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# Illumination Parameters Formulas

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# List of 15 Illumination Parameters Formulas

## Illumination Parameters

### 1) Candle Power

$$\text{fx } CP = \frac{F}{\omega}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b\_img.jpg\)](#)

$$\text{ex } 1.555556\text{cd} = \frac{42\text{lm}}{27\text{sr}}$$

### 2) Depreciation Factor

$$\text{fx } DF = \frac{1}{MF}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d\_img.jpg\)](#)

$$\text{ex } 0.5 = \frac{1}{2}$$

### 3) Illumination

$$\text{fx } E_v = \frac{F}{A}$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d\_img.jpg\)](#)

$$\text{ex } 1.02439\text{lx} = \frac{42\text{lm}}{41\text{m}^2}$$



4) Index of Refraction 

$$fx \quad n_1 = \frac{n_2 \cdot \sin(\theta_r)}{\sin(\theta_i)}$$

Open Calculator 

$$ex \quad 1.133324 = \frac{1.54 \cdot \sin(21.59^\circ)}{\sin(30^\circ)}$$

5) Lamp Efficiency 

$$fx \quad \eta = \frac{F}{P_{in}}$$

Open Calculator 

$$ex \quad 0.144828lm/W = \frac{42lm}{290W}$$

6) Lumens 

$$fx \quad Lm = CP \cdot \omega$$

Open Calculator 

$$ex \quad 41.85cd*sr = 1.55cd \cdot 27sr$$


7) Luminance 

$$fx \quad L_v = \frac{I_v}{A \cdot \cos(\theta)}$$

Open Calculator 

$$ex \quad 0.266631cd*sr/m^2 = \frac{4.62cd}{41m^2 \cdot \cos(65^\circ)}$$



8) Luminous Flux 

$$fx \quad F = \frac{A \cdot I_v}{L^2}$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95\_img.jpg\)](#)


$$ex \quad 42.95238lm = \frac{41m^2 \cdot 4.62cd}{(2.1m)^2}$$

9) Maintenance Factor 

$$fx \quad MF = \frac{I_{final}}{I_{initial}}$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2\_img.jpg\)](#)

$$ex \quad 2 = \frac{6.2lx}{3.1lx}$$

10) Mean Hemi-Spherical Candle Power 

$$fx \quad M.H.S.C.P. = \frac{F}{2 \cdot \pi}$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7\_img.jpg\)](#)

$$ex \quad 6.684508cd = \frac{42lm}{2 \cdot \pi}$$

11) Mean Horizontal Candle Power 

$$fx \quad M.H.C.P. = \frac{S}{N_{Lamp}}$$

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b\_img.jpg\)](#)

$$ex \quad 2.55cd = \frac{7.65cd}{3}$$



12) Mean Spherical Candle Power 

$$\text{fx } \text{M.S.C.P.} = \frac{F}{4 \cdot \pi}$$

Open Calculator 


$$\text{ex } 3.342254\text{cd} = \frac{42\text{lm}}{4 \cdot \pi}$$

13) Number of Lamps Required for Illumination 

$$\text{fx } N_{\text{Lamp}} = \frac{E_v \cdot A}{F \cdot UF \cdot MF}$$

Open Calculator 

$$\text{ex } 3 = \frac{1.02\text{lx} \cdot 41\text{m}^2}{42\text{lm} \cdot 0.15 \cdot 2}$$

14) Reduction Factor 

$$\text{fx } \text{RF} = \frac{\text{M.S.C.P.}}{\text{M.H.C.P.}}$$

Open Calculator 

$$\text{ex } 1.309804 = \frac{3.34\text{cd}}{2.55\text{cd}}$$

15) Solid Angle 

$$\text{fx } \omega = \frac{A}{r^2}$$

Open Calculator 

$$\text{ex } 27.10027\text{sr} = \frac{41\text{m}^2}{(1.23\text{m})^2}$$



## Variables Used










- **A** Area of Illumination (Square Meter)
- **CP** Candle Power (Candela)
- **DF** Depreciation Factor
- **E<sub>v</sub>** Illumination Intensity (Lux)
- **F** Luminous Flux (Lumen)
- **I<sub>final</sub>** Final Illumination (Lux)
- **I<sub>initial</sub>** Initial Illumination (Lux)
- **I<sub>v</sub>** Luminous Intensity (Candela)
- **L** Length of Illumination (Meter)
- **L<sub>v</sub>** Luminance (Candela Steradian per Sq Meter)
- **Lm** Lumen (Candela Steradian)
- **M.H.C.P.** Mean Horizontal Candle Power (Candela)
- **M.H.S.C.P.** Mean Hemi Spherical Candle Power (Candela)
- **M.S.C.P.** Mean Spherical Candle Power (Candela)
- **MF** Maintenance Factor
- **n<sub>1</sub>** Refractive Index of Medium 1
- **n<sub>2</sub>** Refractive Index of Medium 2
- **N<sub>Lamp</sub>** Number of Lamp
- **P<sub>in</sub>** Input Power (Watt)
- **r** Radius of Illumination (Meter)
- **RF** Reduction Factor
- **S** Sum of Candle Power (Candela)



- **UF** Utilization Factor
- **$\eta$**  Lamp Efficiency (*Lumen Per Watt*)
- **$\theta$**  Illumination Angle (*Degree*)
- **$\theta_i$**  Incident Angle (*Degree*)
- **$\theta_r$**  Refracted Angle (*Degree*)
- **$\omega$**  Solid Angle (*Steradian*)



## Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288  
*Archimedes' constant*
- **Function:** **cos**,  $\cos(\text{Angle})$   
*Trigonometric cosine function*
- **Function:** **sin**,  $\sin(\text{Angle})$   
*Trigonometric sine function*
- **Measurement:** **Length** in Meter (m)  
*Length Unit Conversion* 
- **Measurement:** **Luminous Intensity** in Candela (cd)  
*Luminous Intensity Unit Conversion* 
- **Measurement:** **Area** in Square Meter ( $\text{m}^2$ )  
*Area Unit Conversion* 
- **Measurement:** **Illuminance** in Lux (lx), Candela Steradian per Sq Meter ( $\text{cd} \cdot \text{sr} / \text{m}^2$ )  
*Illuminance Unit Conversion* 
- **Measurement:** **Power** in Watt (W)  
*Power Unit Conversion* 
- **Measurement:** **Angle** in Degree ( $^\circ$ )  
*Angle Unit Conversion* 
- **Measurement:** **Luminous Flux** in Lumen (lm), Candela Steradian ( $\text{cd} \cdot \text{sr}$ )  
*Luminous Flux Unit Conversion* 
- **Measurement:** **Luminous Efficacy** in Lumen Per Watt (lm/W)  
*Luminous Efficacy Unit Conversion* 
- **Measurement:** **Solid Angle** in Steradian (sr)  
*Solid Angle Unit Conversion* 





## Check other formula lists

- [Advanced Illumination Formulas](#) 
- [Illumination Parameters Formulas](#) 

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