# Important Illumination Parameters Formulas PDF

**Formulas**
**Examples**
**with Units**

## List of 15
### Important Illumination Parameters Formulas

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### 1) Candle Power Formula

**Formula**

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

**Example with Units**

$$1.5556_{\,cd} = \frac{42_{\,lm}}{27_{\,sr}}$$

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### 2) Depreciation Factor Formula

**Formula**

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

**Example**

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

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### 3) Illumination Formula

**Formula**

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

**Example with Units**

$$1.0244_{\,lx} = \frac{42_{\,lm}}{41_{\,m^2}}$$

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### 4) Index of Refraction Formula

**Formula**

$$n_1 = \frac{n_2 \cdot \sin\left(\theta_r\right)}{\sin\left(\theta_i\right)}$$

**Example with Units**

$$1.1333 = \frac{1.54 \cdot \sin\left(21.59°\right)}{\sin\left(30°\right)}$$

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### 5) Lamp Efficiency Formula

**Formula**

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

**Example with Units**

$$0.1448_{\,lm/W} = \frac{42_{\,lm}}{290_{\,w}}$$

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### 6) Lumens Formula

**Formula**

$$Lm = CP \cdot \omega$$

**Example with Units**

$$41.85_{\,cd*sr} = 1.55_{\,cd} \cdot 27_{\,sr}$$

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## 7) Luminance Formula 📲

**Formula**

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

**Example with Units**

$$0.2666_{\,cd*sr/m^2} = \frac{4.62_{\,cd}}{41_{\,m^2} \cdot \cos(65°)}$$

## 8) Luminous Flux Formula 📲

**Formula**

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

**Example with Units**

$$42.9524_{\,lm} = \frac{41_{\,m^2} \cdot 4.62_{\,cd}}{2.1_{\,m}^2}$$

## 9) Maintenance Factor Formula 📲

**Formula**

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

**Example with Units**

$$2 = \frac{6.2_{\,lx}}{3.1_{\,lx}}$$

## 10) Mean Hemi-Spherical Candle Power Formula 📲

**Formula**

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

**Example with Units**

$$6.6845_{\,cd} = \frac{42_{\,lm}}{2 \cdot 3.1416}$$

## 11) Mean Horizontal Candle Power Formula 📲

**Formula**

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

**Example with Units**

$$2.55_{\,cd} = \frac{7.65_{\,cd}}{3}$$

## 12) Mean Spherical Candle Power Formula 📲

**Formula**

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

**Example with Units**

$$3.3423_{\,cd} = \frac{42_{\,lm}}{4 \cdot 3.1416}$$

## 13) Number of Lamps Required for Illumination Formula 📲

**Formula**

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

**Example with Units**

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

## 14) Reduction Factor Formula 

**Formula**

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

**Example with Units**

$$1.3098 = \frac{3.34\,\text{cd}}{2.55\,\text{cd}}$$

## 15) Solid Angle Formula 

**Formula**

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

**Example with Units**

$$27.1003\,\text{sr} = \frac{41\,\text{m}^2}{1.23\,\text{m}^2}$$

## Variables used in list of Illumination Parameters Formulas above

- **A** Area of Illumination *(Square Meter)*
- **CP** Candle Power *(Candela)*
- **DF** Depreciation Factor
- **$E_v$** Illumination Intensity *(Lux)*
- **F** Luminous Flux *(Lumen)*
- **$I_{final}$** Final Illumination *(Lux)*
- **$I_{initial}$** Initial Illumination *(Lux)*
- **$I_v$** Luminous Intensity *(Candela)*
- **L** Length of Illumination *(Meter)*
- **$L_v$** 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
- **$n_1$** Refractive Index of Medium 1
- **$n_2$** Refractive Index of Medium 2
- **$N_{Lamp}$** Number of Lamp
- **$P_{in}$** Input Power *(Watt)*
- **r** Radius of Illumination *(Meter)*
- **RF** Reduction Factor
- **S** Sum of Candle Power *(Candela)*
- **UF** Utilization Factor
- **η** Lamp Efficiency *(Lumen Per Watt)*
- **θ** Illumination Angle *(Degree)*
- **$θ_i$** Incident Angle *(Degree)*
- **$θ_r$** Refracted Angle *(Degree)*
- **ω** Solid Angle *(Steradian)*

## Constants, Functions, Measurements used in list of Illumination Parameters Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Functions: **cos**, cos(Angle) *Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.*
- Functions: **sin**, sin(Angle) *Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.*
- Measurement: **Length** in Meter (m) *Length Unit Conversion* ↗
- Measurement: **Luminous Intensity** in Candela (cd) *Luminous Intensity Unit Conversion* ↗
- Measurement: **Area** in Square Meter (m²) *Area Unit Conversion* ↗
- Measurement: **Illuminance** in Lux (lx), Candela Steradian per Sq Meter (cd*sr/m²) *Illuminance Unit Conversion* ↗
- Measurement: **Power** in Watt (W) *Power Unit Conversion* ↗
- Measurement: **Angle** in Degree (°) *Angle Unit Conversion* ↗
- Measurement: **Luminous Flux** in Lumen (lm), Candela Steradian (cd*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* ↗

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