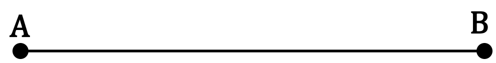
Q1.

A truck moves with a constant speed of 10 m/s in a straight road. It passes point A at time t = 0 and continues towards point B. Ten minutes after the truck passes the point A, a car moving with a constant speed of 15 m/s passes the same point A and continues towards B along the same straight road. The car will catch up with the truck at time t equals to

A) 30 minutes
B) 60 minutes
C) 3 minutes
D) 10 minutes
E) 15 minutes

Solution:



Let's say the car and the truck are at the same position at time t:

$d_{truck} = v_{truck} t = 10\ t$

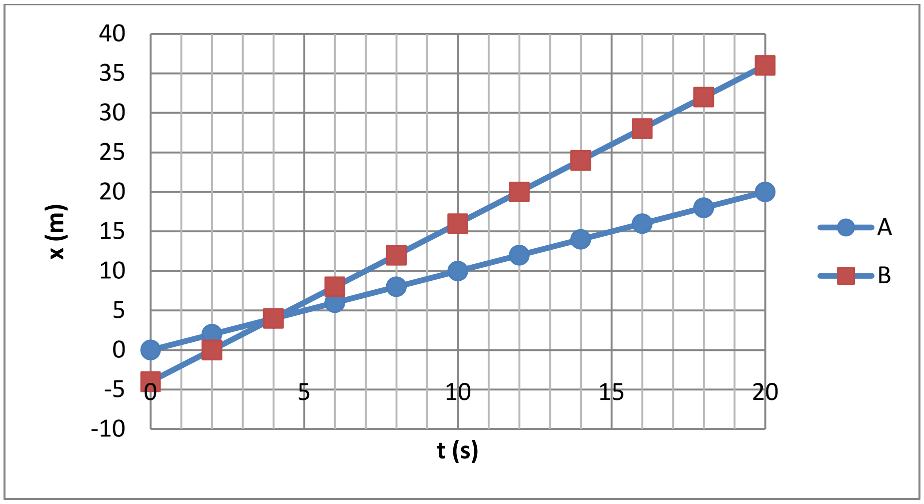
$d_{car} = v_{car}(t - 600) = 15\,t - 9000$

$\therefore 10\,t = 15\,t - 9000 \implies t = 1800\,s = 30\,min$

Stat# NO STATISTICS

Q2.

Figure 1 shows the position-time graph for two objects, A and B, moving along a straight line. Which one of the following statements is TRUE?



A) The speed of B is always greater than the speed of A.
B) The two objects have the same speed at t = 4 s.
C) Object B is always ahead of object A.
D) Object A is always ahead of object B.
E) The speed of A is always greater than the speed of B.

Ans:

A.

Stat# A_48_DIS_0.36_PBS_0.27_B_43_C_3_D_2_E_4_EXP_60_NUM_562

Q3.

Consider two vectors $\vec{v} = 3.0\,\hat{i} + 3.0\,\hat{j}$ and $\vec{w} = \cos\theta\,\hat{i} + \sin\theta\,\hat{j}$, where θ is measured counter clockwise with respect to the positive *x*-axis. For what value of θ (in degrees) is $\vec{v} \times \vec{w} = 0$?

A) 45
B) 135
C) 90
D) 105
E) 0

Solution:

$$(3.0\,\hat{i} + 3.0\,\hat{j}) \times (\cos\theta\,\hat{i} + \sin\theta\,\hat{j}) = 0$$

$$\not{3}\cos\theta\,(-\hat{k}) + \not{3}\sin\theta\,(\hat{k}) = 0$$

$$\sin\theta = \cos\theta\,;\ \tan\theta = 1 \implies \theta = 45°$$

Stat# A_46_DIS_0.43_PBS_0.34_B_27_C_7_D_3_E_17_EXP_50_NUM_562

Q4.

A 2-kg object is initially at rest. At time t = 0, a force $\vec{F}_1 = \left(2\,\hat{i} + 2\,\hat{j}\right) N$, is applied to the object. At time t = 1 s, an additional force $\vec{F}_2 = \left(-2\,\hat{i} - 2\,\hat{j}\right) N$ is applied to the object. Find the velocity of the object at t = 2 s.

