK.

- To hide the axes and the entry line, press **menu** 2: View, 3: Hide Entry Line, then press **menu** 2: View, 1: Hide Axes (Figure 5).
- Explore by moving the pointer around the screen, pressing the NavPad's multi-directional arrow keys.

In geometry, the NavPad will move the pointer to select objects. Press the click button in the center of the NavPad **click** or **enter** to execute the action of the tool that was previously selected.

Interior Angles of a Triangle

- Construct a triangle, $\triangle ABC$, near the center of the screen.
 - Select the Triangle tool **menu** 8: Shapes, 2: Triangle **enter** (Figure 6). Using the Navpad, position the pointer on the screen.
- Press **enter** or the click **click** button to place the first vertex on the screen.

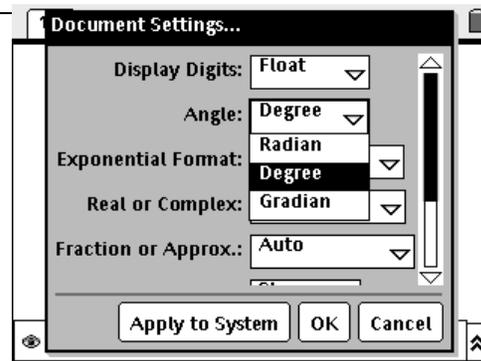


Figure 4

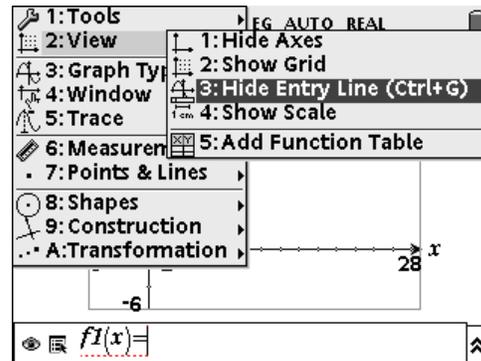


Figure 5

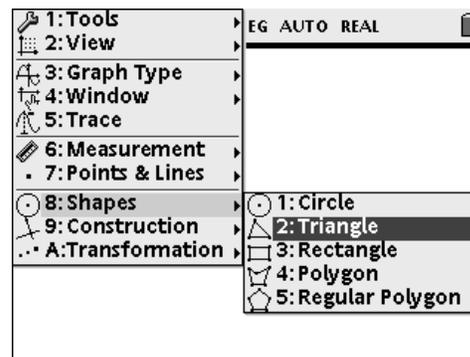


Figure 6

- One way to label vertices and points is to type the label immediately after the vertex or point appears on the screen. (Figure 7)
- Using the Navpad again, move the cursor to a second location for the next vertex and press the  button to place the vertex. Type the label immediately.
 - Repeat this step in a third non-collinear location for the third vertex and its label.
 - If you did not label the vertices when the points were constructed, you can label them using the Text tool by pressing
 -  1: Tools, 5: Text.
 - Select a vertex, and press  or the  button to open an edit box.
 - Press the appropriate letter key, and press .
 - Press the  key to exit the draw triangle mode.
 - To drag a letter so that it does not obscure the construction, press the  key, point to the letter, press the  button, and drag the letter.
 - Press , , or  to quit dragging.
 - Measure the interior angles of the triangle.
 -  7: Measurement, 4: Angle, and select each vertex in either a clockwise or counter-clockwise direction moving the cursor on the screen with the NavPad (Figure 8).
 - No matter what direction you use, the vertex must be selected second. Not only is the angle drawn, but the angle being measured is temporarily marked.

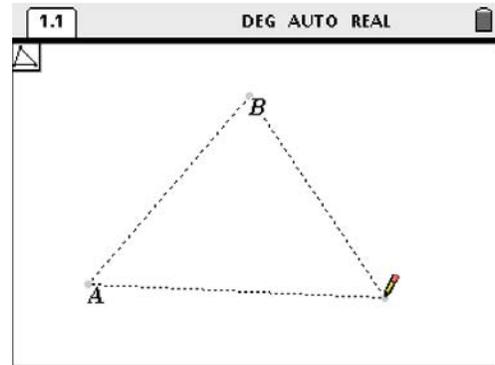


Figure 7

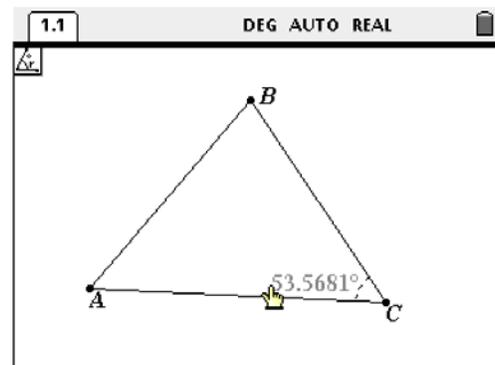


Figure 8

8. Press the ESC key to exit the measurement mode.
9. Now let's calculate the sum of the interior angles. Calculations require that a computation be entered onto the screen.

