

Involute (Inverse Involute)

Use the involute function for calculating gears etc. to find the angle of obliquity from the initial value and involute value.

Conversely, calculate the involute value from the angle of obliquity.

Calculation

Involute function : $\text{inv } \theta = \tan \theta - \theta[\text{rad}]$

Use Newton's method to find the inverse involute:

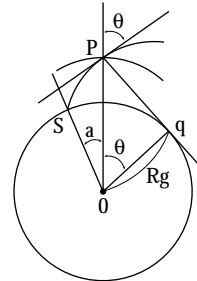
$$\theta_{i+1} = \theta_i - \frac{f'(\theta)}{f(\theta)} = \theta_i - \frac{\tan \theta_i - \theta_i - a}{\tan^2 \theta_i}$$

$$f(\theta) = a - \text{inv } \theta$$

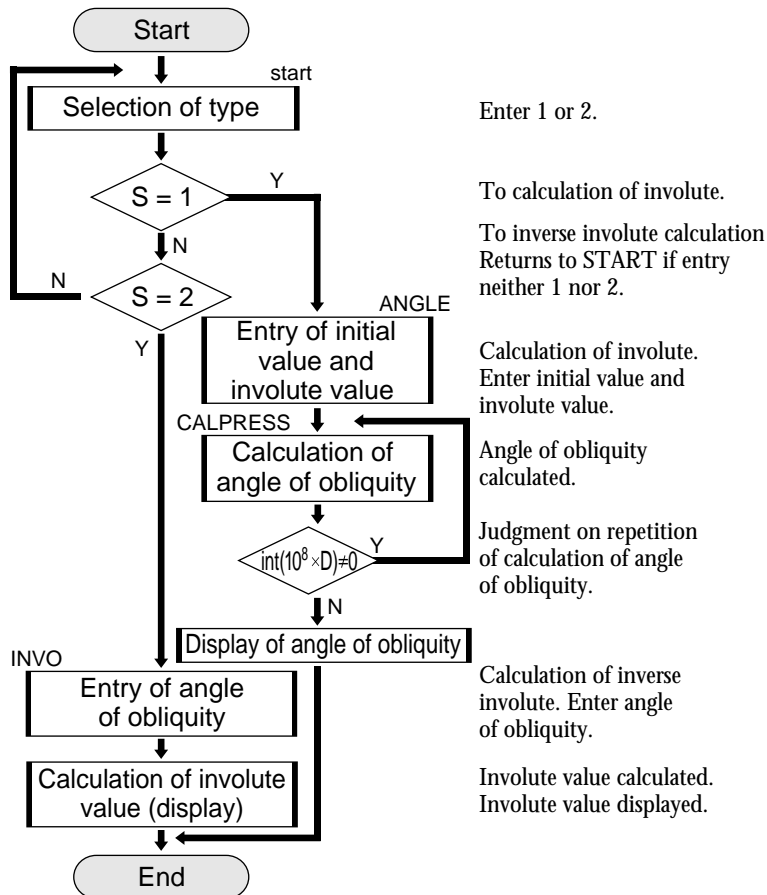
SP : involute curve

S : involute starting point

θ : angle of obliquity of point P



FLOWCHART



PROGRAMME LIST (REAL MODE)

Title : INVOLUTE

Label START

ClrT

Print "SELECT 1 or 2

Input S

If S=1 Goto ANGLE

If S=2 Goto INVO

Goto START

Label ANGLE

Print "Input BEGIN

Input B

B \Rightarrow Z

Print "Input INVO

Input I

I \Rightarrow J

Label CALPRESS

$\tan Z \Rightarrow T$

$\pi * Z / 180.0 \Rightarrow R$

$(T - R - J) / T^2 \Rightarrow D$

$180.0 * (R - D) / \pi \Rightarrow Z$

If $\text{int}(10^8 * D) \neq 0$ Goto CALPRESS

Z \Rightarrow A

Print "ANGLE

Print A

End

Label INVO

Print "Input ANGLE

Input A

A \Rightarrow θ

$\tan \theta - \pi * \theta / 180 \Rightarrow I$

Print "INVOLUTE

Print I

End

PARAMETERS

Name of parameter	Content	Name of parameter	Content
D, R, T, J	working variable for calculating	θ	angle of obliquity
S	selecting calculation type	I	involute value
	(S=1: involute calculation)	A	input and output of angle
	(S=2: inverse involute calculation)	B	input of initial value
Z	initial value, angle of obliquity		

Exercise

- (1) Find the angle of obliquity when the involute value is 0.0050912 and the initial value is 10.
- (2) Find the involute value when the angle of obliquity is 14.1.

Set up condition: angle unit in Deg Mode and decimal point in Float Pt Mode.

2ndF **SETUP** **B** **1** **C** **1** **CL**

<u>Step</u>	<u>Key Operation</u>	<u>Display</u>
1 Specify the programme mode. Select the title INVOLUTE.	PRGM A	SELECT 1 or 2 S=?
2 Select involute calculation.	1 ENTER	SELECT 1 or 2 S= 1 Input BEGIN B=?
3 Enter the initial value and the involute value. (Display of angle of obliquity)	1 0 ENTER 0 . 0 0 5 0 9 1 2 ENTER	Input BEGIN B= 10 Input INVO I= 0.0050912 ANGLE 14.09998733
.....		
4 Select inverse involute calculation.	ENTER 2 ENTER	SELECT 1 or 2 S= 2 Input ANGLE A=?
5 Enter the value of the angle of obliquity. (Display of involute value)	1 4 . 1 ENTER	SELECT 1 or 2 S= 2 Input ANGLE A= 14.1 INVOLUTE 0.005091213