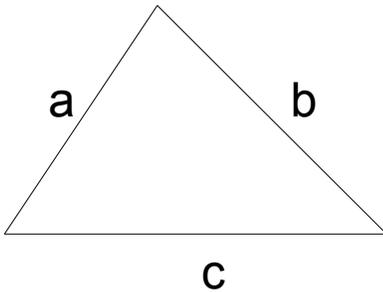


# HERON'S FORMULA

You can calculate the area of a triangle if you know the length of its sides. Let a, b and c be the lengths of the three sides of a triangle, and K its area, then:



$$K = \sqrt{s(s-a)(s-b)(s-c)}$$

Where  $s = \frac{a+b+c}{2}$

This is Heron's formula. Let's consider the triangle with sides 6, 8 and 10 units, we are going to find its area, but, instead of using regular algebra, we are going to use lists and their operations in the HP 50g. Set the calculator to work in RPN mode and soft MENU (flag -117 most be set) .

Enter the lengths of the sides in a list. $\leftarrow$ $+$ 6 SPC 8 SPC / 0 ENTER	1: { 6 8 10 }
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Next we duplicate the list, add the lengths and divide by 2 and duplicate this value (since we have to use it twice). ENTER $\leftarrow$ SYMB $\leftarrow$ 2 $\div$ ENTER	3: { 6 8 10 } 2: 12 1: 12
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Now we need to to move the list to level 1, calculate the differences s-a, s-b and s-c and add s as a fourth item in the list. $\uparrow$ $\uparrow$ $\uparrow$ $\leftarrow$ ENTER - +	1: { 12 6 4 2 }
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Finally we find the product of the items of the list and then, the square root of that product. $\leftarrow$ $\sqrt{x}$	1: 24
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We can write a little program that takes three numbers from the stack and performs all the operations we did before, Let's save this program in a variable called HRN.

**Note:** ( $\leftarrow$  NXT) means: while holding ( $\leftarrow$ ), press (NXT), this is a shortcut that takes you to the last MENU you were using before.

$\rightarrow$ + 3 $\leftarrow$ EVAL $\leftarrow$ EVAL $\leftarrow$ SYMB $\leftarrow$ 2 $\div$ ( $\leftarrow$ NXT) $\leftarrow$ - + ( $\leftarrow$ NXT) $\leftarrow$ $\sqrt{x}$ ENTER	1: * 3 +LIST DUP ΣLIST 2 / DUP ROT - + TLIST ↓ *
' ALPHA ALPHA (H) (R) (N) ALPHA STO▶	1:

Let's use the program to calculate the area of the triangle whose sides are 20, 22 and 24 units.

20 . SPC 22 SPC 24 VAR $\leftarrow$	1: 206.084933947
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**Problem:** Calculate the length of the side of an equilateral triangle whose area is equal to the area of the triangle whose sides are 7, 8 and 9 units (Calculator in exact mode and rigorous unchecked in CAS MODES).

<p>Let X be the length of the side of the equilateral triangle, we have:</p> <p></p>	<p>1: 'X^2/4*√3'</p>
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<p>Now we calculate the area of the other triangle and equal the two expressions.</p> <p></p>	<p>1: 'X^2/4*√3=12*√5'</p>
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<p>Finally we isolate X</p> <p></p>	<p>1: 'X=4*√15'</p>
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Or, if you want an approximate number:

<p></p>	<p>1: 'X=7.87195868508'</p>
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