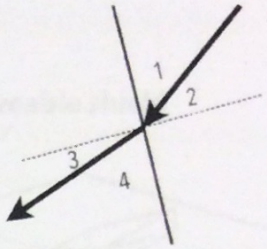
Name_____ Pd_____

Simple Refraction WS

1. Which angle in the figure at right is the angle of incidence? ∠2 Which is the angle of refraction? ∠3



2. If figure at right above shows the path of light traveling from one substance into another, and the two substances are air and glass, which side is the glass? Explain your answer.

Glass is on the left; it is more dense as shown by light bending closer to the normal line in the leftmost substance.

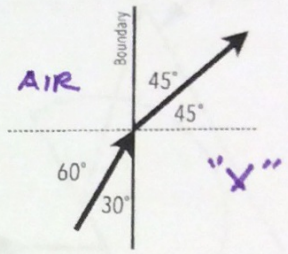
3. In the new figure at right, what is the index of refraction (n) for light going from air into *Substance X*? What's the speed of light in *Substance X*?

$1(\sin 60^\circ) = n_x(\sin 45^\circ)$

$n_x = 1.225$

$n_x = 1.225 = \frac{3\cdot10^8}{v_x} = \frac{c}{v}$

$v_x = 2.45\cdot10^8\ m/s$

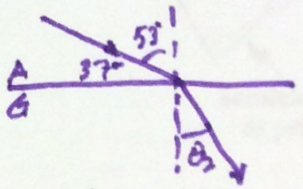


4. Light in air (n_1) enters a flat plate of glass (n_2=1.50) at an angle of 37° with the glass's surface. What is the direction of the beam inside the glass? (∠refr)

$\theta_1 = 53^\circ$

$1(\sin 53^\circ) = 1.5 \sin\theta_2$

$\theta_2 = 32.2^\circ$



5. A diver beneath the surface of a lake shines a bright searchlight up at an angle of 35° measured with respect to the normal. At what angle does the light emerge into air? $n = 1.333$ (water) θ_1

$1.333(\sin 35) = 1\sin\theta_2$

$\theta_2 = 49.9^\circ$

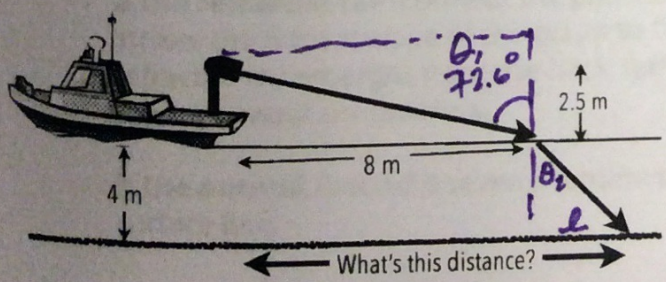
6. A light ray passes from glass, with n_{glass}=1.5, to air with an angle of incidence of 41.8103149°. Determine the angle of refraction for the ray in air.

$1.5(\sin 41.8103149) = 1\sin\theta_2$ $\theta_2 = 90^\circ$

7. A light ray passes from glass to air at an angle of incidence of 55°. Determine the angle of refraction in air.

$1.5\sin 55 = 1\sin\theta_2$

θ_2 does not exist No refraction takes place; the light reflects



8. A spotlight on a boat is 2.5 m above the water and the light strikes the water's surface at a point 8 m behind the boat. The depth of the water is 4 m. If n_{water}=1.37, how far from the back of the boat (measured horizontally) does the light hit the bottom?

$\tan\theta_1 = \frac{8}{2.5}$

$\theta_1 = 72.6^\circ$

$1\sin 72.6 = 1.37\sin\theta_2$

$\theta_2 = 44.1^\circ$

$\tan\theta_2 = \frac{l}{4}$ $l = 4\tan 44.1 = 3.88$ m

distance = 11.88 m