

Properties of Isosceles Triangles

by – Marco A. Gonzalez

Activity overview

In this activity and by using the Nspire handhelds, students will discover the different properties and attributes of Isosceles Triangles.

Concepts

Isosceles Triangles, Vertex Angle, Base Angles, legs & base of the Isosceles Triangle

Teacher preparation

This activity is designed for use in a Geometry classroom. Prior to beginning this activity, students should have prior knowledge of the different types of triangles.

Classroom management tips



This activity is intended to be a teacher-led activity in which students will make their own discoveries pertaining to Isosceles Triangles. Students should be encouraged to make predictions of what to expect when altering a leg or length of the base of the Isosceles Triangle.







TI-Nspire Applications









Graphs and Geometry Page

Step-by-step directions

The following step-by-step directions are the same as the student directions.

After turning “on” the Nspire handheld, press the  button, : **New Document**.

To hide the Axes and the Entry line, press , : **View**, : **Hide Axes**. Then Press , : **View**, : **Hide Entry Line**.

To draw the base of the Isosceles triangle, press , : **Points & Lines**, : **Segment**. Move the cursor to the lower half of the screen and press . Before moving the cursor, press  key and the letter **(A)** to label the point. Now move the cursor to a different position and press . Again, before moving the cursor, press  key and the letter **(B)** to label the point. Press . (see figure 1)






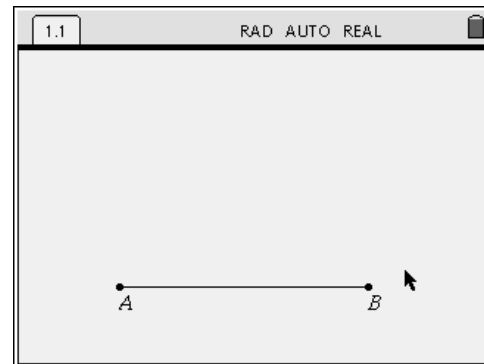
Now, let’s draw the perpendicular bisector of this line segment. Press , : **Construction**, : **Perpendicular Bisector**. Move the cursor with the **Nav Pad** somewhere over the segment you have just drawn and press . Press .

Figure 1



Now, let's place a point on the perpendicular bisector of the segment. Press, **menu**, **6**: **Points & Lines**, **2**: **Point On**. Move the cursor anywhere over the perpendicular bisector and press **enter**. Before moving the cursor, press **alpha** and the letter **C** to label the point. Press **esc** (see figure 2).

Now, let's draw a segment from each of the endpoint of the segment to the point on the perpendicular bisector. Press **menu**, **6**: **Points & Lines**, **5**: **Segment**. Hover the cursor over point A until it blinks and press **enter**. Move the cursor over point C until it blinks and press **enter**. Repeat the process from point B to point C. Press **esc**. Now let's hide the perpendicular bisector. Move the cursor over the perpendicular bisector until it flashes and press **ctrl** **menu** simultaneously. Select **3**: **Hide/Show**. (see figure 3)

Now, let's calculate the length of AC and BC. Press **menu**, **7**: **Measurement**, **1**: **Length**. Move the cursor over segment AC until it flashes and press **enter**. Now move the measurement somewhere to the upper left hand side of the screen and press **enter** again to lock the measurement. Repeat the process for segment BC and move the measurement below the measurement of AC. Press **esc**.

Now let's label the measurements. Press **menu**, **1**: **Tools**, **5**: **Text**. Press **alpha**, **A** **C** Press **enter**. Move the cursor somewhere else on the screen and press **enter**. Press **alpha**, **B** **C**, **enter**. Press **esc**. Now, hover the cursor over each label you just created and press **enter** for 1.7 seconds. Move the label to the left of the measurement of the respective side and press **enter**. Repeat the process for the other label. (see figure 4)

Let's change the angle measurement from radians to degrees. Press **menu**, **8**: **System Info**, **1**: **Document Settings**, **tab**, "Down on Nav Pad" and select "Degree". Press **tab** several times until you get to OK and press **enter**.

