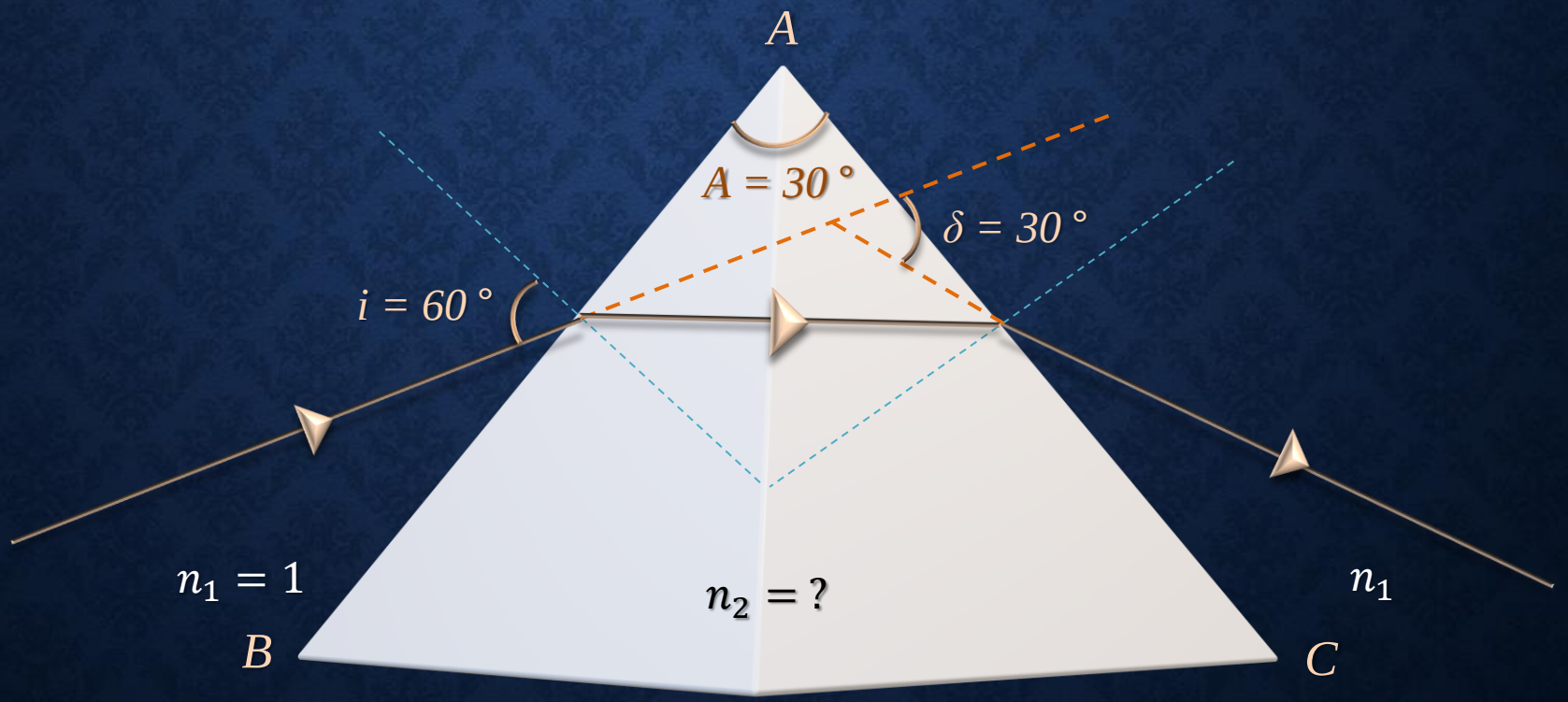
A ray of light is incident at an angle of 60° on one face of a prism which has an angle of 30°. The ray emerging out of the prism makes an angle of 30° with the incident ray. Calculate the refractive index of the material of the prism.

