

The Area Rule

Teacher Notes



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TI-Nspire CAS



Investigation



Student



20min

Aim

The aim of this investigation is to confirm the Area of a Triangle rule.

Equipment

For this activity you will need:

- TI-Nspire (or TI-Nspire)
- TI-Nspire file – Area Rule

National Curriculum Statement:

Establish the sine, cosine and area rules for any triangle and solve related problems (ACMMG273)

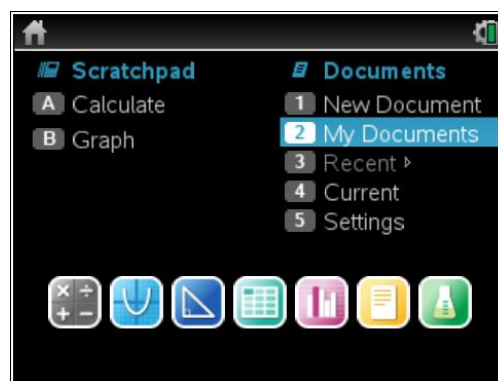
Introduction – Setting up the calculations

During this activity, students will need to use three TI-Nspire file: “Area Rule”. This file can be distributed using TI-Navigator, the TI-Nspire docking station or the teacher/student software. To distribute the file using the Teacher software, use the **Tools** menu and select the **Transfer Tool**. Locate the TI-Nspire file on your computer and then start the transfer. Once the file is transferred to the first handheld, unplug the handheld and continue plugging in each student’s handheld device. Once all the student has the file, stop the transfer. Note that students can also transfer files from one handheld device to another from within the **My Documents** folder. Note also that multi-port USB connectors can be used to transfer file to several computers at the one time.

This activity requires access to the “Area Rule” TI-Nspire file. This file should be loaded on your device before proceeding.

Once the file is on your handheld, press **home** and select **My Documents**. Locate the “Area Rule” file and press **enter** to open.

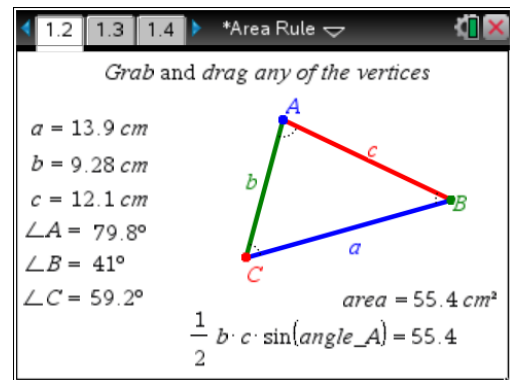
The location of the file depends on the selected location during the file transfer.



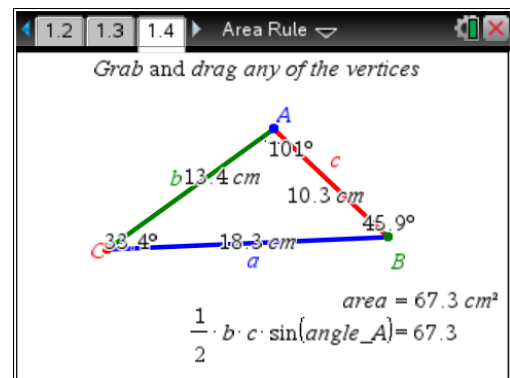
Press **home** and select **My Documents**. Locate the “Area Rule” file and press **enter** to open.


The Area of a Triangle Rule is $\text{Area} = \frac{1}{2} \cdot b \cdot c \cdot \sin(A)$.




Navigate to page 1.2, then grab and drag any of the vertices of the triangle. Observe that even though the measurements change, the Area Rule remains true.



Navigate to page 1.4, then grab and drag any of the vertices of the triangle. Again, observe that even though the measurements change, the Area Rule remains true.



Part of in this investigation requires calculations to be performed. The Scratchpad is a place where calculations can be computed and then discarded. To access the Scratchpad press **home** and select **Scratchpad** (or press **A**). Alternatively, press the  key (this key is not available on a Clickpad).

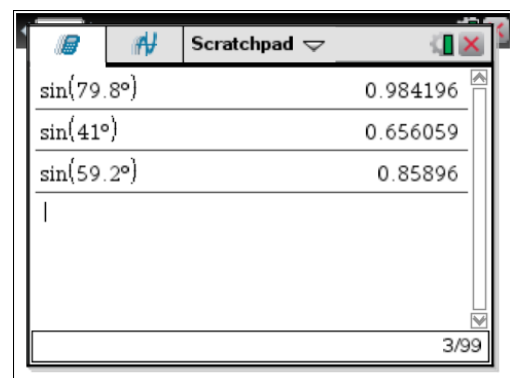
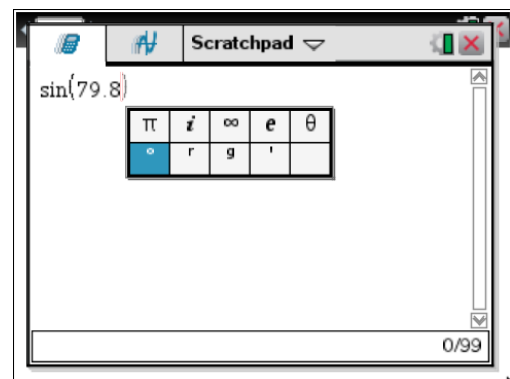
Change the document setting to **Degree** or use the degree symbol ($^\circ$). This can be found in the symbol palette or by pressing  or  to access one of the mini-palettes. On a Clickpad, press **ctrl** + .

It is recommended that the setting be changed to Degree.

Calculate some of the sine values from page 1.2.

Because you are inputting decimal values, you will get decimal answers. If you happen to get an exact answer, press **ctrl** + **enter** for the decimal answer.

To return to the current document, press **esc**. If you are on the **home** page, select **Current** (or press **4**).



1. The three forms of the Area Rule are:

$$\text{Area} = \frac{1}{2} \cdot b \cdot c \cdot \sin(A)$$

$$\text{Area} = \frac{1}{2} \cdot a \cdot c \cdot \sin(B)$$

$$\text{Area} = \frac{1}{2} \cdot a \cdot b \cdot \sin(C)$$

Alter the triangle on page 1.2 then complete the table below using a new set of values. Use the Scratchpad for your calculations.

Several values are possible for the following table. Encourage students to adjust the triangle and use their own values. Students are also encouraged to share their results with others. Ideally, each student will use different values but they will all reach the same conclusion.

Side/Angle	Value	Area Rule	Scratchpad
a	13.9	$\frac{1}{2} \times b \times c \times \sin(A^\circ)$	55.2567
b	9.28		
c	12.1	$\frac{1}{2} \times a \times b \times \sin(C^\circ)$	55.3995
$\angle A$	79.8°		
$\angle B$	41°	$\frac{1}{2} \times a \times c \times \sin(B^\circ)$	55.1713
$\angle C$	59.2°		

2. Do you believe your answers verify the Area Rule? Why or why not?

Yes, although this is not a proof. The results verify the Area of a Triangle Rule as these results are very close. Any discrepancies will be due to rounding errors. Emphasise to students that rounding errors can occur early in a solution, not just at the end.

3. How is this formula different to the area of a triangle formula $\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$?

The formula $\text{Area} = \frac{1}{2} \cdot b \cdot c \cdot \sin(A)$ uses two sides and the angle between the sides.

The formula $\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$ uses one side and the perpendicular distance to the opposite vertex.