A) $\left(\hat{i} + \hat{j}\right) m/s$
B) $\left(-\hat{i} - \hat{j}\right) m/s$
C) $\left(2\hat{i} + 2\hat{j}\right) m/s$
D) $\left(-2\hat{i} - 2\hat{j}\right) m/s$
E) 0

Solution:

$\vec{v}_0 = 0$

$\vec{a}_1 = \frac{\vec{F}_1}{m} = \frac{(2\hat{i}+2\hat{j})}{2} = (\hat{i}+\hat{j})\frac{m}{s^2}$; $\vec{v}(t = 1\ s) = \vec{v}_0 + \vec{a}\ t = 0 + \vec{a} * 1 = (i + \hat{j})\frac{m}{s}$

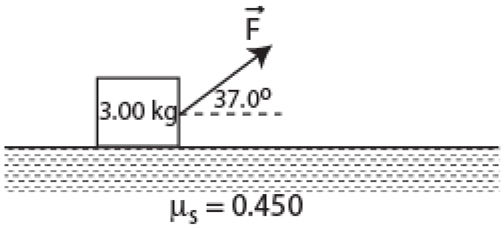
at t=1 s, $\vec{F}_{net} = \vec{F}_1 + \vec{F}_2 = 0$, →No acceleration, no change in velocity after 1 s.

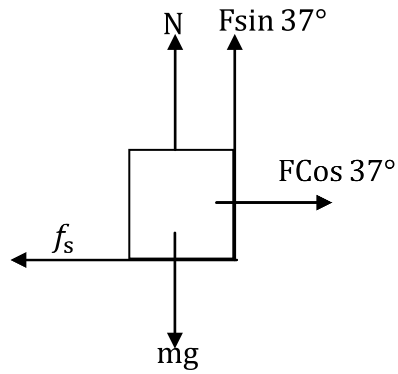
Therefore $\vec{v}(t = 2\ s) = \vec{v}(t = 1\ s) = (i + \hat{j})\ m/s$

Stat# A_15_DIS_0.21_PBS_0.29_B_7_C_9_D_9_E_60_EXP_60_NUM_562

Q5.

A force $\vec{F}$ is applied to a block of mass equal to 3.00 kg resting on a rough horizontal surface. The force makes an angle of 37.0° with the horizontal as shown in **Figure 2**. The coefficient of static friction between the block and the surface is 0.450. If the block is just about to slide, calculate the magnitude of the force $\vec{F}$.





A) 12.4 N
B) 19.6 N
C) 16.5 N
D) 10.7 N
E) 20.6 N

Solution:

$$F\cos 37° = f_s = \mu_s(mg - F\sin 37°)$$

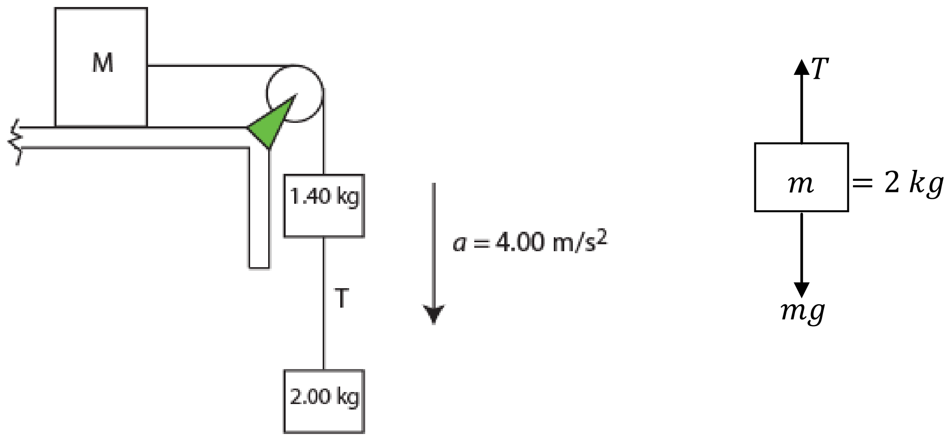
$$F(\cos 37° + \mu_s \sin 37°) = \mu_s mg$$

$$F = \frac{\mu_s mg}{\cos 37° + \mu_s \sin 37°} = \frac{13.23}{0.7986 + 0.2708} = 12.37\ \text{N} = 12.4\ \text{N}$$

Stat# A_25_DIS_0.30_PBS_0.30_B_9_C_45_D_13_E_9_EXP_45_NUM_562

Q6.

The system shown in **Figure 3** is released from rest and is moving with an acceleration of 4.00 m/s^2. Find the magnitude of the tension T shown in the figure. (Assume that the pulley and the cords are massless).



A) T = 11.6 N
B) T = 6.96 N
C) T = 15.4 N
D) T = 10.0 N
E) T = 4.80 N

Solution:

$$mg - T = ma \Rightarrow T = m\,(g - a) = 2.0\,(9.8 - 4.0) = 11.6 \text{ N}$$

Stat# A_52_DIS_0.49_PBS_0.35_B_13_C_15_D_9_E_11_EXP_53_NUM_562

Q7.

If the weight of an object on the Moon is one-sixth of its weight on Earth, the ratio of its kinetic energy when it is moving with speed V on Earth to its kinetic energy when it is moving with the same speed V on the Moon is:

A) 1.0
B) 6.0
C) 2.6
D) 3.1
E) 1.6

Ans.