To measure the base angles, press **menu**, **7**: **Measurement**, **4**: **Angle**. Move the cursor to point C until it flashes and press **enter**. Move the cursor to point A until it flashes and press **enter**. Move the cursor to point B until it flashes and press **enter**. Move the measurement to the upper right hand side of the screen. Repeat the process for

Figure 2

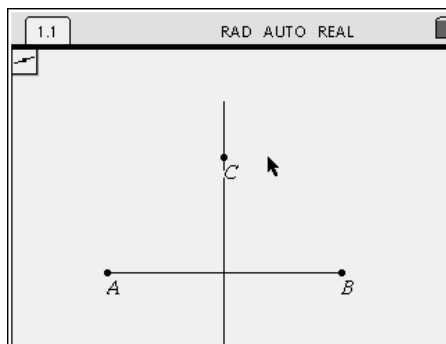


Figure 3

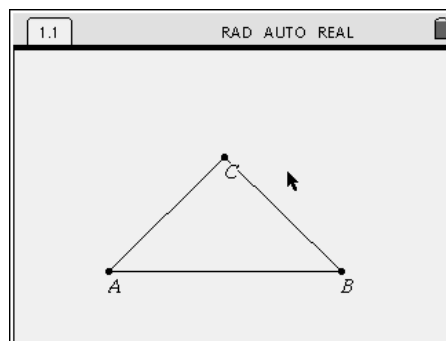
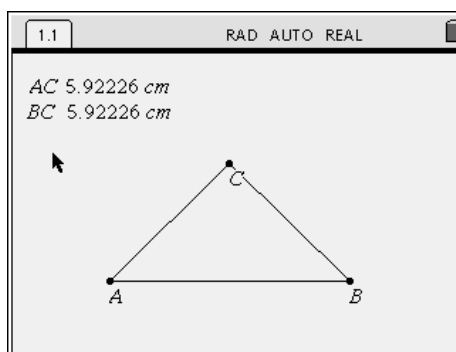


Figure 4



the other base angle. Press ESC .

Now let's label the angle measurements. Press MENU , 1 : **Tools**, 5 : **Text**. Press AP , A , Press AP . Move the cursor somewhere else on the screen and press AP . Press AP , B , AP . Press ESC . Now, hover the cursor over each label you just created and press AP for 1.7 seconds. Move the label to the left of the measurement of the respective side and press AP . Repeat the process for the other label. (see figure 5)

Now, let's have some fun with this triangle. Move the cursor to one of the vertices of the triangle until it flashes and press AP for 1.7 seconds and drag the point to different points on the screen. Notice the measurements of the sides and the base angles. (see figure 6)

Discovery Questions

What do you notice about the "legs" of the isosceles triangle?

What do you notice about the base angles of the isosceles triangle?

What happens when you "drag" the vertex of the isosceles triangle?

Extension

Calculate the midpoint of the base of the Isosceles Triangle. Press MENU , 5 : **Midpoint**. Move the cursor to one of the endpoints until it flashes and press AP . Move the cursor to the other endpoint until it flashes and press AP . Press ESC .

Draw a segment from the vertex angle to the midpoint of the base angle. Press MENU , 6 : **Points & Lines**, 5 : **Segment**. Move the cursor to point C until it flashes and press AP , then move the cursor to the midpoint of the base until it flashes and press AP . Press ESC . (See figure 7)

