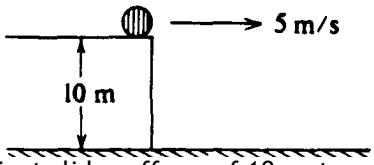
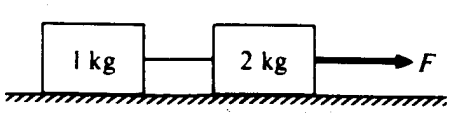
Forces Review Packet

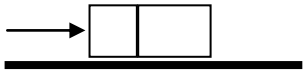


1. An object slides off a roof 10 meters above the ground with an initial horizontal speed of 5 meters per second as shown above. The time between the object's leaving the roof and hitting the ground is most nearly
   (A) $\frac{1}{2}$ s (B) $\frac{1}{\sqrt{2}}$ s (C) $\sqrt{2}$ s (D) 2 s (E) $5\sqrt{2}$ s



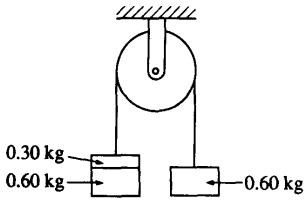
2. When the frictionless system shown above is accelerated by an applied force of magnitude F, the tension in the string between the blocks is (A) 2 F (B) F (C) (2/3)F (D) 0.5F (E) (1/3)F

3. A particle of mass *m* moves along a straight path with a speed *v* defined by the function $v = bt^2 + c$, where *b* and *c* are constants and *t* is time. What is the magnitude *F* of the net force on the particle at time $t = t_1$?
   (A) $bt_1^{\,2} + c$ (B) $3mbt_1 + 2c$ (C) mbt_1 (D) $mbt_1 + c$ (E) $2mbt_1$



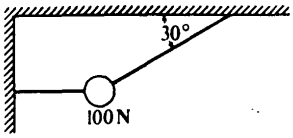
4. Two blocks are pushed along a horizontal frictionless surface by a force of 20 newtons to the right, as shown above. The force that the 2-kilogram block exerts on the 3-kilogram block is
   (A) 8 newtons to the left (B) 8 newtons to the right (C) 10 newtons to the left
   (D) 12 newtons to the right (E) 20 newtons to the left

5. If F_1 is the magnitude of the force exerted by the Earth on a satellite in orbit about the Earth and F_2 is the magnitude of the force exerted by the satellite on the Earth, then which of the following is true?
   (A) F_1 is much greater than F_2. (B) F_1 is slightly greater than F_2.
   (C) F_1 is equal to F_2. (D) F_2 is slightly greater than F_1 (E) F_2 is much greater than F_1



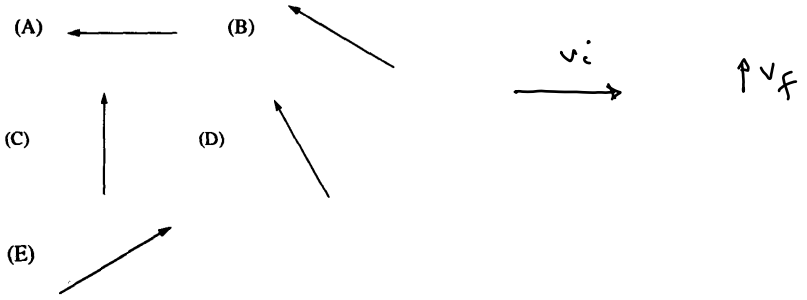
6 Two 0.60-kilogram objects are connected by a thread that passes over a light, frictionless pulley, as shown above. The objects are initially held at rest. If a third object with a mass of 0.30 kilogram is added on top of one of the 0.60-kilogram objects as shown and the objects are released, the magnitude of the acceleration of the 0.30-kilogram object is most nearly
   (A) 10.0 m/s^2 (B) 6.0 m/s^2 (C) 3.0 m/s^2 (D) 2.0 m/s^2 (E) 1.0 m/s^2

7. The position of a toy locomotive moving on a straight track along the x-axis is given by the equation
$x = t^3 - 6t^2 + 9t$, where x is in meters and t is in seconds. The net force on the locomotive is equal to zero when t is equal to
(A) zero (B) 2 s (C) 3 s (D) 4 s (E) 5 s

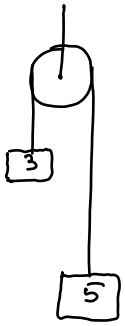


8. A 100-newton weight is suspended by two cords as shown in the figure above. The tension in t slanted cord is
(A) 50 N (B) 100 N (C) 150 N (D) 200 N (E) 250 N

9. A ball initially moves horizontally with velocity v_i, as shown below. It is then struck by a stick. After leaving the stick, the ball moves vertically with a velocity v_f, which is smaller in magnitude than v_i. Which of the following vectors best represents the direction of the average force that the stick exerts on the ball?



1-C 2-E 3-E 4-D 5-C 6-D 7-B 8-D 9-B



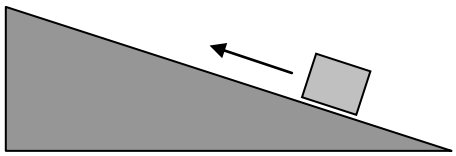
1. Two masses of 3.00 kg and 5.00 kg are connected by a massless string that passes over a massless pulley to form an ideal Atwood's Machine. Determine…

   a) the tension in the string

   b) the magnitude of the acceleration of each mass

   c) the distance each mass moves in the first second of motion.

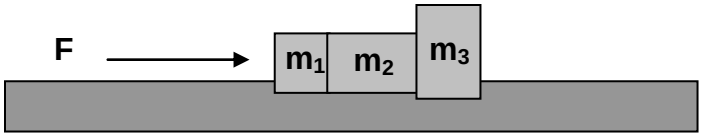
2. A block is given an initial velocity of 5.00 m/s up a frictionless 20.0° incline as shown below. How far up the incline does the block slide before stopping?



3. A 3.0 kg mass moves in a plane with its x and y-coordinates given by the formulae $x = 5t^2 - 1$ and $y = 3t^3 + 2$, where x and y are in meters and t is in seconds. Find the magnitude of the net force acting on this mass at t = 2.0 seconds.

4. The largest caliber anti-aircraft gun operated by the Luftwaffe during World War II was the 12.8-cm Flak 40. This weapon fired a 25.8 kg shell with a muzzle speed of 880 m/s. What propulsive force was necessary to attain the muzzle speed within the 6.0-m barrel? (Assume constant acceleration and neglect the Earth's gravitational effect.)

5. Three blocks are in contact with each other on a frictionless, horizontal surface as shown below. A horizontal force **F** is applied to m_1. If m_1 = 2.00 kg, m_2 = 3.00 kg, and m_3 = 4.00 kg and F = 18.0 N, find…



a) the magnitude of the acceleration of the blocks

b) the net force on each block

c) the magnitude of the contact forces between the blocks.