Refraction Problems

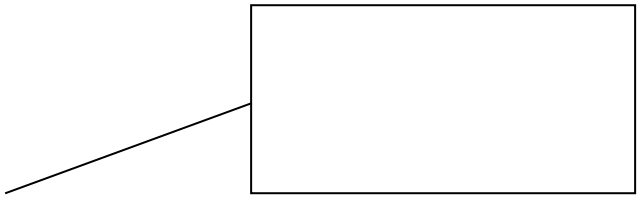
****Remember**** **"n" for air is always 1.0** **$c = 3.0 \times 10^8$ m/s**

1) Complete the chart below. Make you calculations on another page.

Medium 1	Medium 2	Index of refraction (n_1)	Index of refraction (n_2)	Angle of incidence (Θ_1)	Angle of refraction (Θ_2)
Air	Diamond		2.42	30º	
Air	Zircon		1.90	30º	
Diamond	Air	2.42			10º
Water	Diamond	1.33	2.42		10º

2) If the angle of incidence (from crown glass, n=1.52) is 30º, find the angle of refraction in diamond (n=2.42).

3) a) Draw a **ray diagram** to show the path of ray of light as it passes from air into a block of glass (n=1.61) then through the block and out the other side.
Be sure to sketch the **normals** and show your **measured angles** and **calculations** using Snell's Law.



b) What would happen to the angle of refraction if the block was made of ice (n=1.30)?

larger smaller same

c) How will the light bend when it passes back into the air?

Toward normal OR away from normal

4) Complete the chart below

Medium 1	**Medium 2**	**Index of refraction (n_1)**	**Index of refraction (n_2)**	**Critical Angle (Θ_1)**
Diamond	Air	2.42	1.00	
Water	Air	1.33	1.00	
Glass	Water		1.33	61.4º

5) You want to scoop a fish out of water. Where should you aim relative to the fish to capture it? Explain using a diagram.

6) In a magic trick, a coin in a cup can only be viewed when water is in the cup. Explain how this demonstration works using ray diagrams showing the cup without water and containing water.

7) A diagram below shows a ray travelling from air into an object composed of 3 different media. Complete the diagram by continuing the **ray** until it **leaves** the object.

Remember to draw a new normal at the boundary between <u>each</u> medium