Figure 5

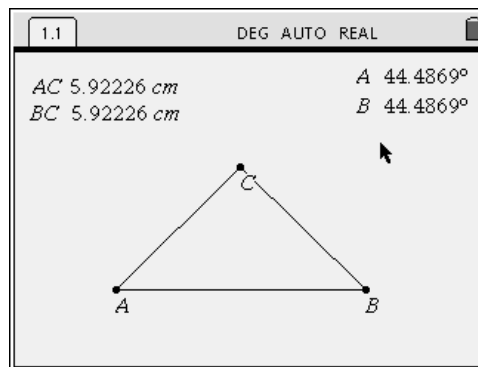


Figure 6

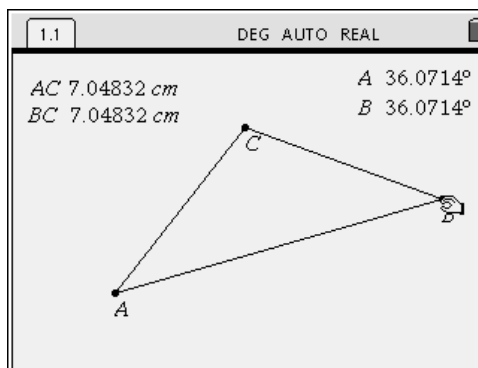
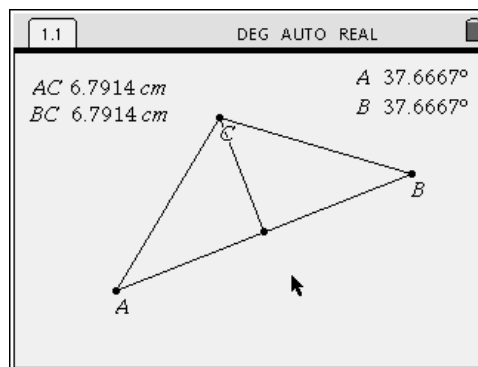


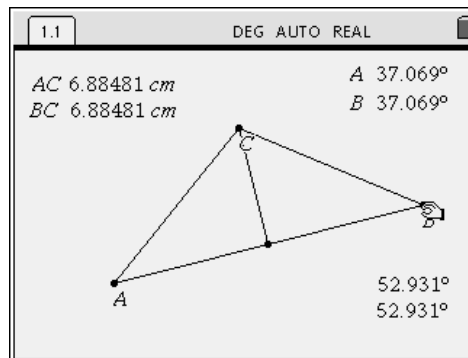
Figure 7



Now, let's measure the two angles created (at the Vertex angle) by the segment we just drew. Press **Measurement**, **Angle**. Move the cursor over point A until it flashes and press **Measure**. Move the cursor over point C and press **Measure**. Move the cursor down to the midpoint and press **Measure**. Move the measurement to the lower right hand side of the screen and press **Move**. Repeat the process for the other angle on the other side of the perpendicular bisector. Press **Done**. (See figure 8)

Now, click and drag one of the vertices discover what happens to all of the measurements on the screen.

Figure 8











What can you conclude are some of the attributes of an isosceles triangle?

Activity extensions

- The student should be encouraged to explore and discover the different attributes of an equilateral triangle, parallelograms, or rhombuses.

Student TI-Nspire Document

After turning “on” the Nspire handheld, press the  button, : **New Document**.

To hide the Axes and the Entry line, press , : **View**, : **Hide Axes**. Then Press , : **View**, : **Hide Entry Line**.









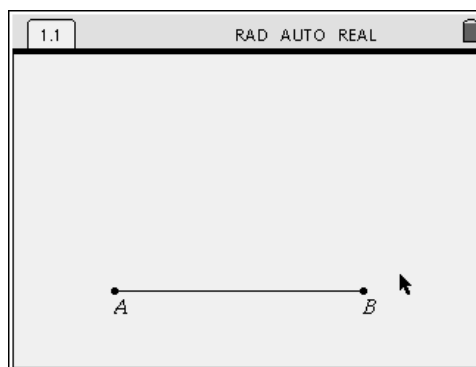
To draw the base of the Isosceles triangle, press , : **Points & Lines**, : **Segment**. Move the cursor to the lower half of the screen and press . Before moving the cursor, press  key and the letter **A** to label the point. Now move the cursor to a different position and press . Again, before moving the cursor, press  key and the letter **B** to label the point. Press . (see figure 1)

