



Microscopes and Telescopes Formulas

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Examples!

Conversions!

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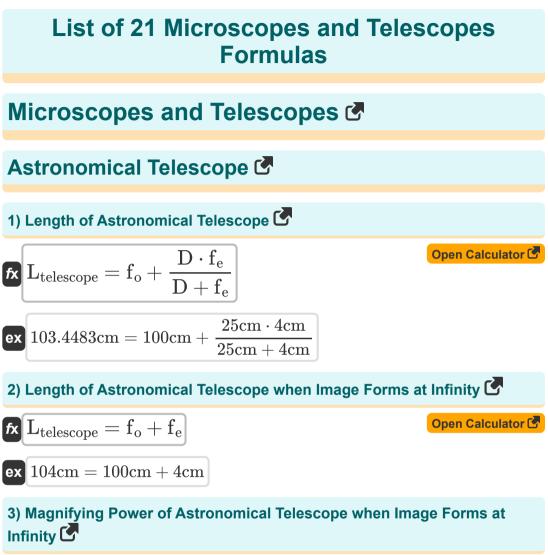
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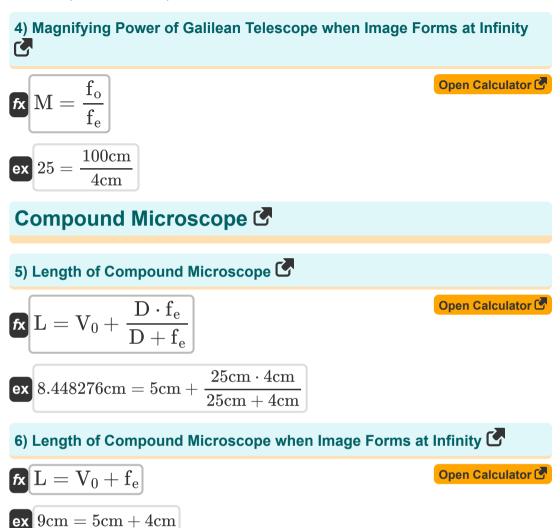


fx
$$M = \frac{f_o}{f_e}$$

ex $25 = \frac{100 \text{cm}}{4 \text{cm}}$











7) Magnification of Eyepiece when Image Formed at Least Distance of Distinct Vision

$$M_{e} = M \cdot \left(rac{U_{0} + f_{o}}{f_{o}}
ight)$$
 Open Calculator G

ex
$$12.375 = 11 \cdot \left(\frac{12.5 \text{cm} + 100 \text{cm}}{100 \text{cm}}\right)$$

8) Magnification of Objective Lens when Image Formed at Least Distance of Distinct Vision

fx
$$M_o = \frac{M}{1 + \frac{D}{f_e}}$$
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ex $1.517241 = \frac{11}{1 + \frac{25cm}{4cm}}$

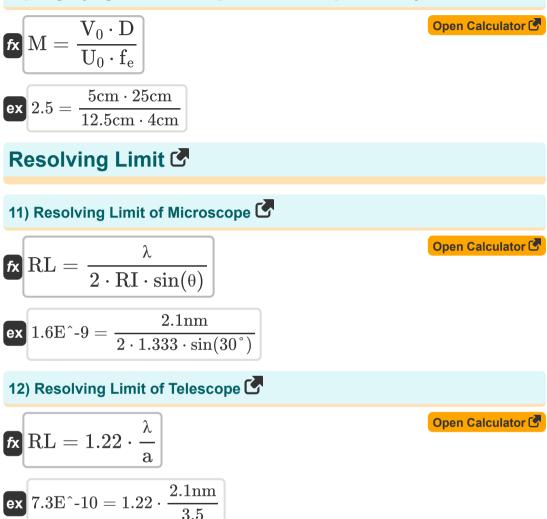
9) Magnifying Power of Compound Microscope 🕑

$$\label{eq:M} \begin{split} & \textbf{M} = \left(1 + \frac{D}{f_e}\right) \cdot \frac{V_0}{U_0} \\ \\ & \textbf{ex} \ 2.9 = \left(1 + \frac{25 \text{cm}}{4\text{cm}}\right) \cdot \frac{5\text{cm}}{12.5\text{cm}} \end{split}$$





