

Question 2.1

a)

GIVEN:

$$\mathbf{NA} := \mathbf{0.2}$$

Numerical Aperture

$$\mathbf{n_{clad}} := \mathbf{1.59}$$

Cladding refractive index

$$\mathbf{n_{water}} := \mathbf{1.33}$$

Refractive index for water

$$\theta_a := \text{asin}\left(\frac{\mathbf{NA}}{\mathbf{n_{water}}}\right)$$

$$\theta_a = \mathbf{8.6487 \text{ deg}}$$

Acceptance angle

b)

$$\mathbf{n_{core}} := \sqrt{\mathbf{NA}^2 + (\mathbf{n_{clad}})^2}$$
 Calculate the core refractive index

$$\mathbf{n_{core}} = \mathbf{1.6025}$$

$$\phi_c := \text{asin}\left(\frac{\mathbf{n_{clad}}}{\mathbf{n_{core}}}\right)$$

Critical Angle at core - cladding interface

$$\phi_c = \mathbf{82.8306 \text{ deg}}$$