

Solutions to refractive index worksheet

1. $n = \frac{\sin i}{\sin r} = \frac{\sin 37}{\sin 24} = 1.48$

2. $1.4 = \frac{\sin 30}{\sin r}$ $1.4 \times \sin r = \sin 30$ $\sin r = \frac{\sin 30}{1.4} = \frac{0.5}{1.4} = 0.3571$ $r = \sin^{-1}(0.3571) = 20.9^\circ$

3. $n = \frac{\sin i}{\sin r} = \frac{\sin 30}{\sin 20} = 1.46$

4. ${}_a n_w = 1.3 = \frac{0.36}{\sin r}$ $1.3 \times \sin r = 0.36$ a) $\sin r = 0.36/1.3 = 0.2769$ b) $r = 16.1$

5. $\sin i = {}_a n_w \times \sin 30 = 1.3 \times 0.5 = 0.65$

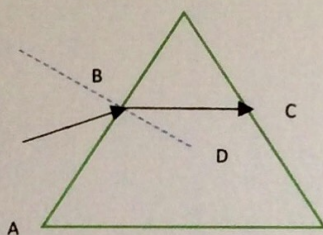
$i = \sin^{-1}(0.65) = 40.5^\circ$

6. $n = \frac{c_1}{c_2} = \frac{3 \times 10^8}{2.5 \times 10^8} = 1.2$

7. $n = \frac{\sin i}{\sin r} = \frac{\sin 40.8}{\sin r} = 1.2$ $\sin r = \frac{\sin 40.8}{1.2} = \frac{0.6494}{1.2} = 0.5412$ $r = \sin^{-1}(0.5412) = 32.8^\circ$

8. $1.08 = \frac{\sin 45.5}{\sin r}$ $\sin r = \frac{\sin 45.5}{1.08} = 0.6604$ $r = \sin^{-1}(0.6604) = 41.3^\circ$

9.



Angle ABC = $180 - 60 = 120^\circ$ supplementary

Angle ABD = 90° Normal at right to surface

a) Angle DBC = $x = 120 - 90 = 30^\circ$

b) $n = \frac{\sin y}{\sin x}$ $\sin y = n \times \sin x = 1.5 \times \sin 30 = 0.75$

$y = \sin^{-1}(0.75) = 48.6^\circ$

10. ${}_a n_w = 1.3$ ${}_a n_g = 1.5$

$1.3 = \frac{\sin 60}{\sin y}$ $\sin y = \frac{\sin 60}{1.3} = 0.6662$ $y = 41.8^\circ$

$1.5 = \frac{\sin 60}{\sin x}$ $\sin x = \frac{\sin 60}{1.5} = 0.5774$ $x = 35.3^\circ$

${}_w n_g = 1.3 = \frac{\sin y}{\sin x} = \frac{\sin 41.8}{\sin 35.3} = 1.2$