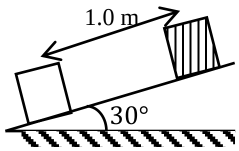
A. (mass does not change !!)

Stat# A_37_DIS_0.40_PBS_0.32_B_44_C_5_D_5_E_9_EXP_60_NUM_562

Q8.

A block is released from rest at the top of an inclined plane making an angle of 30.0° with the horizontal. The coefficient of kinetic friction between the block and the inclined plane is 0.300. What is the speed of the block after it has traveled a distance of 1.00 m downwards along the inclined plane?

A) 2.17 m/s
B) 3.58 m/s
C) 4.30 m/s
D) 5.57 m/s
E) 7.33 m/s



Solution:

$\Delta k + \Delta u_g = W_{nc}$; $\Delta k = \left(\frac{1}{2}mv^2 - 0\right)$; $\Delta u_g = -mgd\sin 37°$

$W_{nc} = -\mu_k mg\cos 37° * d$

$\therefore \frac{1}{2}\cancel{m}v^2 = \cancel{m}gd\sin 37° - \mu_k\cancel{m}g\cos 37° * d$

$v^2 = 2g\sin 30° - 2\mu_k g\ \cos 30°$

$= 2\,(9.8)\frac{1}{2} - 2 * 0.30 * 9.8 * 0.866 = 9.8 - 5.092 = 4.708$

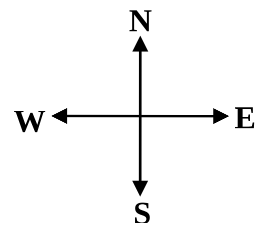
$\Longrightarrow v = 2.169\ \approx 2.17\ m/s$

Stat# A_40_DIS_0.33_PBS_0.30_B_26_C_14_D_12_E_8_EXP_45_NUM_562

Q9.

A 1.00 ×10^3 kg car is traveling at 20.0 m/s toward the north. During a collision, the car receives an impulse of magnitude 1.00 × 10^4 N·s toward the south. What is the velocity of the car immediately after the collision?

A) 10.0 m/s, north
B) 30.0 m/s, north
C) 20.0 m/s, north
D) 10.0 m/s, south
E) 20.0 m/s, south



Solution:

$$\vec{p}_i = 20 * 10^3\,(\hat{j})$$

$$\Delta\,\vec{p} = 10 * 10^3\,(-\hat{j})$$

$$\Delta\,\vec{p} = \vec{p}_f - \vec{p}_i \Longrightarrow \vec{p}_f = \Delta\vec{p} + \vec{p}_i$$

$$\vec{p}_f = 10 * 10^3\,\hat{j} \Longrightarrow \vec{v}_f = \frac{10 * 10^3\hat{j}}{1.0 * 10^3} = 10\hat{j}$$

Stat# A_42_DIS_0.32_PBS_0.28_B_19_C_6_D_24_E_10_EXP_50_NUM_562

Q10.

Two blocks approach each other at right angles on a frictionless surface. Block A has a mass of 45.1 kg and travels in the +*x* direction at 3.20 m/s. Block B has a mass of 85.8 kg and is moving in the +*y* direction at 2.08 m/s. They collide and stick together. Find the final velocity of the two blocks.

A) $\left(1.10\,\hat{i} + 1.36\,\hat{j}\right)$ m/s
B) $\left(2.30\,\hat{i} + 3.36\,\hat{j}\right)$ m/s
C) $\left(3.45\,\hat{i} + 2.56\,\hat{j}\right)$ m/s
D) $\left(5.20\,\hat{i} + 6.37\,\hat{j}\right)$ m/s
E) $\left(4.50\,\hat{i} + 4.76\,\hat{j}\right)$ m/s

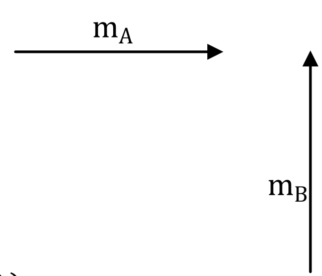
Solution:

$$\vec{P}_{Ai} = 45.1 * 3.20\,\hat{i}$$

$$\vec{P}_{Bi} = 85.8 * 2.08\,\hat{j}$$

$$\vec{P}_{Ai} + \vec{P}_{Bi} = (m_A + m_B)\vec{v}$$

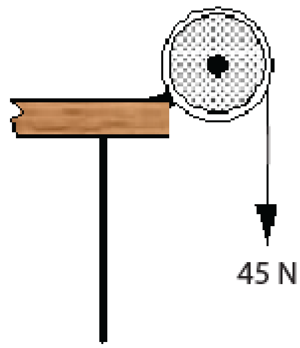
$$\vec{v} = \frac{\vec{P}_{Ai} + \vec{P}_{Bi}}{m_A + m_B} = \frac{144.32\,\hat{i} + 178.46\,\hat{j}}{130.9} = \left(1.10\,\hat{i} + 1.36\,\hat{j}\right)\ \text{m/s}$$



Stat# A_63_DIS_0.61_PBS_0.44_B_12_C_11_D_8_E_6_EXP_40_NUM_562

Q11.

