

Form A: 2. E 3. C 4. D 5. B 6. C 7. B 8. C 9. D

Form B: 2. D 3. B 4. C 5. B 6. C 7. D 8. E 9. C

Form C: 2. C 3. B 4. C 5. D 6. E 7. C 8. D 9. B

Form D: 2. C 3. D 4. E 5. C 6. D 7. B 8. C 9. B

$$10. \quad m = 10.0 \text{ g} = 0.0100 \text{ kg} \quad k = 9.80 \text{ N/m}$$

$$g = 9.80 \text{ m/sec}^2 \quad x = ?$$

$$\Sigma \vec{F} = 0 \quad \vec{F}_g = m\vec{g} \quad \vec{F}_s = -k\vec{x}$$

$$(+F_s) + (-F_g) = 0 \quad kx - mg = 0$$

$$kx = mg \quad x = \frac{mg}{k} = \frac{(0.0100)(9.80)}{(9.80)}$$

$$x = \underline{0.0100 \text{ m}} = \underline{1.00 \text{ cm}}$$

$$11. \quad L = 10.0 \text{ m} \quad 1 = \text{board}, 2 = \text{object}$$

$$m_1 = m_2 \quad F_{g1} = F_{g2} \quad x = ?$$

$$\Sigma \vec{\tau} = 0 \quad \tau = Fl$$

(Place axis of rotation at location of support.)

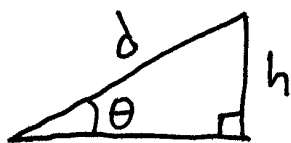
$$\tau_1 = -(F_{g1})(l_1) = -F_{g1} \left( \frac{L}{2} - x \right)$$

$$\tau_2 = +(F_{g2})(l_2) = +F_{g2}(x)$$

$$-F_{g1} \left( \frac{L}{2} - x \right) + F_{g2}(x) = 0 \quad \frac{L}{2} - x = x \quad \frac{L}{2} = 2x$$

$$x = \frac{L}{4} = \frac{10.0}{4} = \underline{2.50 \text{ m}}$$

12.  $v_0 = 10.0 \text{ m/s}$        $\theta = 30.0^\circ$        $v = 0$        $d = ?$



$K.E._0 + P.E._0 = K.E. + P.E.$        $\sin \theta = \frac{\text{opp}}{\text{hyp}}$

$K.E. = \frac{1}{2}mv^2$        $P.E._g = mgy$

$\frac{1}{2}mv_0^2 + 0 = 0 + mgh$        $\sin \theta = \frac{h}{d}$        $h = d \sin \theta$

$\frac{1}{2}mv_0^2 = mgd \sin \theta$        $d = \frac{v_0^2}{2g \sin \theta} = \frac{(10)^2}{(2)(9.80)(\sin 30^\circ)}$

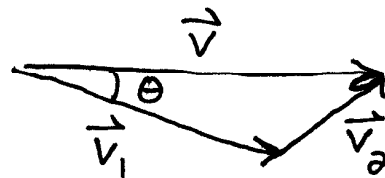
$d = \frac{100}{9.8} = \underline{10.2 \text{ meters}}$

13. 1 = engine      2 = wind

$\vec{v}_1 = (100 \text{ m/sec}, \theta)$        $\theta = ?$

$\vec{v}_2 = (30.0 \text{ m/sec}, 45.0^\circ)$

$\vec{v} = (v, 0^\circ)$



$\vec{v}_1 + \vec{v}_2 = \vec{v}$

$\vec{v}_{1y} + \vec{v}_{2y} = \vec{v}_y = 0$        $\vec{v}_{1y} = -v_1 \sin \theta$        $\vec{v}_{2y} = +v_2 \sin 45^\circ$

$-v_1 \sin \theta + v_2 \sin 45^\circ = 0$        $\sin \theta = \frac{v_2 \sin 45^\circ}{v_1}$

$\theta = \sin^{-1} \left( \frac{v_2 \sin 45^\circ}{v_1} \right) = \sin^{-1} \left( \frac{30(\sqrt{2}/2)}{100} \right)$

$\theta = \underline{12.2^\circ \text{ south of east}}$