

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

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

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

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

10. $V(\text{total}) = 12.0\text{V}$ $R_1 = 2.00\Omega$ $R_2 = 3.00\Omega$ $R_3 = 6.00\Omega$
 $I(\text{total}) = ?$

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \quad V = IR$$

$$R(\text{total}) = \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \right)^{-1} = \left(\frac{1}{2} + \frac{1}{3} + \frac{1}{6} \right)^{-1} = 1.00\Omega$$

$$I(\text{total}) = \frac{V(\text{total})}{R(\text{total})} = \frac{12.0}{1.00} = \underline{12.0\text{A}}$$

11. $\lambda = 10.0\mu\text{m} = 10.0 \times 10^{-6}\text{m} = 1.00 \times 10^{-5}\text{m}$
 $c = 3.00 \times 10^8\text{m/s}$ $f = ?$

$$v = \lambda f$$

$$f = \frac{v}{\lambda} = \frac{c}{\lambda} = \frac{3.00 \times 10^8}{1.00 \times 10^{-5}} = \underline{3.00 \times 10^{13}\text{Hz}}$$

$$12. \quad P = 8.00 \text{ D} \quad d_o = 2.50 \text{ cm} = 0.0250 \text{ m}$$

$$M = ?$$

$$P = \frac{1}{f} \quad \frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i} \quad M = -\frac{d_i}{d_o}$$

$$f = \frac{1}{P} = \frac{1}{8} = 0.1250 \text{ m}$$

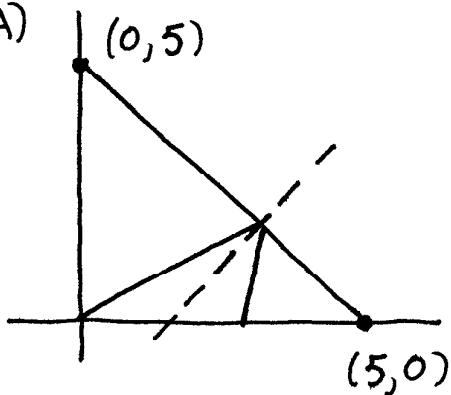
$$\frac{1}{d_i} = \frac{1}{f} - \frac{1}{d_o} = \frac{d_o - f}{fd_o} \quad d_i = \frac{fd_o}{d_o - f}$$

$$M = \frac{-\frac{fd_o}{d_o - f}}{d_o} = \frac{f}{f - d_o}$$

$$M = \frac{(0.125)}{(0.125) - (0.0250)} = \frac{0.125}{0.100} = \frac{125}{100} = \frac{5}{4} = \underline{1.25}$$

(no units)

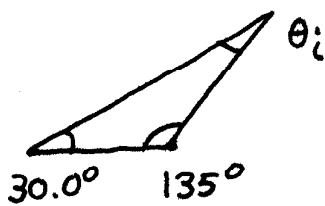
13. (A)



$$y = mx + b = -x + 5$$

$$m = \text{slope} = -1$$

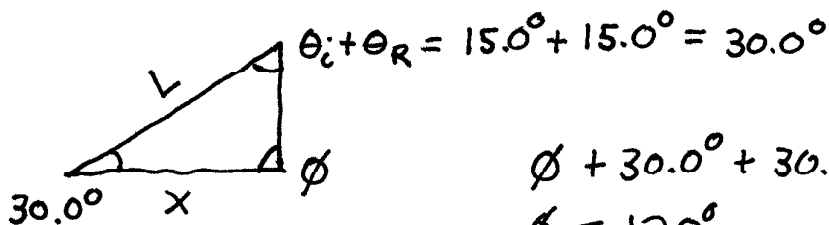
$$b = y\text{-intercept} = 5$$



$$\theta_i + 30.0^\circ + 135^\circ = 180^\circ$$

$$\theta_i = \underline{15.0^\circ}$$

(B)



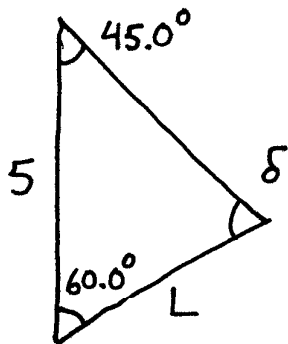
$$\phi + 30.0^\circ + 30.0^\circ = 180^\circ$$

$$\phi = 120^\circ$$

Law of Sines

$$\frac{x}{\sin 30^\circ} = \frac{L}{\sin 120^\circ}$$

$$x = \frac{L \sin 30^\circ}{\sin 120^\circ} = \frac{L(1/2)}{(\sqrt{3}/2)} = \frac{L}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}L}{3}$$



$$\delta + 45.0^\circ + 60.0^\circ = 180^\circ$$

$$\delta = 75.0^\circ$$

$$\frac{5}{\sin 75^\circ} = \frac{L}{\sin 45^\circ}$$

$$L = \frac{5 \sin 45^\circ}{\sin 75^\circ}$$

$$x = \frac{\sqrt{3} L}{3} = \frac{5\sqrt{3} \sin 45^\circ}{3 \sin 75^\circ} = \frac{5\sqrt{3} (\sqrt{2}/2)}{3 \sin 75^\circ}$$

$$x = \frac{5\sqrt{6}}{6 \sin 75^\circ} = \underline{2.11 \text{ meters}}$$