10) Magnifying Power of Compound Microscope at Infinity





()

13) Resolving Power of Microscope
$$\checkmark$$

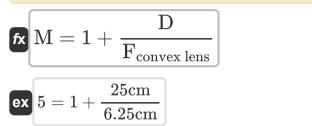
(x) $RP = \frac{2 \cdot RI \cdot sin(\theta)}{\lambda}$
(ex) $6.3E^{*}8 = \frac{2 \cdot 1.333 \cdot sin(30^{\circ})}{2.1nm}$
14) Resolving Power of Telescope \checkmark
(x) $RP = \frac{a}{1.22 \cdot \lambda}$
(x) $RP = \frac{3.5}{1.22 \cdot 2.1nm}$
(b) Focal Length of Simple Microscope when Image Forms at Least Distance of Distinct Vision \checkmark

$$f_{X} F_{convex lens} = \frac{D}{M-1}$$
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$$e_{X} 2.5cm = \frac{25cm}{11-1}$$

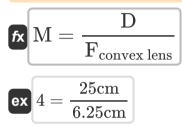




16) Magnifying Power of Simple Microscope 🕑



17) Magnifying Power of Simple Microscope when Image Formed at Infinity



Terrestrial Telescope 🕑

18) Length of Terrestrial Telescope

fx
$$\mathrm{L}_{\mathrm{telescope}} = \mathrm{f}_{\mathrm{o}} + 4 \cdot \mathrm{f} + rac{\mathrm{D} \cdot \mathrm{f}_{\mathrm{e}}}{\mathrm{D} + \mathrm{f}_{\mathrm{e}}}$$

$$113.4483 \text{cm} = 100 \text{cm} + 4 \cdot 2.5 \text{cm} + \frac{25 \text{cm} \cdot 4 \text{cm}}{25 \text{cm} + 4 \text{cm}}$$

19) Length of Terrestrial Telescope when Image Forms at Infinity

$$\mathrm{L}_{\mathrm{telescope}} = \mathrm{f}_{\mathrm{o}} + \mathrm{f}_{\mathrm{e}} + 4 \cdot \mathrm{f}$$

$$114\mathrm{cm} = 100\mathrm{cm} + 4\mathrm{cm} + 4\cdot 2.5\mathrm{cm}$$

Open Calculator

fx

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20) Magnifying Power of Terrestrial Telescope when Image Forms at Infinity

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ex
$$25 = \frac{100 \text{cm}}{4 \text{cm}}$$

 $\mathrm{M}=rac{\mathrm{f_o}}{\mathrm{f_e}}$

21) Magnifying Power of Terrestrial Telescope when Image Forms at Least Distance of Distinct Vision

fx
$$M = \left(1 + \frac{f_e}{D}\right) \cdot \frac{f_o}{f_e}$$

ex $29 = \left(1 + \frac{4cm}{25cm}\right) \cdot \frac{100cm}{4cm}$

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Variables Used

- **a** Aperture of Objective
- **D** Least Distance of Distinct Vision (Centimeter)
- **f** Focal Length of Erecting lens (Centimeter)
- Fconvex lens Focal Length of Convex Lens (Centimeter)
- **f**_e Focal Length of Eyepiece (Centimeter)
- **f**o Focal Length of Objective (Centimeter)
- L Length of Microscope (Centimeter)
- Ltelescope Length of Telescope (Centimeter)
- M Magnifying Power
- Me Magnification of Eyepiece
- Mo Magnification of Objective Lens
- RI Refractive Index
- RL Resolving Limit
- RP Resolving Power
- U₀ Object Distance (Centimeter)
- V₀ Distance between Two Lens (Centimeter)
- **θ** Theta (Degree)
- **λ** Wavelength (Nanometer)





Constants, Functions, Measurements used

- Function: **sin**, sin(Angle) *Trigonometric sine function*
- Measurement: Length in Centimeter (cm) Length Unit Conversion
- Measurement: Angle in Degree (°) Angle Unit Conversion
- Measurement: Wavelength in Nanometer (nm) Wavelength Unit Conversion



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