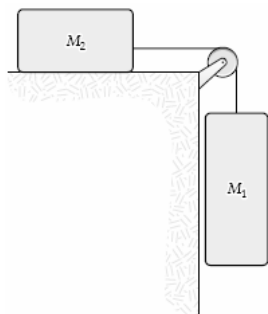


AP Physics Rotation & Torque

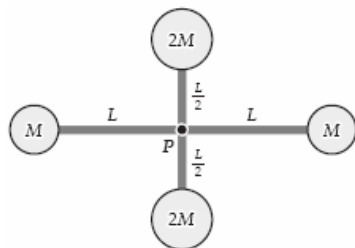
Multiple Choice

Identify the choice that best completes the statement or answers the question.

- 1 A mass ($M_1 = 5.0$ kg) is connected by a light cord to a mass ($M_2 = 4.0$ kg) which slides on a smooth surface, as shown in the figure. The pulley (radius = 0.20 m) rotates about a frictionless axle. The acceleration of M_2 is 3.5 m/s^2 . What is the moment of inertia of the pulley?

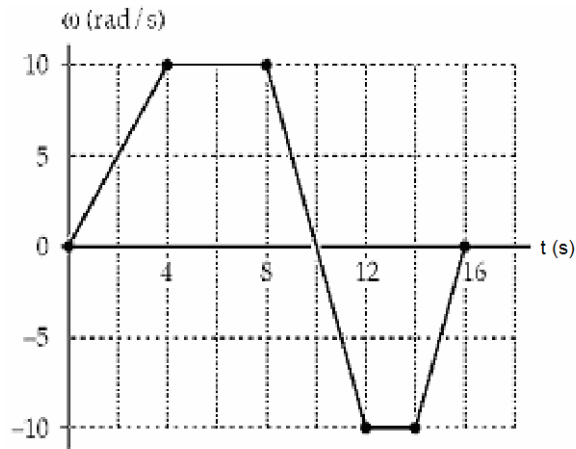


- a. $0.29 \text{ kg} \cdot \text{m}^2$ b. $0.42 \text{ kg} \cdot \text{m}^2$ c. $0.20 \text{ kg} \cdot \text{m}^2$ d. $0.62 \text{ kg} \cdot \text{m}^2$ e. $0.60 \text{ kg} \cdot \text{m}^2$
- 2 A horizontal disk with a radius of 10 cm rotates about a vertical axis through its center. The disk starts from rest at $t = 0$ and has a constant angular acceleration of 2.1 rad/s^2 . At what value of t will the radial and tangential components of the linear acceleration of a point on the rim of the disk be equal in magnitude?
- a. 0.55 s b. 0.63 s c. 0.69 s d. 0.59 s e. 0.47 s
- 3 The rigid object shown is rotated about an axis perpendicular to the paper and through point P. The total kinetic energy of the object as it rotates is equal to 1.4 J. If $M = 1.3$ kg and $L = 0.50$ m, what is the angular velocity of the object? Neglect the mass of the connecting rods and treat the masses as particles.