As shown in **Figure 4**, a 45-N force is applied to one end of a massless string which is wrapped around a pulley that has a radius of 1.5 m and a moment of inertia of 2.25 kg.m^2. Through what angle will the pulley rotate in 3.0 s if it was initially at rest?



A) 135 rad
B) 90.0 rad
C) 451 rad
D) 270 rad
E) 225 rad

Solution:

$$\tau = I\alpha \ \Rightarrow \ \alpha = \frac{\tau}{I} = \frac{F * R}{I}$$

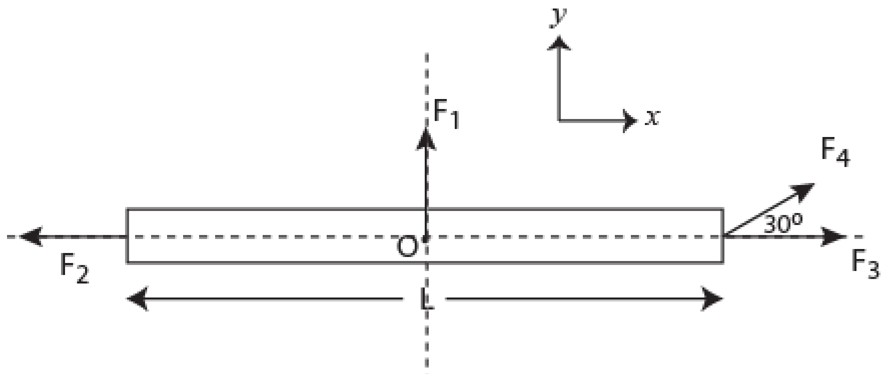
$$\therefore \ \alpha = \frac{45 * 1.5}{2.25} = 30.0\frac{rad}{s^2}$$

$$\Delta\theta = \omega_0 t + \frac{1}{2}\alpha t^2 = \frac{1}{2}(30) * 9 = 135 \text{ rad}$$

Stat# A_32_DIS_0.34_PBS_0.33_B_16_C_10_D_17_E_23_EXP_50_NUM_562

Q12.

Figure 5 shows a uniform horizontal beam of mass M = 4.00 kg and length L = 4.00 m being acted upon by four forces of magnitudes F_1 = 10.0 N, F_2 = 20.0 N, F_3 = 30.0 N and F_4 = 10.0 N and in the directions as indicated. Find the net torque about point O at the center of the beam.



A) 10.0 N.m, counter clockwise
B) 10.0 N.m, clockwise
C) 100 N.m, counter clockwise
D) 100 N.m, clockwise
E) 140 N.m, counter clockwise

Solution:

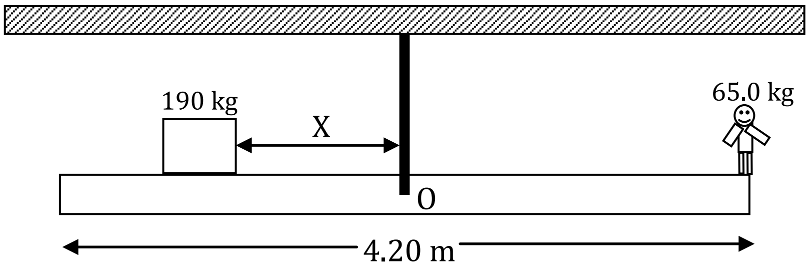
$$\vec{\tau}_{net} = \vec{\tau}_{F_1} + \vec{\tau}_{F_2} + \vec{\tau}_{F_3} + \vec{\tau}_{F_4}$$

$$\vec{\tau}_{net} = (F_4 \sin 30° * 2.0)\ \mathrm{CCW} = (10 * \frac{1}{2} * 2)\ \mathrm{CCW} = (10\ \mathrm{N.m})\ \mathrm{CCW}$$

Stat# A_59_DIS_0.52_PBS_0.41_B_13_C_14_D_7_E_7_EXP_50_NUM_562

Q13.

As shown in **Figure 6,** a uniform beam of length 4.20 m is suspended by a cable from its center point O. A 65.0-kg man stands at one end of the beam. Where should a 190-kg block be placed on the beam so that the beam is in static equilibrium (Distances are measured from the center point O of the beam)?