- MENU 1: Tools, 5: Text.
Press ENTER to open the edit box.
- Type the phrase $S3 = A+B+C$ on the screen using the keypad, and press ENTER to affix the statement to the screen (Figure 10).

Note: You can start the phrase with a word or letter like "s" as long as it is not a reserved word like "sum."

- Press MENU 1: Tools, 7: Calculate to select the Calculation tool. Point at the statement $S3 = A+B+C$, and press ENTER to select this calculation rule. When the Pointer is moved away, the rule will be highlighted.
- (Figure 11)

10. As you move the cursor away from the calculation, a message asking for the first variable in the calculation will appear (Figure 11). Select the first value of the angle measures on the screen.

11. The second variable value is requested as you move the cursor away from the first value.

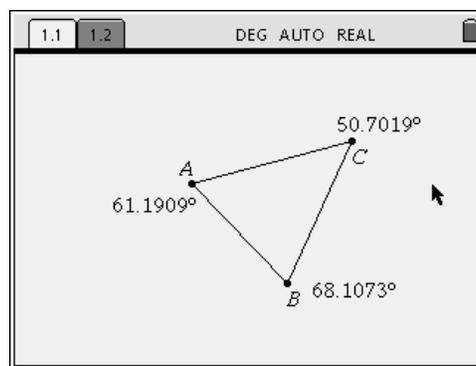


Figure 9

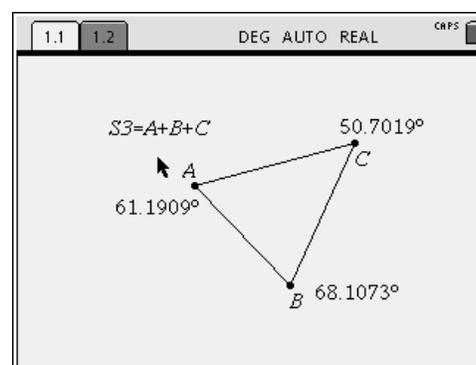


Figure 10

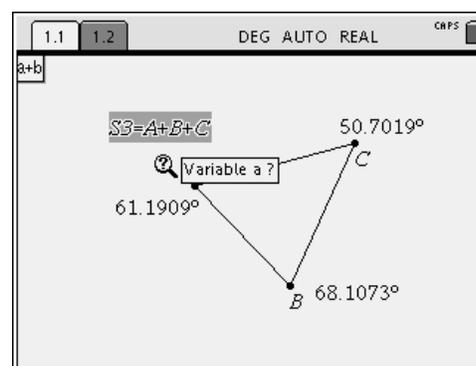


Figure 11

12. Finally, the third variable value is requested as you move the cursor away from the second value.
13. A sum will appear on the screen as you move away from the last number selected (Figure 12).

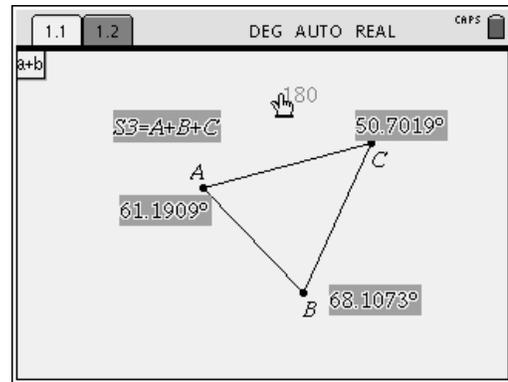


Figure 12

- You can use the Text tool to label this numerical result (Figure 13).

