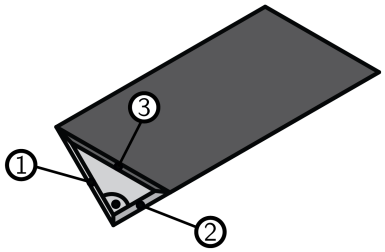
View Factor 12

The image shows a long right triangular body. Determine the view factor Φ_{12}:

$$\Phi_{12}$$



A flat plate can never see itself and therefore:

$$\Phi_{11} = \Phi_{22} = \Phi_{33} = 0$$

Furthermore, from symmetry, it can be seen that $\Phi_{31} = \Phi_{32}$, combining this with the summation rule ($\Phi_{31} + \Phi_{32} + \Phi_{33} = 1$) it yields:

$$\Phi_{31} = \frac{1}{2}$$

From the reciprocity rule ($A_1\Phi_{13} = A_3\Phi_{31}$) it can be determined that :

$$\Phi_{13} = \Phi_{31}\frac{A_3}{A_1} = \frac{1}{2} \cdot \frac{\sqrt{W^2 + W^2} \cdot L}{W \cdot L} = \frac{1}{\sqrt{2}}$$

Where W and L are the respective width and length of surfaces 1 and 2.

Using the summation rule ($\Phi_{11} + \Phi_{12} + \Phi_{13} = 1$), one finds:

$$\Phi_{12} = 1 - \Phi_{11} - \Phi_{13} = 1 - \frac{1}{\sqrt{2}}$$