Engineering Mechanics
AGE 2330

Extra Problems

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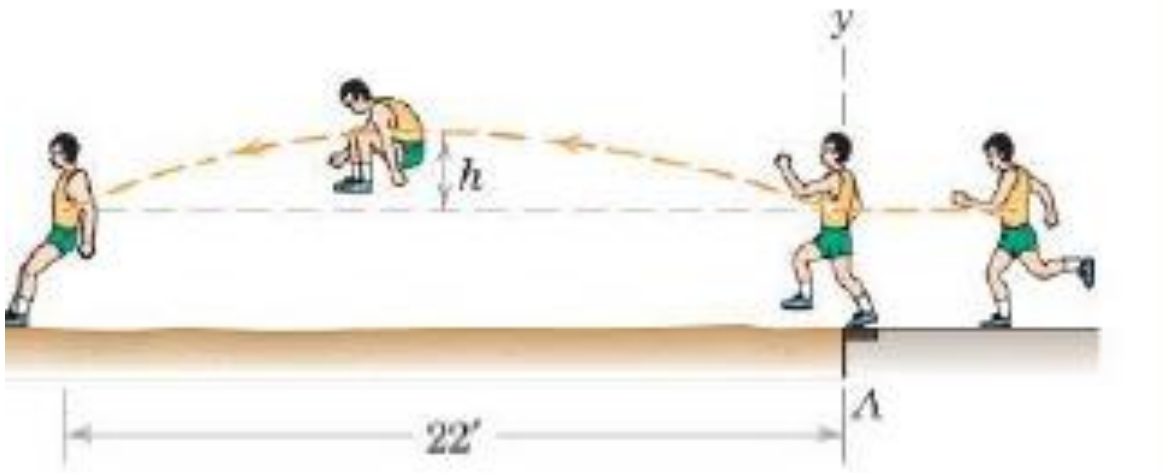
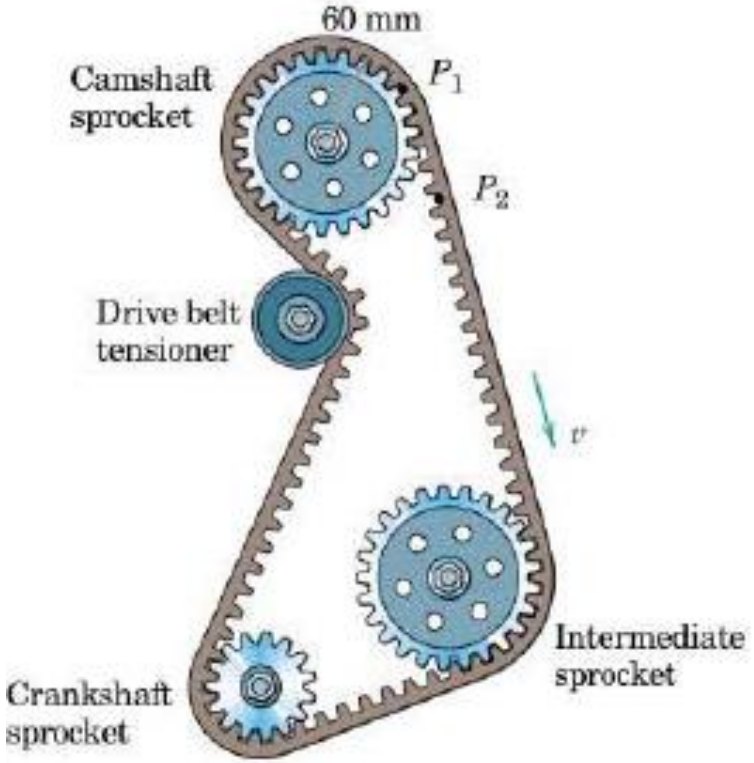
The deadline to submit this Extra problem bonus is **before** Final Exam

A long jumper approaches his takeoff board A with a horizontal velocity of 30 ft/sec. Determine the vertical component v_y of the velocity of his center of gravity at takeoff for him to make the jump shown. What is the vertical rise h of his center of gravity?

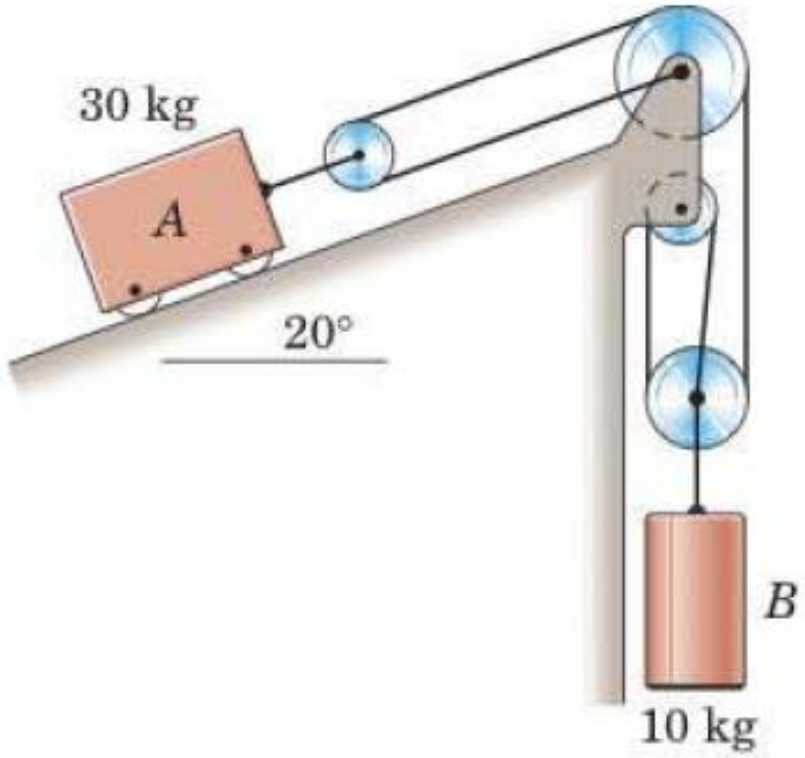
Ans. $v_y = 11.81$ ft/sec, $h = 2.16$ ft