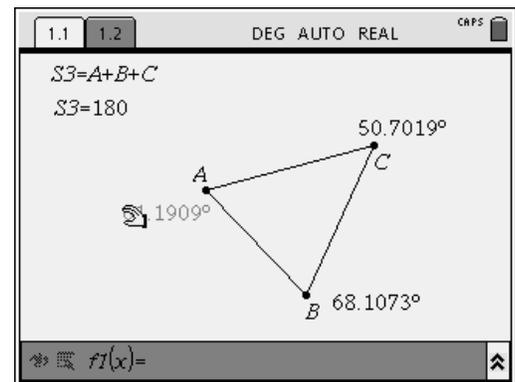


Figure 13

- To change the number of decimal places displayed, press MENU 1: Tools, 3: Attributes, and select the number (Figure 14).
- Use the NavPad arrows to increase or decrease the precision.

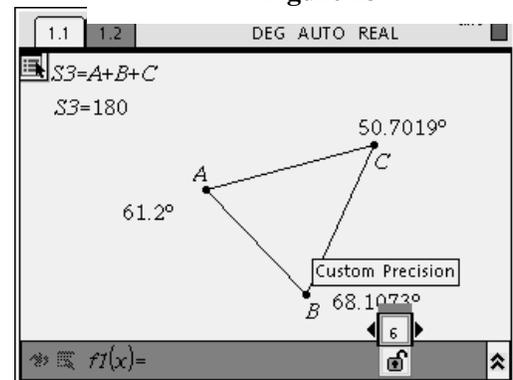


Figure 14

14. Save the file.

- Press MENU 1: File, 4: Save As, and enter the name 'AngleSumAll' (Figure 15).
- Press ENTER , and click on OK to save the file.

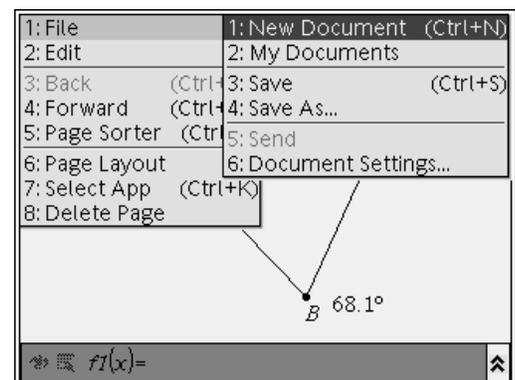


Figure 15

15. Drag a vertex of the triangle to explore different types of triangles (Figure 16).
- How does the construction prove that the sum of the angles of a triangle is 180° ?

16. Save the file as before.

17. Now draw a ray B to A to form an exterior angle at angle A. Press $\text{\textcircled{menu}}$, 6: Points and Lines, 6: Ray.

18. Label the point on the ray outside the triangle as point D. Press $\text{\textcircled{menu}}$, 6: Points and Lines, 2: Point On. (Figure 17)

19. Measure the exterior angle. ($\angle DAC$)

- $\text{\textcircled{menu}}$ 7: Measurement, 4: Angle, and select each vertex in either a clockwise or counter-clockwise direction moving the cursor on the screen with the NavPad (Figure 18)

