Question: If 270°<m°<360°, and √3sin m° + cos m° = 2sin2011°. then m=?

Solution:

√3sin m° + cos m° = 2 sin 2011° (1)

Let's divide both sides of the equation (1) by 2:

$\frac{\sqrt{3}}{2}$ sin m° + $\frac{1}{2}$ cos m° = sin 2011°

Let's substitute $\frac{\sqrt{3}}{2}$ with cos 30° and $\frac{1}{2}$ with sin 30°:

cos 30°sin m° + sin 30°cos m° = sin 2011°

Left side of the equation is sinus of the sum of 30° and m°.

sin(m+30°)=sin2011°

sin(m+30°) - sin2011°=0

Here let's use the formula for the substraction of sinuses: $\sin a - \sin b = 2\sin\frac{a-b}{2}\cos\frac{a+b}{2}$

2sin$\frac{m+30-2011}{2}\cos\frac{m+30+2011}{2} = 0$

$\sin\frac{m-1981}{2}\cos\frac{m+2041}{2} = 0$ (2)

From equation (2) we get these solutions: $\sin\frac{m-1981}{2} = 0$ or $\cos\frac{m+2041}{2} = 0$.

1) $\sin\frac{m-1981}{2} = 0$

$\frac{m-1981}{2}$=πn

m-1981=2πn

m=1981+2πn (3)

Here 1981=181°+5*2πn, so the equation (3) becomes:

m=181°+2πn, where n is an integer.

This solution does not correspond to the condition that 270°<m°<360°.

2) $\cos\frac{m+2041}{2} = 0$

$\frac{m+2041}{2} = \frac{\pi}{2} + \pi k$

$m + 2041 = \pi + 2\pi k$ (4)

As 2041=61°+π+5*2πk, the equation (4) becomes:

$m = -61° + 2\pi k$, where k is an integer.

In the last equation substituting k=1 we get a solution m=299° that corresponds to the condition that 270°<m°<360°.

Answer: m=299°