1.If the momentum of an object is doubled, its speed must have increased by

A. 4
B. 2
C. 0.5
D. 0.25

8

2. Red Rover, Red Rover, let Leslie come over. In this childhood game, you try to stop and catch a person who is running directly at you. Who would you rather pick?

A. Sean, who weighs 350 N and can run 5 m/s.
B. Meihong, who weighs 250 N and can run 8 m/s.
C. Deidra, who weighs 300 N and can run 3 m/s.

8

3.A lump of clay of mass 0.1 kg is thrown with a speed of 9 m / s against a rigid wall where it comes to rest. Calculate the change in momentum of the lump of clay.

$v_f = 0$ $m = 0.1\,kg$ $v_i = 9\,m/s$

$\Delta p = p_f - p_i = \cancel{m v_f}^{\,0} - m v_i = -m v_i = -(0.1\,kg)(9\,m/s)$

$= -0.9\,kg\,m/s$ 10

4. Calculate the momentum of a golf ball of mass 0.045 kg that moves at a speed of 40 m / s.

$p = mv = (0.045\,kg)(40\,m/s) = 1.8\,kg\,m/s$

8

5. If the golf ball in the previous problem strikes a tree and rebounds with the same speed it had before the collision but in the opposite direction, calculate the change in momentum.

$p_f = -1.8\,kg\,m/s$

7

$\Delta p = p_f - p_i = -1.8\,kg\,m/s - (+1.8\,kg\,m/s) = -3.6\,kg\,m/s$

6 . A freight car of mass 120,000 kg rolling down the track at 3 m / s collides with an identical freight car that was initially at rest. The two cars couple together and move off together.

Calculate the speed of the combination of two cars.

$v_{i1} = 3\,m/s \qquad v_{i2} = 0 \qquad v_{fc} = ?$

$m_1 v_{i1} + m_2 v_{i2} = (m_1 + m_2) v_{fc} \Rightarrow v_{fc} = \dfrac{m_1 v_{i1}}{m_1 + m_2} = \dfrac{(120{,}000\,kg)(3\,m/s)}{2(120{,}000\,kg)}$

$\Rightarrow v_{fc} = 1.5\,m/s$

10

7. An automobile engine is described as operating at 5000 rpm, meaning its crankshaft completes 5000 revolutions per minute. Express this angular velocity in radians per second.

$$\left(\frac{5000\,rev}{min}\right)\left(\frac{1\,min}{60\,s}\right) = 83.33\,rev/s$$

$$\omega = \left(2\pi\,\frac{rad}{rev}\right)\left(83.33\,\frac{rev}{s}\right) = 523.6\,rad/s$$

10

8. An object that starts from rest experiences a constant angular acceleration of 2.0 rad / s^2. What is its angular velocity after 5 seconds expressed in rad / s and in rev / s?

$\omega_0 = 0 \qquad \alpha = 2.0\,rad/s^2$

$\omega = \omega_0 + \alpha t = (2.0\,rad/s^2)(5\,s) = 10.0\,rad/s$

10

$1\,rev = 2\pi\,rad$

$\omega = \left(10.0\,\frac{rad}{s}\right)\left(\frac{1\,rev}{2\pi\,rad}\right) = 1.59\,rev/s$

9. A force of 20 N is applied perpendicular to the end of a bar of length 0.5 m. Calculate the torque produced by the force.

$\tau = Fl = (20\,N)(0.5\,m) = 10\,N\cdot m$

7

10. Which of the following is NOT a unit for rotational displacement?

A. Degrees
B. Rad/s
C. Revolutions
D. radians

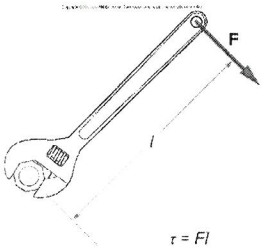
8

11. When using the equation that relates linear speed and rotational velocity ($v = r\omega$) what are acceptable units for the rotational velocity (ω)?

A. degrees/s
B. Radians/min
C. Rev/min (rpm)

6

12. To increase the applied torque one can



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A. Increase the force
B. Increase the lever arm by moving to the end of the lever
C. Increase the lever arm by applying the force perpendicularly to the lever
D. All of the above
E. None of the above