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# Light Measurement Formulas

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# List of 18 Light Measurement Formulas

## Light Measurement

### 1) Area affected by Light Incident

$$\text{fx } A = \frac{L_p}{H}$$

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

$$\text{ex } 28.20513\text{m}^2 = \frac{22\text{W}}{0.78\text{W}/\text{m}^2}$$

### 2) Area Projected at solid angle

$$\text{fx } \Omega = \frac{\Phi_m}{I}$$

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

$$\text{ex } 8\text{m}^2 = \frac{230\text{Wb}}{28.75\text{cd}}$$


### 3) Flux at Solid Angle

$$\text{fx } \Phi_m = I \cdot \Omega$$

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

$$\text{ex } 230\text{Wb} = 28.75\text{cd} \cdot 8\text{m}^2$$



4) Illuminance 

$$\text{fx } E = \frac{\Phi_m}{A}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235\_img.jpg\)](#)


$$\text{ex } 8.070175\text{lx} = \frac{230\text{Wb}}{28.5\text{m}^2}$$

5) Incident Luminous Flux 

$$\text{fx } \Phi_i = \frac{\Phi_r}{\rho}$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0\_img.jpg\)](#)


$$\text{ex } 2\text{lm} = \frac{5.1\text{lm}}{2.55}$$

6) Intensity on Solid Angle 

$$\text{fx } I = \frac{\Phi_m}{\Omega}$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f\_img.jpg\)](#)

$$\text{ex } 28.75\text{cd} = \frac{230\text{Wb}}{8\text{m}^2}$$

7) Irradiation 

$$\text{fx } H = \frac{L_p}{A}$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754\_img.jpg\)](#)

$$\text{ex } 0.77193\text{W}/\text{m}^2 = \frac{22\text{W}}{28.5\text{m}^2}$$



8) Light flux 

$$fx \quad \Phi = \frac{I_{pc}}{P_s}$$

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


$$ex \quad 3.870968lm = \frac{12A}{3.1}$$

9) Light Power 

$$fx \quad L_p = A \cdot H$$

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

$$ex \quad 22.23W = 28.5m^2 \cdot 0.78W/m^2$$

10) Luminous Flux incident upon Object 

$$fx \quad L_i = \frac{L_t}{\tau}$$

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

$$ex \quad 7.738095lm = \frac{32.5lm}{4.2}$$


11) Luminous Flux Transmitted by Object 

$$fx \quad L_t = \tau \cdot L_i$$

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

$$ex \quad 32.34lm = 4.2 \cdot 7.7lm$$



12) Luminous Intensity in Direction at Angle 

$$fx \quad I_{\theta} = L_n \cdot A \cdot \cos(\theta)$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a\_img.jpg\)](#)

$$ex \quad 5.608471cd = 0.37lx \cdot 28.5m^2 \cdot \cos(1.01rad)$$

13) Luminous Intensity in Direction Normal to Surface 

$$fx \quad I_n = A \cdot L_n$$

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021\_img.jpg\)](#)

$$ex \quad 10.545cd = 28.5m^2 \cdot 0.37lx$$

14) Photoelectric Current 

$$fx \quad I_{pc} = F \cdot P_s$$

[Open Calculator !\[\]\(bd3b31712ad9bab5a241210fa6925cdd\_img.jpg\)](#)

$$ex \quad 12.09A = 3.9lm \cdot 3.1$$

15) Photoelectric Sensitivity 

$$fx \quad P_s = \frac{I_{pc}}{F}$$

[Open Calculator !\[\]\(7bc43b319a082987e20f7bf78f4bab80\_img.jpg\)](#)

$$ex \quad 3.076923 = \frac{12A}{3.9lm}$$

16) Reflected Luminous Flux 

$$fx \quad \Phi_r = \Phi_i \cdot \rho$$

[Open Calculator !\[\]\(4a7b4ce770af8456e11a71f9565c8c2b\_img.jpg\)](#)

$$ex \quad 5.865lm = 2.3lm \cdot 2.55$$



## 17) Reflection Factor

$$\text{fx } \rho = \frac{\Phi_r}{\Phi_i}$$

[Open Calculator !\[\]\(d3fb9f94af8b26d1c844efa9a98805b0\_img.jpg\)](#)

$$\text{ex } 2.217391 = \frac{5.1\text{lm}}{2.3\text{lm}}$$

## 18) Transmission Factor

$$\text{fx } \tau = \frac{L_t}{L_i}$$

[Open Calculator !\[\]\(e1d6102fe77919492c04879c8450f1f5\_img.jpg\)](#)

$$\text{ex } 4.220779 = \frac{32.5\text{lm}}{7.7\text{lm}}$$












## Variables Used

- **A** Surface Area (Square Meter)
- **E** Illumination (Lux)
- **F** Luminous Flux (Lumen)
- **H** Irradiation (Watt per Square Meter)
- **I** Luminous Intensity (Candela)
- **I<sub>n</sub>** Luminous Intensity Normal to Surface (Candela)
- **I<sub>pc</sub>** Photoelectric Current (Ampere)
- **I<sub>θ</sub>** Luminous Intensity at Angle (Candela)
- **L<sub>i</sub>** Luminous Flux Incident upon Object (Lumen)
- **L<sub>n</sub>** Luminance Normal to Surface (Lux)
- **L<sub>p</sub>** Power (Watt)
- **L<sub>t</sub>** Luminous Flux Transmitted by Object (Lumen)
- **P<sub>s</sub>** Photoelectric Sensitivity
- **θ** Angle to Normal (Radian)
- **ρ** Reflection Factor
- **T** Transmission Factor
- **Φ** Flux (Lumen)
- **Φ<sub>i</sub>** Incident Luminous Flux (Lumen)
- **Φ<sub>m</sub>** Magnetic Flux (Weber)
- **Φ<sub>r</sub>** Reflected Luminous Flux (Lumen)
- **Ω** Area Projected at Solid Angle (Square Meter)



## Constants, Functions, Measurements used

- **Function:** **cos**,  $\cos(\text{Angle})$   
*Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.*
- **Measurement:** **Electric Current** in Ampere (A)  
*Electric Current 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)  
*Illuminance Unit Conversion* 
- **Measurement:** **Power** in Watt (W)  
*Power Unit Conversion* 
- **Measurement:** **Angle** in Radian (rad)  
*Angle Unit Conversion* 
- **Measurement:** **Magnetic Flux** in Weber (Wb)  
*Magnetic Flux Unit Conversion* 
- **Measurement:** **Heat Flux Density** in Watt per Square Meter ( $\text{W}/\text{m}^2$ )  
*Heat Flux Density Unit Conversion* 
- **Measurement:** **Luminous Flux** in Lumen (lm)  
*Luminous Flux Unit Conversion* 





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