

# Calculating Tension

Use the law of sines to find the tension when a pole of weight  $W$  is suspended with two strings, and the strings are balanced with the angles from the vertical line  $A$  and  $B$ .

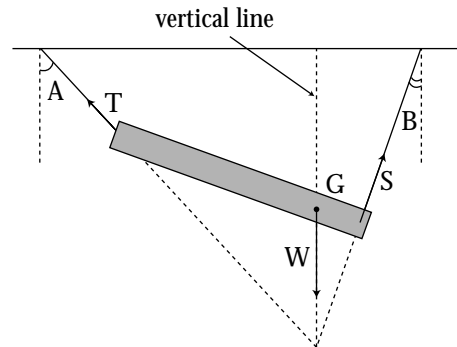
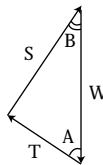
## Calculation

$$\frac{T}{\sin B} = \frac{S}{\sin A} = \frac{W}{\sin (A+B)}$$

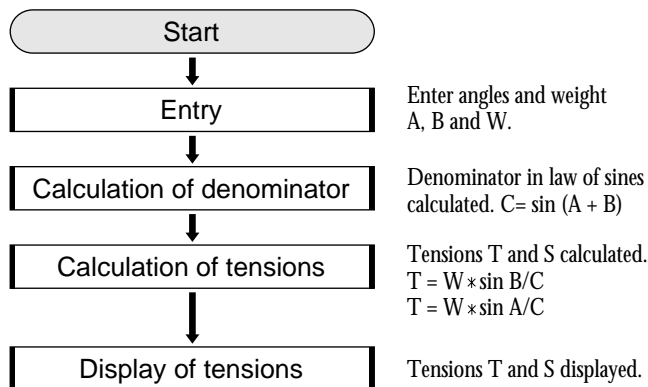
$$\therefore T = W \frac{\sin B}{\sin (A+B)}$$

$$\therefore S = W \frac{\sin A}{\sin (A+B)}$$

$T, S$  : tension     $W$  : weight  
 $A, B$  : angles (6 sexagesimal numbers)



## FLOWCHART



## PROGRAMME LIST (REAL MODE)

```

Title : TENSION
Print "Input ANGLE
Input A
Input B
Print "Input WEIGHT
Input W
sin (A+B) ÷ C
W * sin B / C ÷ T
W * sin A / C ÷ S
Print "TENSION
Print "T=
Print T
Print "S=
Print S
End
  
```

## PARAMETERS

Name of parameter	Content	Name of parameter	Content
A	angle A	S	tension S
B	angle B	T	tension T
C	$\sin(A+B)$	W	weight

**Exercise**

Calculate the tension assuming weight=40kg, angle A=30° 15' 20", and angle B=27° 45' 40". Enter the angles with sexagesimal numbers.

Set up condition: decimal point digit number in TAB 3 Mode, decimal point in Fix Mode, and angle unit in Deg Mode.

**2nd F** **SET UP** **C** **2** **D** **3** **B** **1** **CL**

<u>Step</u>	<u>Key Operation</u>	<u>Display</u>
<b>1</b> Specify the programme mode. Select the title TENSION.	<b>PRGM</b> <b>A</b>	<pre>TENSION Input ANGLE A=?</pre>
<b>2</b> Enter the values of angles A and B.	<b>3</b> <b>0</b> <b>.</b> <b>1</b> <b>5</b> <b>2</b> <b>0</b> <b>ENTER</b> <b>2</b> <b>7</b> <b>.</b> <b>4</b> <b>5</b> <b>4</b> <b>0</b> <b>ENTER</b>	<pre>Input ANGLE A= 30.1520 B= 27.4540 Input WEIGHT W=?</pre>
<b>3</b> Enter the value of weight.	<b>4</b> <b>0</b> <b>ENTER</b>	<pre>Input WEIGHT W= 40 TENSION T= S= 21.840 23.795</pre>
<b>4</b> Tension T is 21.840kg and S is 23.795kg.		