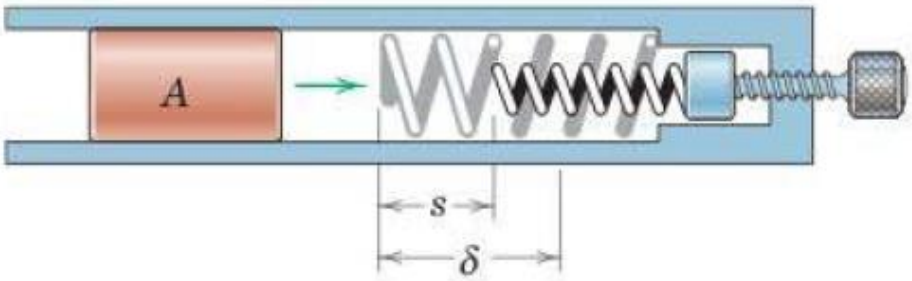
The design of a camshaft-drive system of a four-cylinder automobile engine is shown. As the engine is revved up, the belt speed v changes uniformly from 3 m/s to 6 m/s over a two-second interval. Calculate the magnitudes of the accelerations of points P_1 and P_2 halfway through this time interval.



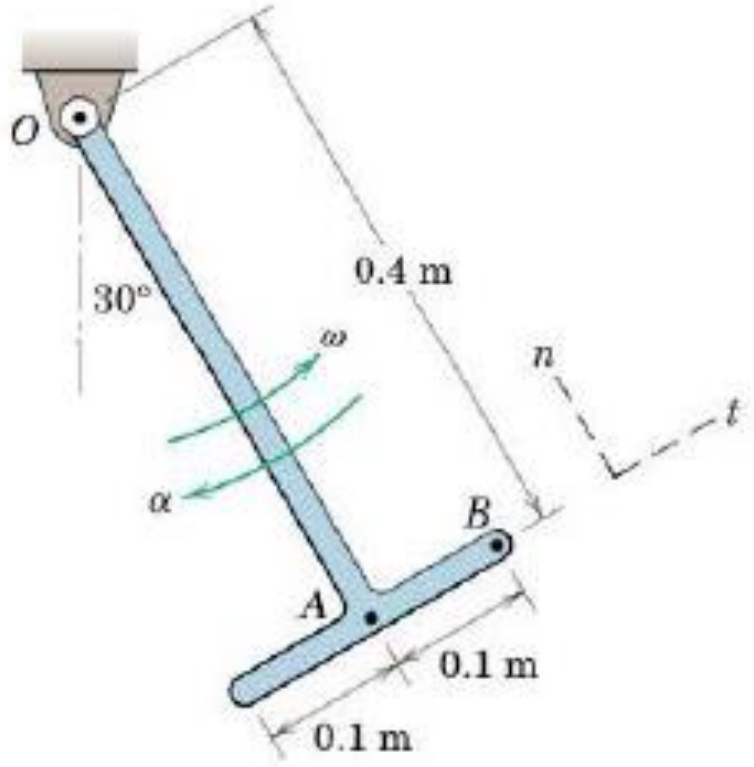
Neglect all friction and the mass of the pulleys and determine the accelerations of bodies A and B upon release from rest.



The nest of two springs is used to bring the 0.5-kg plunger A to a stop from a speed of 5 m/s and reverse its direction of motion. The inner spring increases the deceleration, and the adjustment of its position is used to control the exact point at which the reversal takes place. If this point is to correspond to a maximum deflection $\delta = 200$ mm for the outer spring, specify the adjustment of the inner spring by determining the distance s. The outer spring has a stiffness of 300 N/m and the inner one a stiffness of 150 N/m.



The T-shaped body rotates about a horizontal axis through point O. At the instant represented, its angular velocity is $\omega = 3$ rad/s and its angular acceleration is $\alpha = 14$ rad/s^2 in the directions indicated. Determine the velocity and acceleration of (a) point A and (b) point B. Express your results in terms of components along the n- and t-axes shown.



The rigid link moves from position ABC to position $A'B'C'$ while end A moves 40 in. to the left with a constant velocity of 10 in./sec. Determine the average angular velocity ω_{av} of the arm BC during this interval. Assume counterclockwise motion.