A) 0.718 m
B) 1.44 m
C) 2.35 m
D) 0.543 m
E) 2.10 m

Solution:

$$65 * 2.1 = 190 * x$$

$$x = \frac{65 * 2.1}{190} = 0.718 \text{ m}$$

Stat# A_70_DIS_0.45_PBS_0.38_B_14_C_5_D_5_E_6_EXP_60_NUM_562

Q14.

What increase in pressure is necessary to decrease the volume of a sphere by 0.150 % (Take the bulk modulus of the sphere B = 2.80×10^{10} N/m^2)?

A) 4.20×10^7 N/m^2
B) 1.40×10^7 N/m^2
C) 3.56×10^6 N/m^2
D) 2.80×10^7 N/m^2
E) 1.01×10^5 N/m^2

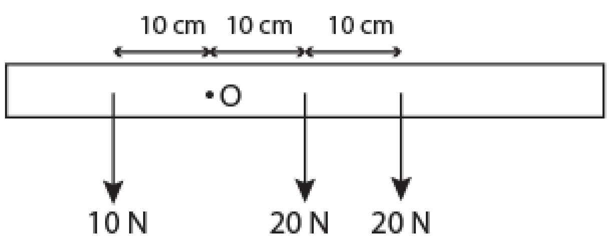
Solution:

$$\Delta p = -B\,\frac{\Delta V}{V} = B * \frac{0.15}{100} = \frac{2.80 * 10 * 0.15}{100} = 4.20 \times 10^7\ N/m^2$$

Stat# A_71_DIS_0.46_PBS_0.36_B_7_C_6_D_9_E_6_EXP_57_NUM_562

Q15.

Three parallel forces of magnitudes 10.0 N, 20.0 N, and 20.0 N, respectively, act on a body (**Figure 7**). The perpendicular distances from a given point O to their lines of action are shown. The single force which can replace these forces is:



A) 50.0 N, 10.0 cm to the right of point O.
B) 50.0 N, 20.0 cm to the right of point O.
C) 30.0 N, 17.5 cm to the right of point O.
D) 50.0 N, 17.5 cm to the right of point O.
E) 50.0 N, acting through the given point O.

Solution:

$\vec{F}_{net} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 = 50$ N ;
$\vec{\tau}_{net} = 10(0.1) - 20(0.1) - 20(0.2) = 5\ N \cdot m\ \ clockwise$

$\tau_{net}(from\ the\ replacing\ force) = F_{net}\ x = 5$

$$50\,x = 5$$

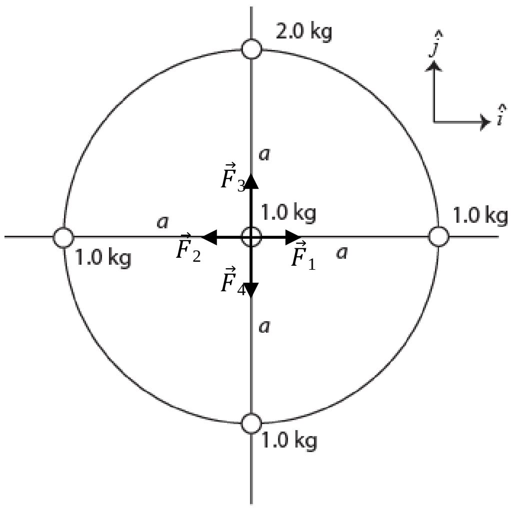
$\Longrightarrow\ x = \frac{5}{50} = 0.10$ m $= 10$ cm, and to the right to make the torque clockwise.

Stat# A_50_DIS_0.54_PBS_0.40_B_7_C_16_D_18_E_9_EXP_45_NUM_562

Q16.
Five masses are put together as shown in **Figure 8**. What is the net force on the 1.0-kg mass placed in the center of the circle? G is the gravitational constant.

A) $G/a^2\left(+\hat{j}\right)$
B) $G/a^2\left(-\hat{j}\right)$
C) 0
D) $3G/a^2\left(\hat{i}+\hat{j}\right)$
E) $4G/a^2\left(-\hat{j}\right)$

Solution:



$$\vec{F}_1 = \frac{G}{a^2}(\hat{i})$$

$$\vec{F}_2 = \frac{G}{a^2}(-\hat{i})$$

$$\vec{F}_3 = \left(\frac{2G}{a^2}\right)(\hat{j})$$

$$\vec{F}_4 = \left(\frac{G}{a^2}\right)(-\hat{j})$$

$$\vec{F}_{net} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \vec{F}_4$$

$$\vec{F}_{net} = \left(\frac{G}{a^2}\right)(+\hat{j})$$

Stat# A_75_DIS_0.36_PBS_0.31_B_9_C_7_D_5_E_5_EXP_55_NUM_562

Q17.