Figure 1








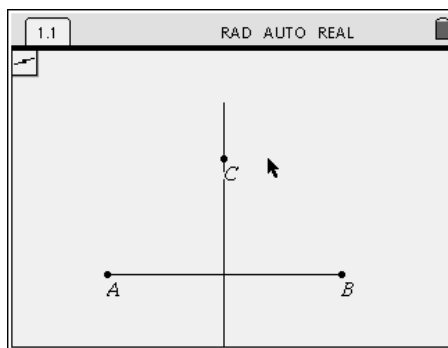






Now, let's draw the perpendicular bisector of this line segment. Press , : **Construction**, : **Perpendicular Bisector**. Move the cursor with the **Nav Pad** somewhere over the segment you have just drawn and press . Press .

Figure 2



Now, let's place a point on the perpendicular bisector of the segment. Press, , : **Points & Lines**, : **Point On**. Move the cursor anywhere over the perpendicular bisector and press . Before moving the cursor, press  and the letter **C** to label the point. Press  (see figure 2).










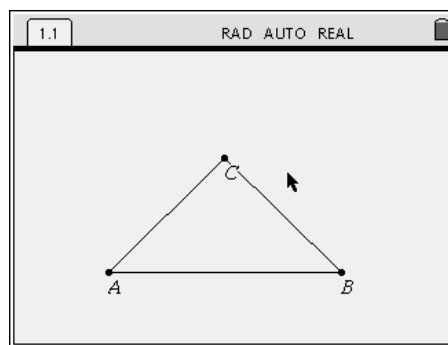
Now, let's draw a segment from each of the endpoint of the segment to the point on the perpendicular bisector. Press , : **Points & Lines**, : **Segment**. Hover the cursor over point A until it blinks and press . Move the cursor over point C until it blinks and press . Repeat the process from point B to point C. Press . Now let's hide the perpendicular bisector. Move the cursor over the perpendicular bisector until it flashes and press   simultaneously. Select : **Hide/Show**. (see figure 3)

Figure 3








Now, let's calculate the length of AC and BC. Press , : **Measurement**, : **Length**. Move the cursor over segment AC until it flashes and press . Now move the measurement somewhere to the upper left hand side of the screen and press  again to lock the measurement. Repeat the process for segment BC and move the measurement below the

Figure 4

measurement of AC. Press ESC .

Now let's label the measurements. Press MENU , 1 : **Tools**, 5 : **Text**. Press F7 , A C Press F5 . Move the cursor somewhere else on the screen and press F6 . Press F7 , B C , F5 . Press ESC . Now, hover the cursor over each label you just created and press F6 for 1.7 seconds. Move the label to the left of the measurement of the respective side and press F6 . Repeat the process for the other label. (see figure 4)

Let's change the angle measurement from radians to degrees. Press F8 , 8 : **System Info**, 1 : **Document Settings**, tab , "Down on Nav Pad" and select "Degree". Press tab several times until you get to OK and press F5 .

To measure the base angles, press MENU , 7 : **Measurement**, 4 : **Angle**. Move the cursor to point C until it flashes and press F6 . Move the cursor to point A until it flashes and press F6 . Move the cursor to point B until it flashes and press F6 . Move the measurement to the upper right hand side of the screen. Repeat the process for the other base angle. Press ESC .

Now let's label the angle measurements. Press MENU , 1 : **Tools**, 5 : **Text**. Press F7 , A , Press F5 . Move the cursor somewhere else on the screen and press F6 . Press F7 , B , F5 . Press ESC . Now, hover the cursor over each label you just created and press F6 for 1.7 seconds. Move the label to the left of the measurement of the respective side and press F6 . Repeat the process for the other label. (see figure 5)

Now, let's have some fun with this triangle. Move the cursor to one of the vertices of the triangle until it flashes and press F6 for 1.7 seconds and drag the point to different points on the screen. Notice the measurements of the sides and the base angles. (see figure 6)

Discovery Questions

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What do you notice about the base angles of the isosceles triangle?

