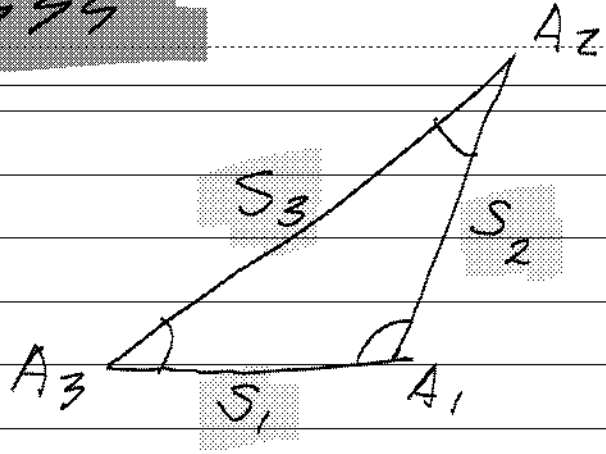
'SSS'

Note Title 20/10/2007



if we know the 3 sides:

as (cosine law):

$$S_3^2 = S_1^2 + S_2^2 - 2 S_1 S_2 \cos A_1$$

$$A_1 = \cos^{-1} \frac{S_3^2 - S_1^2 - S_2^2}{-2 S_1 S_2}$$

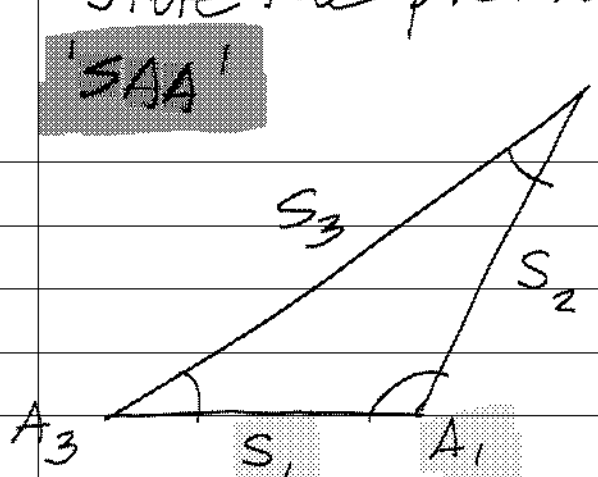
etc. (same for A_2 & A_3). Assume S_1 S_2 S_3 are on the stack:

```
<< -> S1 S2 S3
     <<
          'ACOS((S3^2-S1^2-S2^2)/(-2*S1*S2))' EVAL
          'ACOS((S1^2-S2^2-S3^2)/(-2*S2*S3))' EVAL
          'ACOS((S2^2-S1^2-S3^2)/(-2*S1*S3))' EVAL
          -> A1 A2 A3
          << S1 A1 S2 A2 S3 A3 >>
     >>
>>
```

store the previous program as 'SSS' ← IMPORTANT

'SAA'

If we know S, A, A



$A_3 = 180 - A_1 - A_2$

using the sine law:

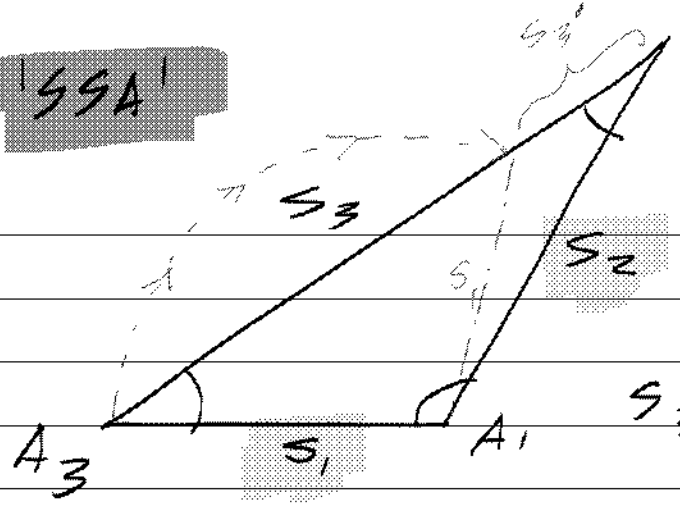
$$S_2 = \frac{S_1}{\sin A_2} \sin A_3 \text{, etc...}$$

```
<< → S1 A1 A2
   << 'S1 / SIN(A2) X SIN(A1)' EVAL
      '180 - A1 - A2' EVAL SIN
      'S1 / SIN(A2)' EVAL X  S1
      → S3 S2 S1
      << S1 S2 S3 'SSS' EVAL >>
   >>
>>
```

& call it here!

store this program as 'SAA'

'SSA'



using the cosine law:

$$S_1^2 = S_2^2 + S_3^2 - 2S_2S_3\cos A_2$$

a quadratic eq. in S_3:

$$S_3 = \frac{2S_2\cos A_2 \pm \sqrt{4S_2^2\cos^2 A_2 - 4S_1^2}}{2}$$

if the square root is imaginary, S_1 is too short so it won't cut the line with S_3 on it: NO SOLUTION!
if the root is null, there is only one solution, else:

```
<<→ S1 S2 A2 << 'S2×SIN(A2)' EVAL DUP SQ S1 SQ
  SWAP - √ 'S2×COS(A2)' EVAL → x y z
  << S1 S2 Z y + 'SSS' EVAL HALT
     S1 S2 Z y - 'SSS' EVAL
  >> >>
```

>> The program delivers one solution and "halts"...
PRESS [WHITE] CONT to see the other solution,
or [WHITE] PRGM NEXT NEXT [RUN] KILL