If, instead of being distributed over the volume of the Earth, the mass of the Earth is distributed inside a thin shell, what would be the radial dependence of the gravitational force on an object outside the Earth? Take *r* to be the distance to the object from the center of the Earth.

A) $1/r^2$
B) $1/r$
C) $1/r^3$
D) $1/\sqrt{r}$
E) None of the others

Ans.

A.

Stat# A_31_DIS_0.20_PBS_0.19_B_13_C_14_D_18_E_24_EXP_63_NUM_562

Q18.

If we assume that a black hole is a planet where the escape velocity is equal to the speed of light (3.00×10^8 m/s), find the radius of a black hole with a mass equal to that of Earth.

A) 8.86×10^{-3} m
B) $8.85 \times 10^{+3}$ m
C) $6.38 \times 10^{+3}$ m
D) 6.38×10^{-3} m
E) $3.00 \times 10^{+8}$ m

Solution:

$$v_{esc} = \sqrt{\frac{2GM}{R}}$$

$$v_{esc}{}^2 = \frac{2GM}{R} \Rightarrow R = \frac{2GM}{v_{esc}{}^2}$$

$$R = \frac{2 * 6.67 * \ 10^{-11} * 5.97^6 * 10^{24}}{9 * \ 10^{16}} = 8.86 * \ 10^{-3}\text{m}$$

Stat# A_86_DIS_0.33_PBS_0.33_B_3_C_6_D_3_E_2_EXP_60_NUM_562

Q19.

The law of areas due to Kepler is equivalent to the law of

A) Conservation of angular momentum.
B) Conservation of mass.
C) Conservation of energy.
D) Conservation of linear momentum.
E) None of the others.

Ans.

A.

Stat# A_38_DIS_0.38_PBS_0.29_B_10_C_22_D_14_E_15_EXP_60_NUM_562

Q20.

What speed on the surface of Earth should be given to a satellite to put it in an orbit of radius R = 3R_E around the Earth (where R_E is the radius of Earth)?

A) $\sqrt{\frac{10\,G\,M_E}{6\,R_E}}$

B) $\sqrt{\frac{5\,G\,M_E}{6\,R_E}}$

C) $\sqrt{\frac{8\,G\,M_E}{6\,R_E}}$

D) $\sqrt{\frac{G\,M_E}{R_E}}$

E) $\sqrt{\frac{7\,G\,M_E}{6\,R_E}}$

Solution:

$$\frac{1}{2}\cancel{m}v^2 - \frac{G\cancel{m}M}{R_E} = -\frac{G\cancel{m}M}{2\,(3R_E)}$$

$$v^2 = \frac{2GM}{R_E} - \frac{GM}{6R_E}$$

$$v^2 = \frac{12GM - 2GM}{6R_E} = \frac{10GM}{6R_E}$$

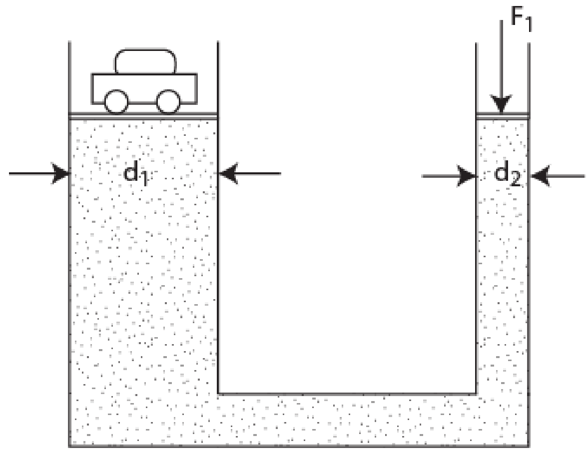
$$v = \sqrt{\frac{10GM}{6R_E}}$$

Stat# A_15_DIS_0.09_PBS_0.09_B_20_C_31_D_20_E_13_EXP_52_NUM_562

Q21.

In the hydraulic lift of **Figure 9**, a large piston of diameter d_1 = 120 cm supports a car of mass 3.20×10^3 kg. What is the magnitude of the vertically downward force F_1 that must be applied to the smaller piston of diameter d_2 = 15.0 cm to balance the car?