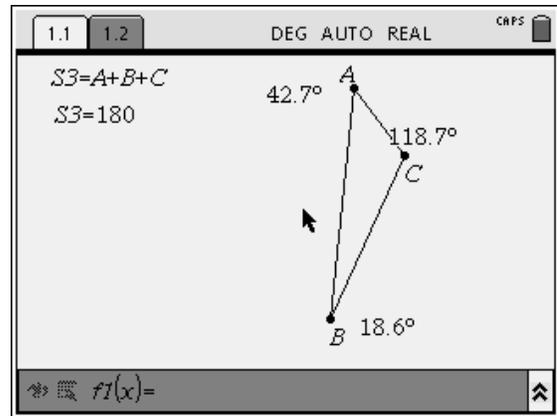


Figure 16

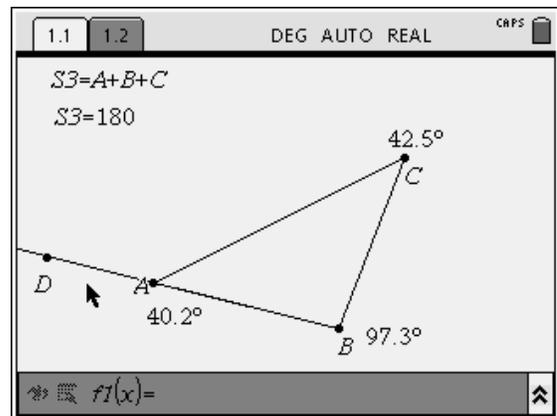


Figure 17

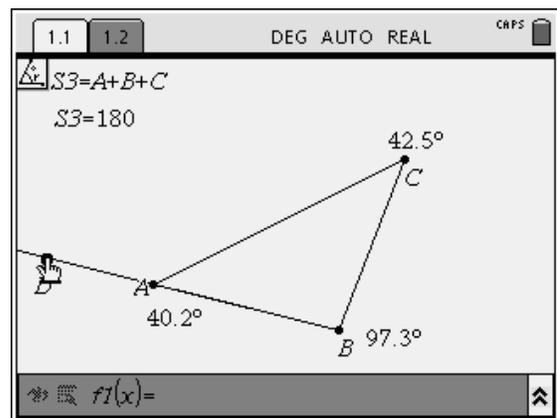


Figure 18

20. Label $\angle DAC$. (Figure 19).

21. Now let's calculate the sum of angles B and C.

Calculations require that a computation be entered onto the screen.

- $\text{\textcircled{menu}}$ 1: Tools, 5: Text.
- Position the pointer on the screen.
Press $\text{\textcircled{enter}}$ to open the edit box.
- Type the phrase $S2 = B + C$ on the screen using the keypad, and press $\text{\textcircled{enter}}$ to affix the statement to the screen (Figure 20).

22. Press $\text{\textcircled{menu}}$ 1: Tools, 7: Calculate to select the Calculation tool. Point at the statement $S2 = B + C$, and press $\text{\textcircled{enter}}$ to select this calculation rule. When the Pointer is moved away, the rule will be highlighted. (Figure 21). See step 8 on page 4 for more detailed steps.

23. Drag a vertex of the triangle to explore different types of triangles (Figure 22).

- How does the construction prove that the sum of the remote interior angles of a triangle is equal to the exterior angle?

24. Save the file as before.

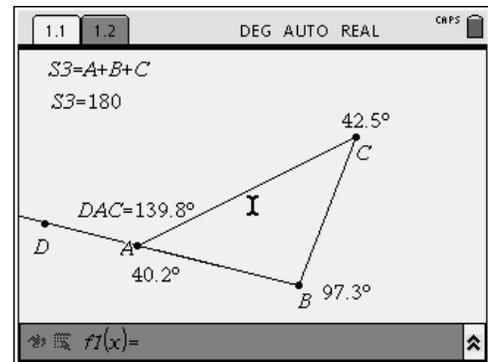


Figure 19

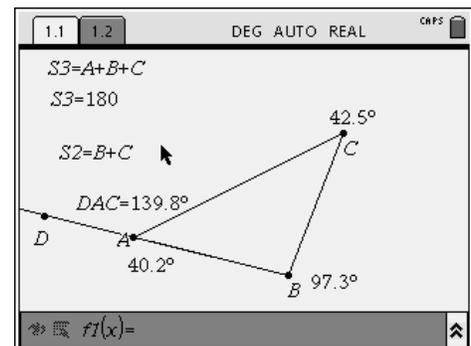


Figure 20

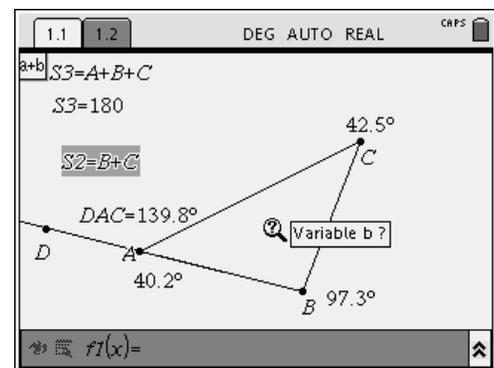


Figure 21

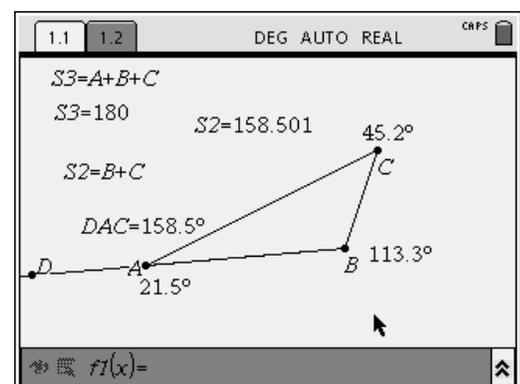


Figure 22