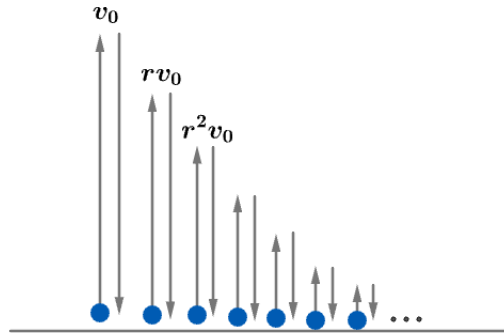


2008 F=ma Exam: Problem 24

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If a ball is launched upward with velocity v , then it will reach the top in time

$$v - gt = 0$$

$$t = \frac{v}{g}$$

The ball takes the same amount of time to come down so the time for the first bounce is

$$t_1 = \frac{2v}{g}$$

For the second bounce, the velocity is modified by a factor of r ,

$$t_2 = \frac{2rv}{g}$$

An additional factor of r is introduced for each subsequent bounce. Thus, the total time the ball bounces is

$$T = t_1 + t_2 + t_3 + \dots = \frac{2v}{g}(1 + r + r^2 + \dots) = \frac{2v}{g} \frac{1}{1 - r}$$

using the formula for the sum of an infinite geometric series. The answer is \boxed{A} .