A) 4.90×10^2 N
B) 3.92×10^3 N
C) 1.50×10^3 N
D) 2.00×10^2 N
E) 2.50×10^4 N



Solution:

$$\frac{F_1}{A_1} = \frac{F_2}{A_2} \Longrightarrow F_1 = \frac{F_2}{A_2} * A_1$$

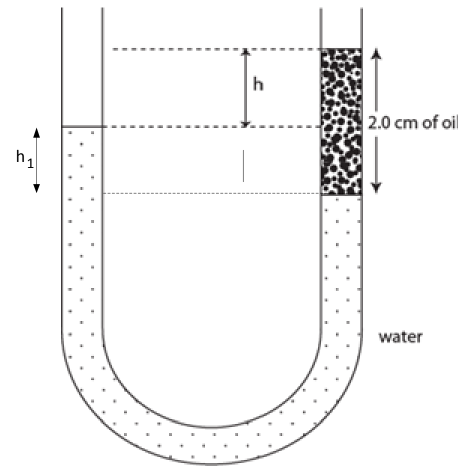
$$F_1 = F_2\left(\frac{A_1}{A_2}\right) = 3.20 * 10^3 * 9.8\left(\frac{15}{120}\right)^2$$

$$F_1 = 0.49 * 10^3 = 4.9 \times 10^3 \text{ N}$$

Stat# A_49_DIS_0.58_PBS_0.46_B_24_C_4_D_7_E_16_EXP_55_NUM_562

Q22.

A U-shaped tube open at both ends contains water and a quantity of oil occupying a 2.0 cm length of the tube, as shown in **Figure 10**. If the density of oil is 82% of the density of water, what is the height difference h?



A) 0.36 cm
B) 1.2 cm
C) 0.43 cm
D) 0.75 cm
E) 0.82 cm

Solution:

$$\rho_{oil} * 2.0 * \cancel{g} = \rho_w (h_1) \cancel{g}$$

$$h_1 = \frac{2\rho_{oil}}{\rho_w} = 2 * 0.82 = 1.64 \text{ cm}$$

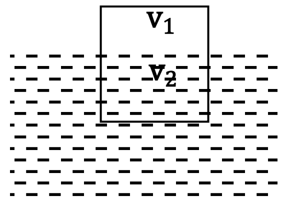
$$h = 2 - 1.64 = 0.36 \text{ cm}$$

Stat# A_47_DIS_0.47_PBS_0.39_B_23_C_10_D_7_E_12_EXP_47_NUM_562

Q23.

The average density of a typical iceberg is 0.86 that of sea water. What fraction of the volume of the iceberg is outside the water?

A) 0.14
B) 0.86
C) 0.50
D) 0.45
E) 0.75



Solution:

$$B = m_{ice}g$$

$$\rho_w V_2 \not{g} = \rho_{ice}\, V_{ice}\, \not{g}$$

$$\frac{V_2}{V_{ice}} = \frac{\rho_{ice}}{\rho_w} = 0.86\,; \quad \frac{V_1}{V_{ice}} = 0.14$$

Stat# A_38_DIS_0.48_PBS_0.39_B_38_C_5_D_9_E_9_EXP_50_NUM_562

Q24.

Water flows through a horizontal pipe of varying cross-section. The pressure is 1.5×10^4 Pa at a point where the speed is 2.0 m/s and the area of cross section is A. Find the speed and pressure at a point where the area is A/2.

A) 4.0 m/s and 0.90×10^4 Pa
B) 4.0 m/s and 0.75×10^4 Pa
C) 8.0 m/s and 0.90×10^4 Pa
D) 8.0 m/s and 1.5×10^4 Pa
E) 2.0 m/s and 1.8×10^4 Pa

Solution:

$$P_1 + \frac{1}{2}\rho {v_1}^2 = P_2 + \frac{1}{2}\rho {v_2}^2$$

i) $v_2 = \frac{A_1}{A_2} v_1 = \frac{A_1}{A_{1/2}} * v_1 = 2v_1 = 4.0\ m/s$

ii) $P_2 = P_1 + \frac{1}{2}\rho {v_1}^2 - \frac{1}{2}\rho {v_2}^2$

$$= 1.5 * 10^4 + \frac{1}{2} 10^3 (4 - 16)^2 = 1.5 * 10^4 - 6 * 10^3$$

$$= (1.5 - 0.6)10^4 = 0.90 \times 10^4 \text{ P}_a$$

Stat# A_39_DIS_0.47_PBS_0.39_B_40_C_7_D_6_E_6_EXP_43_NUM_562

Q25.

A large tank is filled with water. A tightly fitting piston rests on top of the water (**Figure 11**). The combined pressure from the piston and atmosphere on the top surface of water is 1.02 × 10^5 Pa. A very small circular hole is opened at a depth of 60.0 cm below the initial water level of the tank. What is the initial speed of water coming out of the hole?