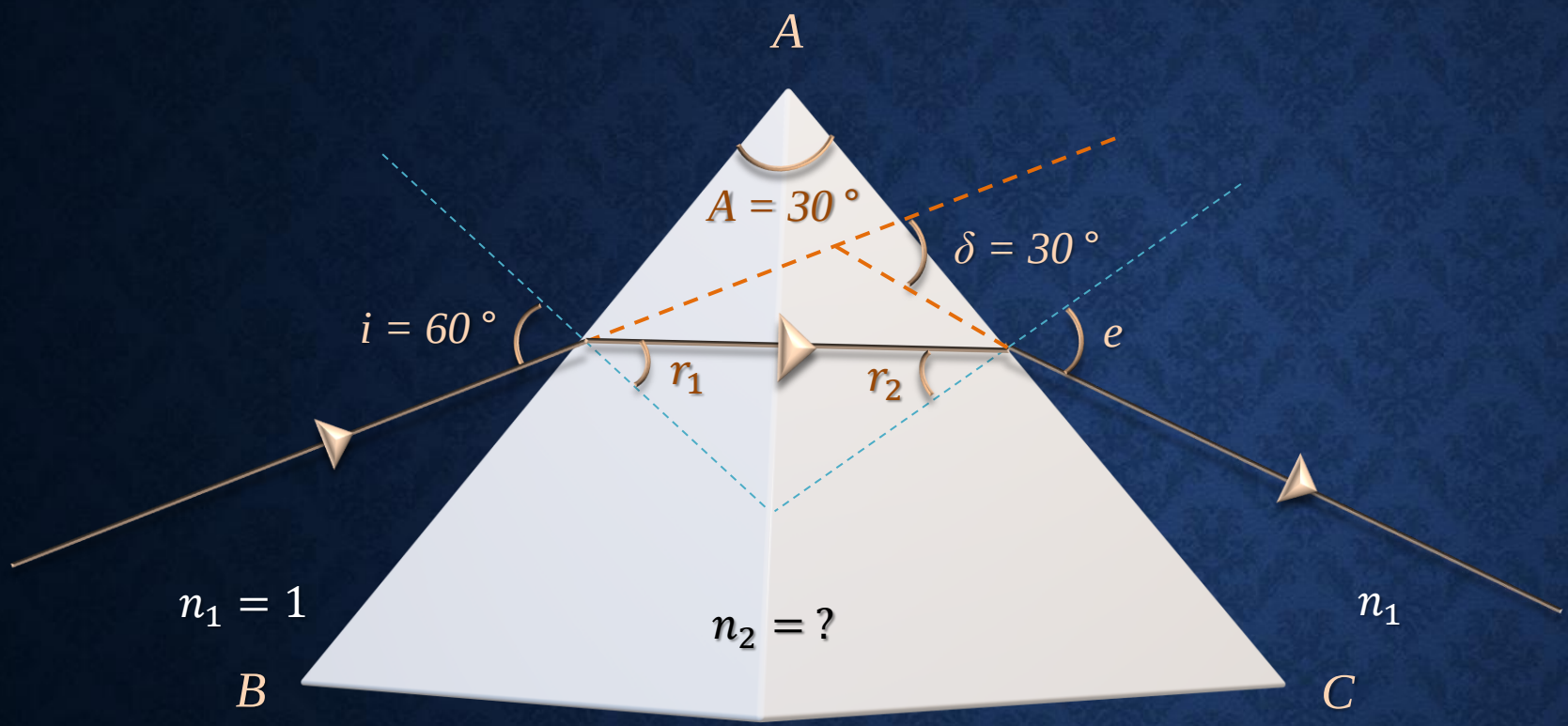
(a) 1

(b) $\sqrt{2}$

(c) $\sqrt{3}$

(d) 2





Face AB

$n_1 \sin i = n_2 \sin r_1$

$\sin 60^\circ = n_2 \sin r_1$

$\frac{\sqrt{3}}{2} = n_2 \sin r_1$ ---------- 1

6 in 1

$\frac{\sqrt{3}}{2} = n_2 \sin 30^\circ$

$\frac{\sqrt{3}}{2} = n_2 \frac{1}{2}$

$\sqrt{3} = n_2$

$A = r_1 + r_2$

$30^\circ = r_1 + r_2$ --------- 3

5 in 3

$30^\circ = r_1$ ---------- 6

$\delta = i + e - A$

$30^\circ = 60^\circ + e - 30^\circ$

$30^\circ = 30^\circ + e$

$e = 0$ ---------- 4

Face AC

$n_2 \sin r_2 = \sin e$ ---------- 2

4 in 2

$n_2 \sin r_2 = 0$

$n_2 = 0$ OR $\sin r_2 = 0$

$r_2 = 0$ --------- 5

A thin prism of angle A = 6° produces a deviation δ = 3°. Find the refractive index of the material of prism

(a) 1.5

(b) 1

(c) 2.5

(d) 0.5