| NAME: Solution | Quiz #10: Phys142 |
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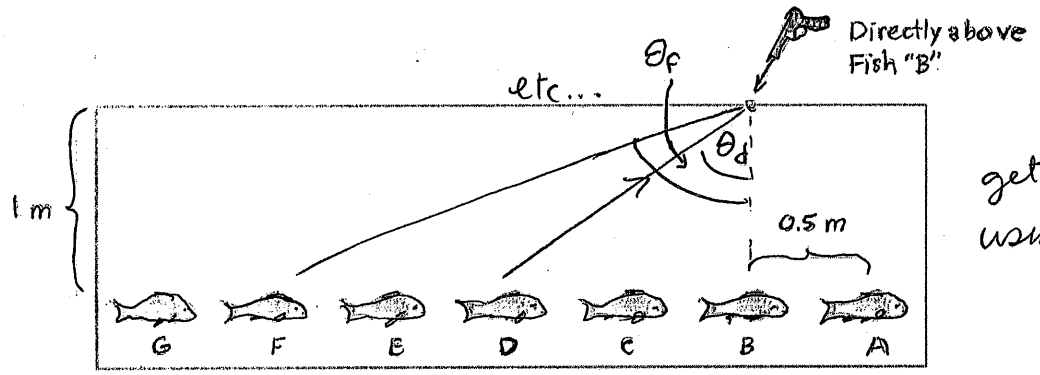
A person is standing on a pier with a loaded spear gun very close to the surface of an extremely placid pond containing very clear water. Seven fish are lined up (fish A through G) from the shore at a depth of 1m where fish "B" is directly underneath the gun. All the fish are separated by an equal distance of 0.5m. The index of refraction of water is 1.3.




get each fish's $\theta_x$ using $\tan\theta_x = \frac{n(0.5)}{1.0}$

(a) (4 pts) Which of the fish (A-G) can see the gun? Show your work, and name **all** the fish that can see the gun!

find $\theta_c$:

$\sin\theta_c = \frac{1}{1.3}\sin 90°$

$\theta_c = 50.3°$

any fish w/ $\theta_x > \theta_c = 50.3°$ can't see the gun; $\theta_d = 45°$ ✓; $\theta_e = 56.3°$ ✗

so A, B, C, D can see the gun, others can't (assuming A and B can look around).

(b) (3 pts) Which of the fish (A-G) can the person see as they take aim (that is, the person's eye is very close to the gun)? Name **all** the fish the person can see.

the logic here is the same, just with the light rays traveling in the opposite direction, so the person can see fish A, B, C, D.

(c) (3 pts) If the person wants to shoot fish "C" and compensate for refraction, should he aim directly at the apparent location of the fish, or should he aim higher or lower? Explain.

the light from the fish will refract as it leaves the water, bending as shown, producing an image of the fish further away than it actually is; therefore, he should aim lower.