

G7SINGCX

Convex single refracting surface

r is positive, light from left propagating from medium with n1 to medium with n2

xo on left of surface (negative)

Calculation for 4 positions for real and virtual objects, to the left and right of the object focus and image focus.

Calculation of xi from given xo, refractive indices and radius of curvature

Calculation of magnification

$$\begin{array}{llll} \text{Image focus} & r \equiv 10 & n1 := 1 & n2 := 1.5 \quad \text{Object focus} \\ x_{if} := n2 \cdot \frac{r}{n2 - n1} & x_{if} = 30 & x_{of} := n1 \cdot \frac{r}{n1 - n2} & x_{of} = -20 \end{array}$$

a

$$x_{1o} := -100$$

$$x_{1i} := \frac{n2}{\left(\frac{n2 - n1}{r}\right) + \frac{n1}{x_{1o}}}$$

$$mm1 := x_{1i} \cdot \frac{n1}{x_{1o} \cdot n2} \quad mm1 = -0.25$$

$$x_{1i} = 37.5$$

b

$$x_{2o} := -10$$

$$x_{2i} := \frac{n2}{\left(\frac{n2 - n1}{r}\right) + \frac{n1}{x_{2o}}}$$

$$mm2 := x_{2i} \cdot \frac{n1}{x_{2o} \cdot n2} \quad mm2 = 2$$

$$x_{2i} = -30$$

c

$$x_{3o} := 20$$

$$x_{3i} := \frac{n2}{\left(\frac{n2 - n1}{r}\right) + \frac{n1}{x_{3o}}}$$

$$mm3 := x_{3i} \cdot \frac{n1}{x_{3o} \cdot n2} \quad mm3 = 0.5$$

$$x_{3i} = 15$$

d

$$x_{4o} := 100$$

$$x_{4i} := \frac{n2}{\left(\frac{n2 - n1}{r}\right) + \frac{n1}{x_{4o}}}$$

$$x_{4i} = 25$$

$$mm4 := x_{4i} \cdot \frac{n1}{x_{4o} \cdot n2} \quad mm4 = 0.167$$