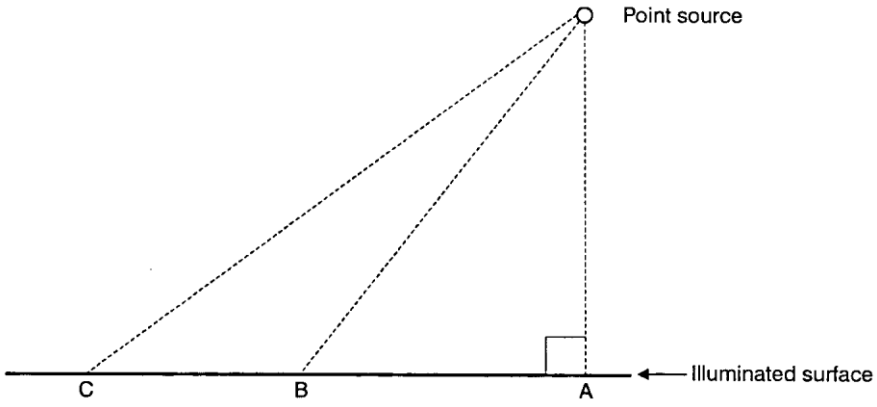
COSINE LAW



$$E = \frac{I \times \cos\phi}{d^2}$$

d = distance from point source to surface in metres

I = luminous intensity in candelas

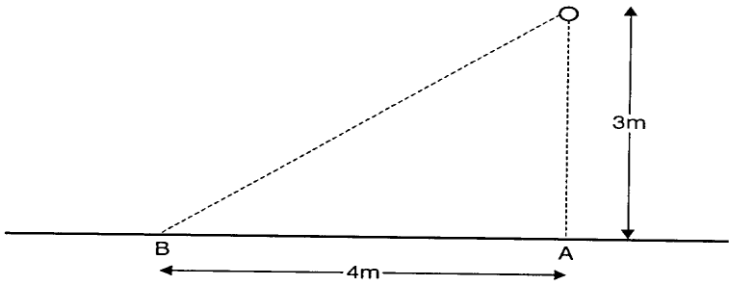
ϕ = the angle between the normal to the surface and the direction of the light

The cosine law may be used to determine the illuminance at any given point on a surface.

A lamp that delivers 900 cd in all directions below the horizontal is suspended 3m above a level work bench. Calculate the illuminance at a point A, directly below the lamp and also at point B four metres away from point A.

Solution

Step 1 – sketch diagram



Step 2 – state formula

for illumination at point A $E = \frac{I}{d^2}$

Step 3 – substitute and evaluate

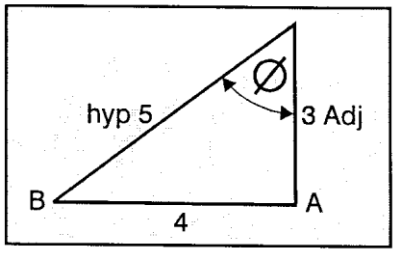
$$E = \frac{I}{d^2}$$

$$= \frac{900}{3^2}$$

$$= 100 \text{ lux}$$

$$d = \sqrt{3^2 + 4^2}$$

$$d = 5m$$



$$\cos \phi = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$= \frac{3}{5}$$

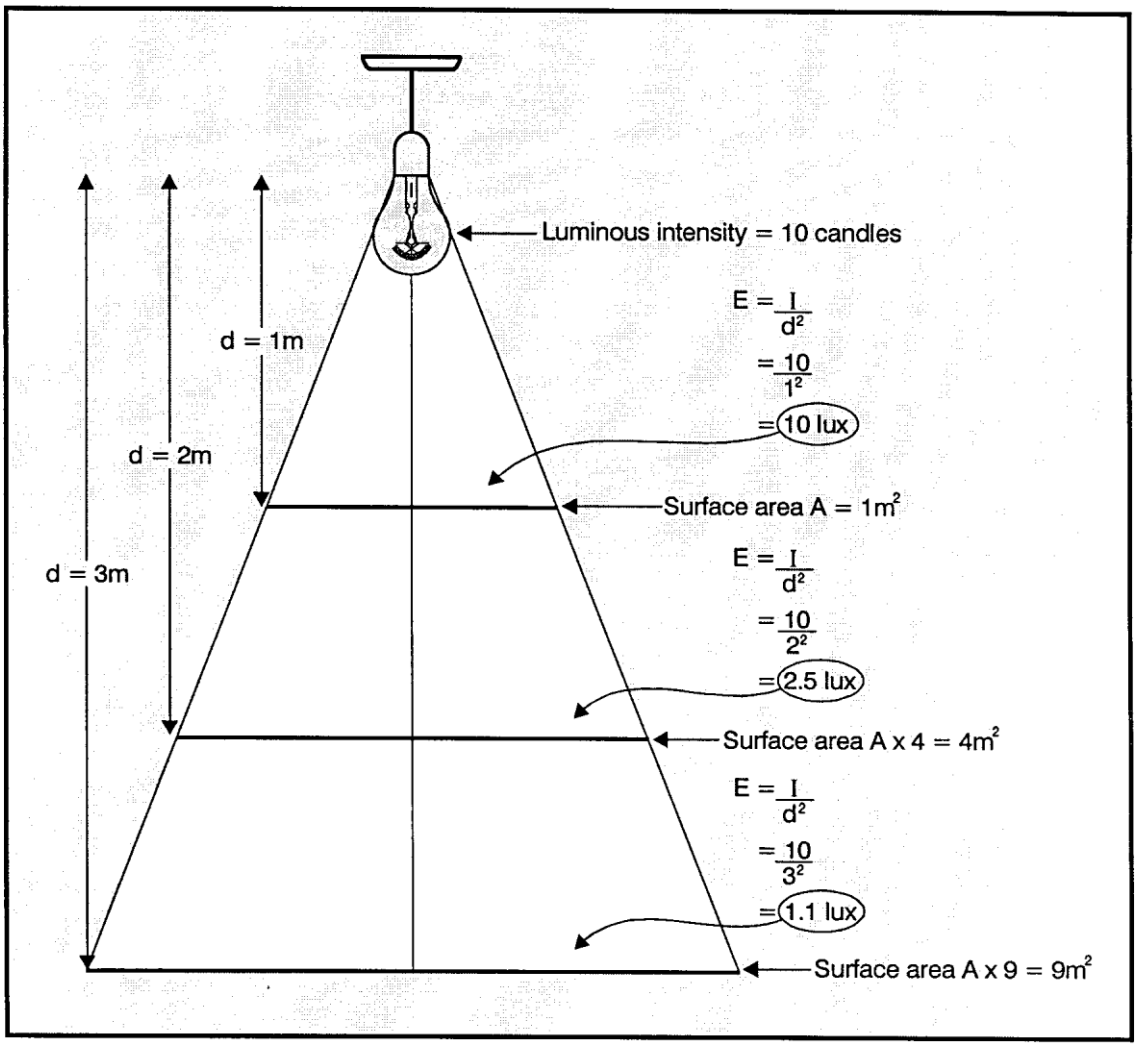
$$= 0.6$$

$$E = \frac{I}{d^2} \times \cos \phi$$

$$E = \frac{900 \times 0.6}{5^2}$$

$$E = 21.6 \text{ lux}$$

INVERSE SQUARE LAW



The inverse square law can be expressed as

$$E = \frac{I}{d^2}$$

Where E = Illuminance (lux)

I = Luminous intensity (candelas)

d = Distance (metres)