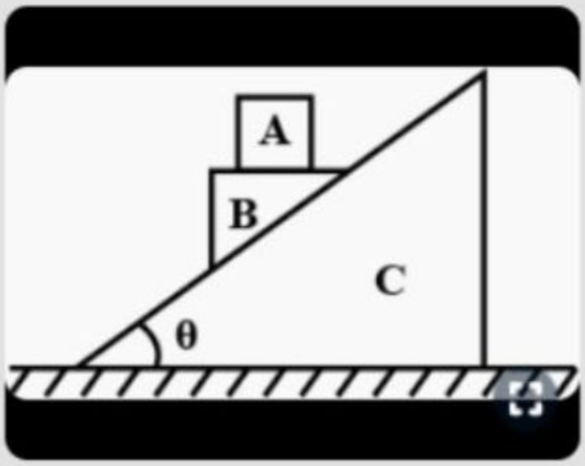
In the figure shown all blocks are of equal mass m. All surfaces are smooth. The acceleration of block A with respect to the ground is :

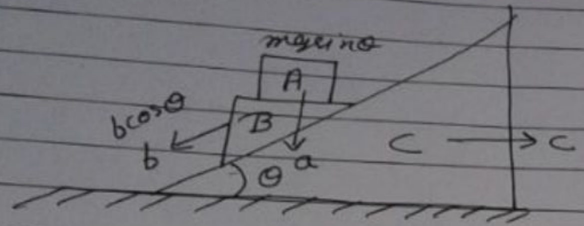


A $\dfrac{4g\sin\theta}{1+3\sin^2\theta}$

B $\dfrac{4g\sin^2\theta}{1+3\sin^2\theta}$

C $\dfrac{4g\sin^2\theta}{(1+3\sin^2\theta)^{1/2}}$

D None of these



a = acceleration of the block A downwards w.r.t ground.
b = acceleration of the block B w.r.t inclined plane
c = acceleration of the block C w.r.t ground right side.

b + c = acceleration of B w.r.t ground

applying newton's law F = ma on (b & c)

$F_1 = mc \qquad F_2 = mc - mb\cos\theta$

$mc + mc - mb\cos\theta = 0$

$2\cancel{m}c = \cancel{m}b\cos\theta$

$2c = b\cos\theta$ — (1)

$\boxed{a = b\sin\theta}$

applying again newton's law on (A+B)

$2mg\sin\theta = m(b - c\cos\theta) + ma\sin\theta$

$2mg\sin\theta = mb - mc\cos\theta + ma\sin\theta$

$2g\sin\theta = b - c\cos\theta + a\sin\theta$ — (2)

$2g\sin\theta = b - c\cos\theta + b\sin\theta\cdot\sin\theta$

$2g\sin\theta = b - c\cos\theta + b\sin^2\theta$

$2g\sin\theta + c\cos\theta = b(1+\sin^2\theta)$

$2g\sin\theta + \frac{b\cos^2\theta}{2} = b(1+\sin^2\theta)$

$2g\sin\theta + \frac{b(1-\sin^2\theta)}{2} = b(1+\sin^2\theta)$

$2g\sin\theta + \frac{b}{2} - \frac{b}{2}\sin^2\theta + b - b\sin^2\theta = 0$

$2g\sin\theta + b\left(\frac{1}{2} - \frac{1}{2}\sin^2\theta - 1 - \sin^2\theta\right) = 0$

$2g\sin\theta + b\left(-\frac{1}{2} - \frac{3}{2}\sin^2\theta\right) = 0$

$\cancel{-}\frac{b}{2}\left(1+3\sin^2\theta\right) = \cancel{-}2g\sin\theta$

$b = \frac{2\times 2g\sin\theta}{1+3\sin^2\theta}$

$\boxed{b = \frac{4g\sin\theta}{1+3\sin^2\theta}}$

$\boxed{a = \frac{4g\sin^2\theta}{1+3\sin^2\theta}} \qquad a = b\sin\theta$