



calculatoratoz.com



unitsconverters.com

Levelling Formulas

Calculators!

Examples!

Conversions!

Bookmark calculatoratoz.com, unitsconverters.com

Widest Coverage of Calculators and Growing - **30,000+ Calculators!**
Calculate With a Different Unit for Each Variable - **In built Unit Conversion!**
Widest Collection of Measurements and Units - **250+ Measurements!**

Feel free to SHARE this document with your friends!

[Please leave your feedback here...](#)



List of 23 Levelling Formulas

Levelling

1) Angle of Dip for Compass Surveying

$$\text{fx } \theta = \frac{D}{R} \cdot \left(\frac{180}{\pi} \right)$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$\text{ex } 18.29507^\circ = \frac{35.5\text{m}}{6370} \cdot \left(\frac{180}{\pi} \right)$$

2) Back Sight given Height of Instrument

$$\text{fx } \text{BS} = \text{HI} - \text{RL}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$\text{ex } 36\text{m} = 65\text{m} - 29\text{m}$$

3) Combined Error Due to Curvature and Refraction

$$\text{fx } c_r = 0.0673 \cdot D^2$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$\text{ex } 84.81482\text{m} = 0.0673 \cdot (35.5\text{m})^2$$

4) Correction on Refraction Error

$$\text{fx } c_r = 0.0112 \cdot D^2$$

[Open Calculator !\[\]\(83bbbd261710c59db0214aa27b2edc0d_img.jpg\)](#)

$$\text{ex } 14.1148 = 0.0112 \cdot (35.5\text{m})^2$$



5) Difference in Elevation between Ground Points in short lines under Trigonometric levelling

$$\text{fx } \Delta h = D_p \cdot \sin(M) + h_i - h_t$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$\text{ex } 50.6452\text{m} = 80\text{m} \cdot \sin(37^\circ) + 22\text{m} - 19.5\text{m}$$

6) Difference in Elevation between Two Points using Barometric Levelling

fx

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$D_p = 18336.6 \cdot (\log 10(h_i) - \log 10(h_t)) \cdot \left(1 + \frac{T_1 + T_2}{500}\right)$$

ex

$$2058.222\text{m} = 18336.6 \cdot (\log 10(22\text{m}) - \log 10(19.5\text{m})) \cdot \left(1 + \frac{8^\circ\text{C} + 17^\circ\text{C}}{500}\right)$$

7) Distance between Two points under Curvature and Refraction

$$\text{fx } D = \left(2 \cdot R \cdot c + (c^2)\right)^{\frac{1}{2}}$$

[Open Calculator !\[\]\(7d1d6890825e83a6a4a51febe2dcc7f3_img.jpg\)](#)

$$\text{ex } 35.49642\text{m} = \left(2 \cdot 6370 \cdot 0.0989 + ((0.0989)^2)\right)^{\frac{1}{2}}$$

8) Distance for small errors under Curvature and Refraction

$$\text{fx } D = \sqrt{2 \cdot R \cdot c}$$

[Open Calculator !\[\]\(28f72b996fc97883dfd9d4e8b1b16b4e_img.jpg\)](#)

$$\text{ex } 35.49628\text{m} = \sqrt{2 \cdot 6370 \cdot 0.0989}$$



9) Distance to Visible Horizon

$$\text{fx } D = \sqrt{\frac{h}{0.0673}}$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

$$\text{ex } 35.53873\text{m} = \sqrt{\frac{85\text{m}}{0.0673}}$$

10) Error Due to Curvature Effect

$$\text{fx } c = \frac{D^2}{2 \cdot R}$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)

$$\text{ex } 0.098921 = \frac{(35.5\text{m})^2}{2 \cdot 6370}$$

11) Height of Instrument

$$\text{fx } \text{HI} = \text{RL} + \text{BS}$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$\text{ex } 49\text{m} = 29\text{m} + 20\text{m}$$

12) Height of Observer

$$\text{fx } h = 0.0673 \cdot D^2$$

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b_img.jpg\)](#)

$$\text{ex } 84.81482\text{m} = 0.0673 \cdot (35.5\text{m})^2$$

13) Permissible Closing Error for Accurate Levelling

$$\text{fx } e = 12 \cdot \sqrt{D}$$

[Open Calculator !\[\]\(40770d9ed6ed4f1222ebf89a1396e8b2_img.jpg\)](#)

$$\text{ex } 71.49825\text{m} = 12 \cdot \sqrt{35.5\text{m}}$$



14) Permissible Closing Error for Ordinary Levelling

$$fx \quad e = 24 \cdot \sqrt{D}$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