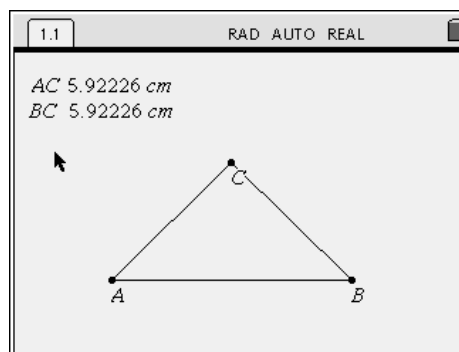


Figure 5

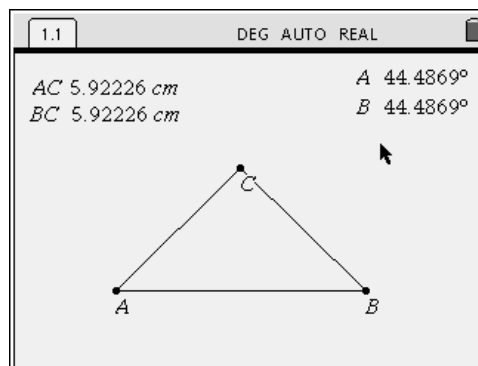


Figure 6

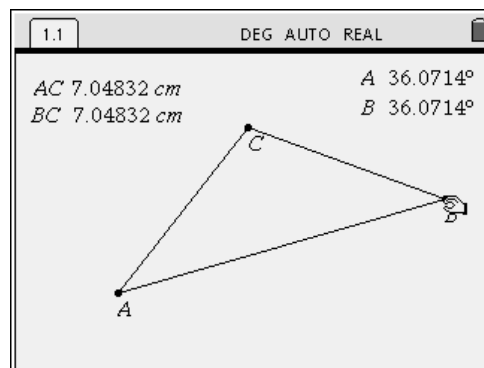


Figure 7

What happens when you “drag” the vertex of the isosceles triangle?

Extension

Calculate the midpoint of the base of the Isosceles Triangle. Press **Ⓜ**, **5**: **Midpoint**. Move the cursor to one of the endpoints until it flashes and press **Ⓜ**. Move the cursor to the other endpoint until it flashes and press **Ⓜ**. Press **Ⓜ**.

Draw a segment from the vertex angle to the midpoint of the base angle. Press **Ⓜ**, **5**: **Points & Lines**, **5**: **Segment**. Move the cursor to point C until it flashes and press **Ⓜ**, then move the cursor to the midpoint of the base until it flashes and press **Ⓜ**. Press **Ⓜ**. (See figure 7)

Now, let’s measure the two angles created (at the Vertex angle) by the segment we just drew. Press **Ⓜ**, **7**: **Measurement**, **4**: **Angle**. Move the cursor over point A until it flashes and press **Ⓜ**. Move the cursor over point C and press **Ⓜ**. Move the cursor down to the midpoint and press **Ⓜ**. Move the measurement to the lower right hand side of the screen and press **Ⓜ**. Repeat the process for the other angle on the other side of the perpendicular bisector. Press **Ⓜ**. (See figure 8)

Now, click and drag one of the vertices discover what happens to all of the measurements on the screen.

What can you conclude are some of the attributes of an isosceles triangle?

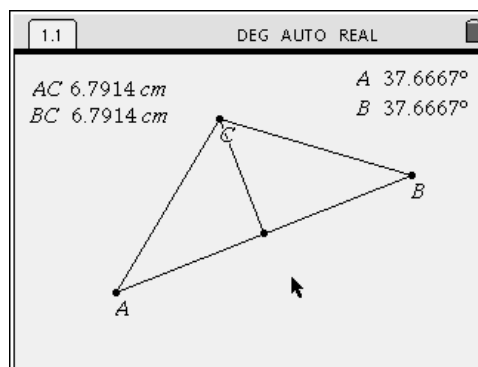


Figure 8

