The Area Rule
Teacher Answers

TEXAS INSTRUMENTS
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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

Introduction – Setting up the calculations

This activity requires access to the "Area Rule" TI-Nspire file. This file should be loaded on your device before proceeding.
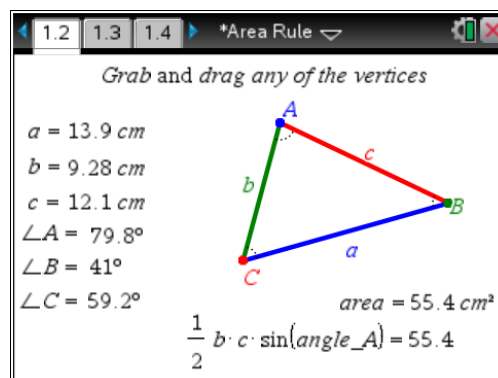
Once the file is on your handheld, press **home** and select **My Documents**. Locate the "Area Rule" file and press **enter** to open.
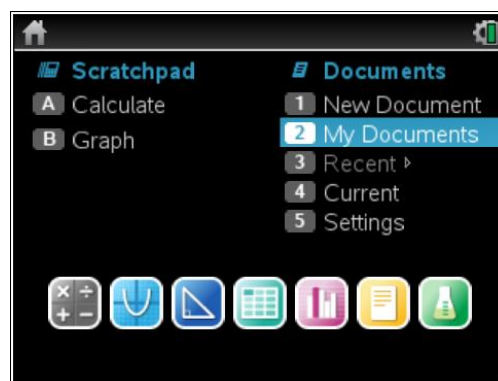

Press **home** and select **My Documents**. Locate the "Area Rule" file and press **enter** to open.

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

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.

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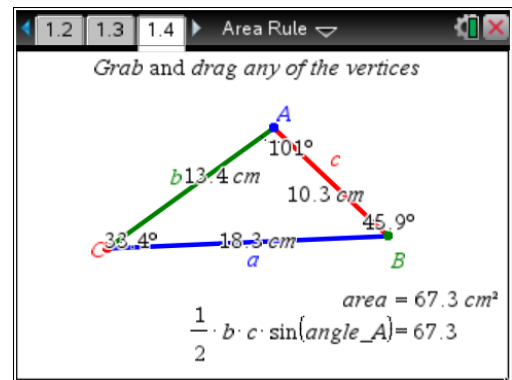
Part of in this investigation requires calculations to be performed. The Scratchpad is a place where calculations can be computed and then discarded. To access the Scratchpad press **home** and select **Scratchpad** (or press **A**). Alternatively, press the ⌨ key (this key is not available on a Clickpad).

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

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**).
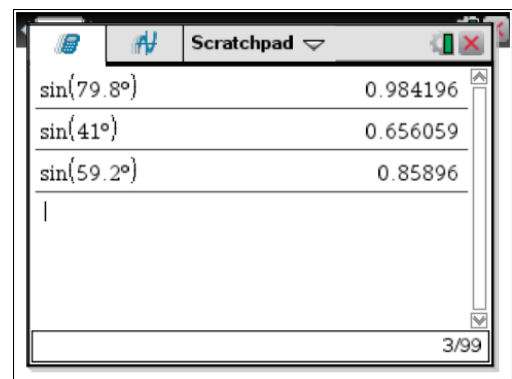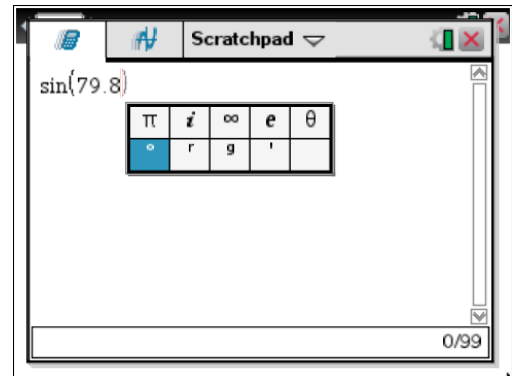
1. The three forms of the Area Rule are:

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

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

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

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.

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

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.