$$ex \quad 142.9965m = 24 \cdot \sqrt{35.5m}$$

15) Permissible Closing Error for Precise Levelling

$$fx \quad e = 4 \cdot \sqrt{D}$$

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

$$ex \quad 23.83275m = 4 \cdot \sqrt{35.5m}$$

16) Permissible Closing Error for Rough Levelling

$$fx \quad e = 100 \cdot \sqrt{D}$$

[Open Calculator !\[\]\(bd3b31712ad9bab5a241210fa6925cdd_img.jpg\)](#)

$$ex \quad 595.8188m = 100 \cdot \sqrt{35.5m}$$

17) Reduced Level given Height of Instrument

$$fx \quad RL = HI - BS$$

[Open Calculator !\[\]\(7bc43b319a082987e20f7bf78f4bab80_img.jpg\)](#)

$$ex \quad 45m = 65m - 20m$$

Sensitiveness of Level Tube

18) Angle between Line of Sights given Radius of Curvature

$$fx \quad \alpha = n \cdot \frac{1}{R_C}$$

[Open Calculator !\[\]\(e119fc79c8f448683d20ba4c873025a2_img.jpg\)](#)

$$ex \quad 0.084507rad = 9 \cdot \frac{2mm}{213mm}$$



19) Angle between Line of Sights in Radians

$$fx \quad \alpha = \frac{s_i}{D}$$

[Open Calculator !\[\]\(d3fb9f94af8b26d1c844efa9a98805b0_img.jpg\)](#)

$$ex \quad 0.084507rad = \frac{3m}{35.5m}$$

20) Distance from Instrument to Staff given Angle between LOS

$$fx \quad D = \frac{s_i}{\alpha}$$

[Open Calculator !\[\]\(e1d6102fe77919492c04879c8450f1f5_img.jpg\)](#)

$$ex \quad 37.5m = \frac{3m}{0.08rad}$$

21) Number of Division where Bubble Moves given Staff Intercept

$$fx \quad n = s_i \cdot \frac{R_C}{l \cdot D}$$

[Open Calculator !\[\]\(ab4e2b3fc7e7887b7a72f548aa6f5e60_img.jpg\)](#)

$$ex \quad 9 = 3m \cdot \frac{213mm}{2mm \cdot 35.5m}$$

22) Radius of Curvature of Tube

$$fx \quad R_C = n \cdot l \cdot \frac{D}{s_i}$$

[Open Calculator !\[\]\(5abce1a84a655b073239ab33e1199487_img.jpg\)](#)

$$ex \quad 213mm = 9 \cdot 2mm \cdot \frac{35.5m}{3m}$$



23) Staff Intercept given Angle between LOS

fx $S_i = \alpha \cdot D$

Open Calculator 

ex $2.84\text{m} = 0.08\text{rad} \cdot 35.5\text{m}$



Variables Used

- **BS** Back Sight (*Meter*)
- **c** Error due to Curvature
- **c_r** Refraction Correction
- **c_r** Combined Error (*Meter*)
- **D** Distance between Two Points (*Meter*)
- **D_p** Distance between Points (*Meter*)
- **e** Closing Error (*Meter*)
- **h** Height of Observer (*Meter*)
- **h_i** Height of point A (*Meter*)
- **h_t** Height of point B (*Meter*)
- **HI** Height of Instrument (*Meter*)
- **l** One Division Length (*Millimeter*)
- **M** Measured Angle (*Degree*)
- **n** Number of Division
- **R** Earth Radius in km
- **R_C** Radius of Curvature (*Millimeter*)
- **RL** Reduced Level (*Meter*)
- **s_i** Staff Intercept (*Meter*)
- **T₁** Temperature at Lower Ground Level (*Celsius*)
- **T₂** Temperature at Higher level (*Celsius*)
- **α** Angle between LOS (*Radian*)
- **Δh** Elevation Difference (*Meter*)
- **θ** Dip Angle (*Degree*)



Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288
Archimedes' constant
- **Function:** **log10**, log10(Number)
Common logarithm function (base 10)
- **Function:** **sin**, sin(Angle)
Trigonometric sine function
- **Function:** **sqrt**, sqrt(Number)
Square root function
- **Measurement:** **Length** in Meter (m), Millimeter (mm)
Length Unit Conversion 
- **Measurement:** **Temperature** in Celsius (°C)
Temperature Unit Conversion 
- **Measurement:** **Angle** in Degree (°), Radian (rad)
Angle Unit Conversion 



Check other formula lists

- **Levelling Formulas** 

Feel free to SHARE this document with your friends!

PDF Available in

[English](#) [Spanish](#) [French](#) [German](#) [Russian](#) [Italian](#) [Portuguese](#) [Polish](#) [Dutch](#)

8/31/2023 | 10:22:55 PM UTC

[Please leave your feedback here...](#)

