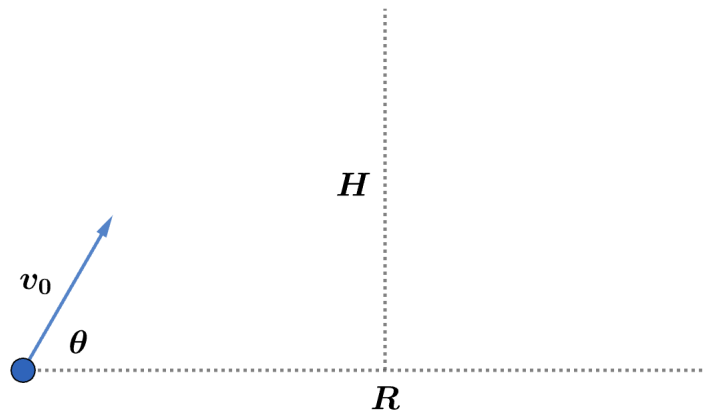


2012 F=ma Exam: Problem 2

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Recall the range and height equations from projectile motion:

$$R = \frac{v^2 \sin(2\theta)}{g}$$

$$H = \frac{v^2 \sin^2 \theta}{2g}$$

We want to find the critical angle when $H = R$,

$$\frac{v^2 \sin(2\theta)}{g} = \frac{v^2 \sin^2 \theta}{2g}$$

$$\sin(2\theta) = \frac{1}{2} \sin^2 \theta$$

Since $\sin(2\theta) = 2 \sin \theta \cos \theta$,

$$2 \sin \theta \cos \theta = \frac{1}{2} \sin^2 \theta$$

$$\tan \theta = 4$$

$$\theta = \arctan 4 = 76^\circ$$

so the answer is $\boxed{A}$.