

Question 3) When a disc slides on a smooth inclined surface from rest, the time taken to move from A to B is t_1 . When the disc performs pure rolling from rest then the time taken to move from A to B is t_2 . If

$$\frac{t_1}{t_2} = \sqrt{\frac{3}{x}}$$

find x .

Solution:

When disc slides $a_1 = g \sin \theta$

So,

$$S = ut_1 + \frac{1}{2} a_1 t_1^2 = \frac{1}{2} g \sin \theta t_1^2$$

.....(1)

When disc do pure rolling

$$a_2 = \frac{g \sin \theta}{1 + \frac{k^2}{R^2}} = \frac{g \sin \theta}{1 + 1/2} = \frac{2}{3} g \sin \theta$$

So,

$$S = ut_2 + \frac{1}{2} a_2 t_2^2 = \frac{1}{2} \times \frac{2}{3} g \sin \theta t_2^2$$

---(2)

From (1) and (2)

$$\frac{t_2}{t_1} = \sqrt{\frac{3}{2}}$$

So, $x = 2$