1. For the first refraction,

$1.6 \sin d = \sin 50°$

$\sin d = 0.4788$

$d = 28.6°$

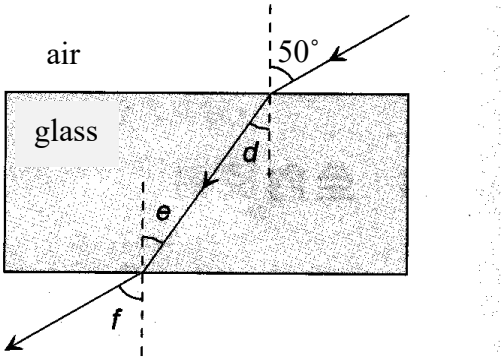
$e = d = 28.6°$

For the second refraction,

$1.6 \sin e = \sin f$

$\sin f = 0.7659$

$f = 50.0°$



2. For the first refraction,

$\sin 60° = 1.5 \sin a$

$\sin a = 0.5774$

$a = 35.3°$

$b = 90° - 35.3° = 54.7°$

$c = 180° - 60° - 54.7° = 65.3°$

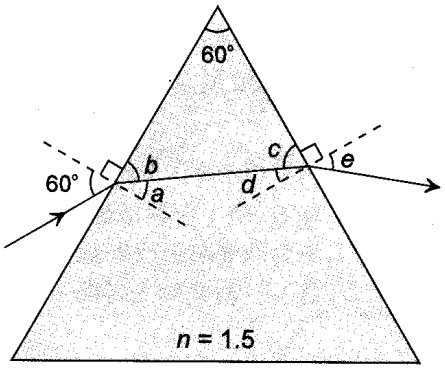
$d = 90° - 65.3° = 24.7°$

For the second refraction,

$1.5 \sin 24.7° = \sin e$

$\sin e = 0.6268$

$e = 38.8°$



3. $1 \cdot \sin 40° = 1.7 \sin x$

$\sin x = 0.3781$

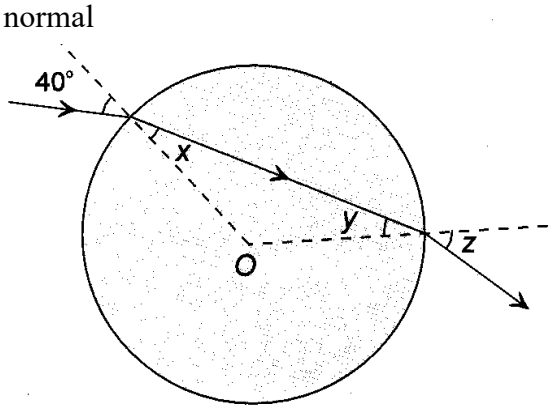
$x = 22.2°$

$y = x = 22.2°$ (isos. Δ)

$1.7 \sin 22.2° = 1 \cdot \sin z$

$\sin z = 0.6423$

$z = 40.0°$



4. (a) $1 \cdot \sin 30° = n \sin 20°$

$n = \dfrac{\sin 30°}{\sin 20°} = 1.46$

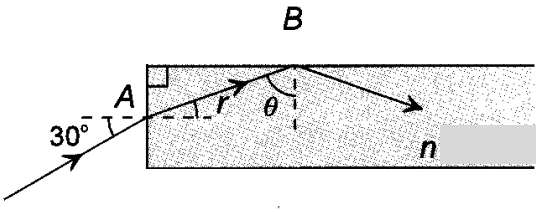
(b) $c = \sin^{-1} \dfrac{1}{1.46}$

$\Rightarrow \quad c = 43.2°$

(c) $\theta = 180° - 90° - 20° = 70°$

$\because \quad \theta > c$

$\therefore$ The ray is totally reflected at B.



(d) When $i = 80°$,

$\sin 80° = 1.46 \sin r$

$\sin r = 0.6745$

$r = 42.4°$

$\theta = 90° - 42.4° = 47.6°$

$\because \quad \theta > c$

$\therefore$ The light cannot come out at B.