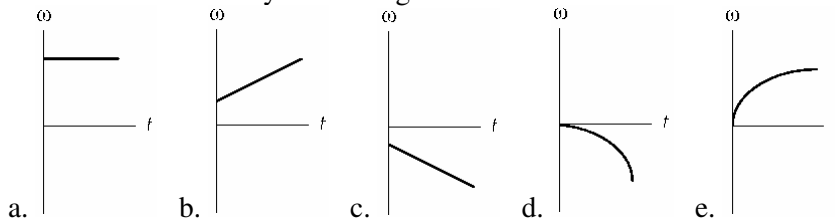


- a. 1.3 rad/s b. 1.5 rad/s c. 1.7 rad/s d. 1.2 rad/s e. 2.1 rad/s
- 4 A wheel (radius = 12 cm) is mounted on a frictionless, horizontal axle that is perpendicular to the wheel and passes through the center of mass of the wheel. A light cord wrapped around the wheel supports a 0.40-kg object. If released from rest with the string taut, the object is observed to fall with a downward acceleration of 3.0 m/s^2 . What is the moment of inertia (of the wheel) about the given axle?
- a. $0.023 \text{ kg} \cdot \text{m}^2$ b. $0.013 \text{ kg} \cdot \text{m}^2$ c. $0.020 \text{ kg} \cdot \text{m}^2$ d. $0.016 \text{ kg} \cdot \text{m}^2$ e. $0.035 \text{ kg} \cdot \text{m}^2$

- 5 The figure below shows a graph of angular velocity as a function of time for a car driving around a circular track. Through how many radians does the car travel in the first 10 minutes?



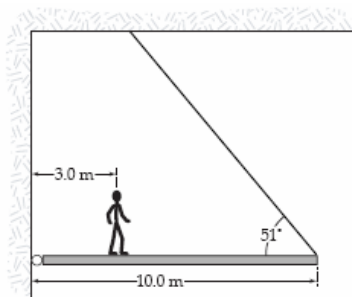
- 6 The graphs below show angular velocity as a function of time. In which one is the magnitude of the angular acceleration constantly decreasing?



- 7 The angular speed of the minute hand of a clock, in rad/s, is

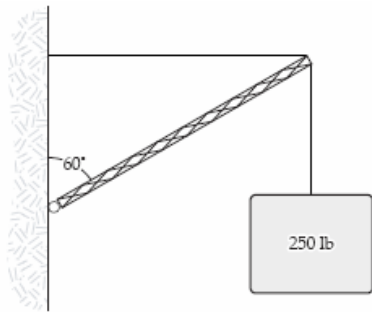
a. $\frac{1}{1800} \pi$. b. $\frac{1}{60} \pi$. c. $\frac{1}{30} \pi$. d. π . e. 120π .

- 8 The figure shows a uniform, horizontal beam (length = 10 m, mass = 25 kg) that is pivoted at the wall, with its far end supported by a cable that makes an angle of 51° with the horizontal. If a person (mass = 60 kg) stands 3.0 m from the pivot, what is the tension in the cable?



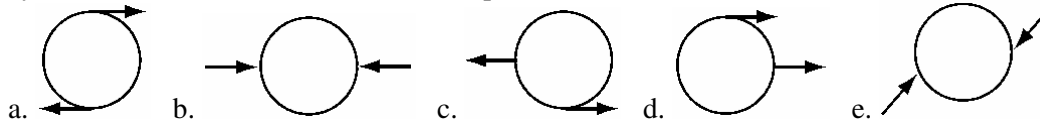
a. 0.83 kN b. 0.30 kN c. 0.39 kN d. 0.42 kN e. 3.0 kN

9A 25-ft long crane supported at its lower end by a pin is elevated by a horizontal cable as shown in the figure. A 250-lb load is suspended from the outer end of the crane. The center of gravity of the crane is 10 ft from the pin, and the crane weighs 200 lb. What is the tension in the horizontal cable?



- a. 610 lb b. 540 lb c. 640 lb d. 570 lb e. 2000 lb

10 Pairs of forces of equal magnitude act on identical cylinders as shown in the figures. In which example is the cylinder in translational and rotational equilibrium?



AP Physics Rotation & Torque Answer Section

MULTIPLE CHOICE

- | | | |
|----|--------|--------|
| 1 | ANS: C | PTS: 1 |
| 2 | ANS: C | PTS: 1 |
| 3 | ANS: C | PTS: 1 |
| 4 | ANS: B | PTS: 1 |
| 5 | ANS: C | PTS: 1 |
| 6 | ANS: E | PTS: 1 |
| 7 | ANS: A | PTS: 1 |
| 8 | ANS: C | PTS: 1 |
| 9 | ANS: D | PTS: 1 |
| 10 | ANS: B | PTS: 1 |