A) 3.71 m/s
B) 5.43 m/s
C) 9.80 m/s
D) 4.93 m/s
E) 1.60 m/s

$P_1 \cdot v_1$

$P_2 \cdot v_2$

$$\begin{bmatrix} v_1 \approx 0 \\ v_2 > v_1 \\ P_1 = 1.02 * 10^5 \\ P_2 = 1.01 * 10^5 \end{bmatrix}$$

Solution:

$$P_1 + \frac{1}{2}\rho v_1^2 + \rho g h = P_2 + \frac{1}{2}\rho v_2^2$$

$$\frac{1}{2}\rho v_2^2 = P_1 - P_2 + \rho g h$$

$$\frac{1}{2} 10^3 v_2^2 = (1.02 - 1.01) * 10^5 + 10^3 * 9.8 * 0.60$$

$$= 0.01 * 10^5 + 5.88 * 10^3 = 0.0688 * 10^5$$

$$v_2^2 = \frac{2 * 0.0688 * 10^5}{10^3} = 13.76$$

$$v = 3.71\, m/s$$

Stat# A_43_DIS_0.38_PBS_0.34_B_13_C_16_D_17_E_11_EXP_37_NUM_562

Q26.

If the amplitude of oscillation of an object in simple harmonic motion is increased, then

A) the total mechanical energy of the object will increase
B) the period of oscillations of the object will increase
C) the frequency of oscillations of the object will increase
D) the frequency of oscillations of the object will decrease
E) the maximum kinetic energy of the object will decrease

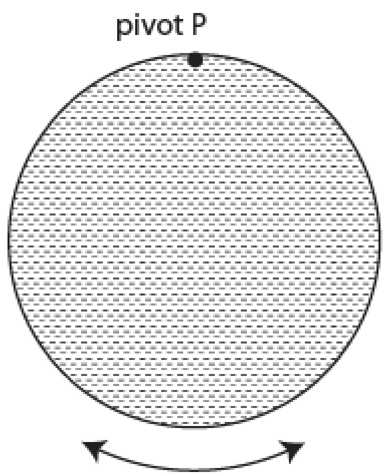
Ans.

A.

Stat# A_47_DIS_0.50_PBS_0.40_B_11_C_18_D_16_E_9_EXP_50_NUM_562

Q27.

A solid circular disk is oscillating with a period T in a vertical plane about pivot point P as shown in **Figure 12**. If the disk is made four times heavier but still having the same radius, what will be its period of oscillation?



$$\left[I_P = I_{COM} + MR^2 = \frac{3}{2} MR^2 \right]$$

A) T
B) 2T
C) T/2
D) T/4

E) 4T

Solution:

$$T = 2\pi \sqrt{\frac{I}{Mgd}}$$

$$= 2\pi \sqrt{\frac{\frac{3}{2} MR^2}{MgR}}$$

$$T = 2\pi \sqrt{\frac{3R}{2g}}$$

$T \propto \sqrt{R}$ *and it does not depend on M.* T *is same*

Stat# A_37_DIS_0.30_PBS_0.28_B_23_C_18_D_14_E_8_EXP_40_NUM_562

Q28.

The maximum speed of a 3.00-kg object executing simple harmonic motion is 6.00 m/s. The maximum acceleration of the object is 5.00 m/s^2. What is its period of oscillations?

A) 7.54 s
B) 2.50 s
C) 1.20 s
D) 0.833 s
E) 0.278 s

Solution:

$$v_{max} = 6 = y_{\mathrm{m}}\omega$$

$$a_{max} = 5 = y_{\mathrm{m}}\omega^2$$

$$\frac{a_{max}}{v_{max}} = \frac{5}{6} = \omega$$

$$\mathrm{T} = \frac{2\pi}{5/6} = 7.54\ s$$

Stat# A_35_DIS_0.51_PBS_0.46_B_14_C_26_D_16_E_9_EXP_45_NUM_562

Q29.

An object executes simple harmonic motion with an amplitude of 1.2 cm and a time period of 0.10 s. What is the total distance traveled by the object in 1.9 s?

A) 91 cm
B) 27 cm
C) 40 cm
D) 11 cm
E) 70 cm

Solution:

In a time period it covers a distance = 4 × amplitude.

$$\therefore d = \frac{4 * Amp * t}{\mathrm{T}} = \frac{4 * 1.2 * 1.9}{0.10} = 91.2\ cm$$

Stat# A_21_DIS_0.19_PBS_0.25_B_30_C_14_D_23_E_11_EXP_42_NUM_562

Q30.

A simple pendulum of length L_1 has time period T_1. A second simple pendulum of length L_2 has time period T_2. If $T_2 = 2\ T_1$, find the ratio L_1/L_2.

A) 1/4
B) 1/2
C) 4
D) 2
E) 1

Solution:

$$T_1 = 2\pi\sqrt{\frac{L_1}{g}}$$

$$T_2 = 2\pi\sqrt{\frac{L_2}{g}}$$

$$\sqrt{\frac{L_1}{L_2}} = \frac{T_1}{T_2} = \frac{1}{2}$$

$$\frac{L_1}{L_2} = \frac{1}{4}$$

Stat# A_52_DIS_0.55_PBS_0.40_B_19_C_17_D_9_E_4_EXP_50_NUM_562