

Important Measurement of Distance with Tapes Formulas PDF



Formulas
Examples
with Units

List of 24 Important Measurement of Distance with Tapes Formulas

1) Correction for Temperature and Measurements on Slope Formulas ↗

1.1) Correction to be Subtracted from Slope Distance Formula ↗

Formula

$$C_h = (s \cdot (1 - \cos(\theta)))$$

Example with Units

$$1.03\text{ m} = (10.993\text{ m} \cdot (1 - \cos(25^\circ)))$$

Evaluate Formula ↗

1.2) Correction to be Subtracted from Slope Distance given difference in Elevation Formula ↗

Formula

$$C = \frac{(\Delta H)^2}{2 \cdot s}$$

Example with Units

$$10.2338\text{ m} = \frac{(15\text{ m})^2}{2 \cdot 10.993\text{ m}}$$

Evaluate Formula ↗

1.3) Measured Length given Correction to be Subtracted from Slope Distance Formula ↗

Formula

$$s = \left(\frac{C_h}{1 - \cos(\theta)} \right)$$

Example with Units

$$10.9934\text{ m} = \left(\frac{1.03\text{ m}}{1 - \cos(25^\circ)} \right)$$

Evaluate Formula ↗

1.4) Measured Length given Temperature Correction Formula ↗

Formula

$$s = \left(\frac{C_t}{0.0000065 \cdot (T_f - t)} \right)$$

Example with Units

$$10\text{ m} = \left(\frac{0.00078\text{ m}}{0.0000065 \cdot (22^\circ\text{C} - 10^\circ\text{C})} \right)$$

Evaluate Formula ↗

1.5) Temperature Correction to Measured Length Formula ↗

Formula

$$C_t = (0.000065 \cdot (T_f - t))$$

Example with Units

$$0.0008\text{ m} = (0.000065 \cdot (22^\circ\text{C} - 10^\circ\text{C}))$$

Evaluate Formula ↗



2) Correction for Tension and Sag to Measured Length Formulas

2.1) Sag Correction of Unsupported Tape Formula

Formula

$$C_s = \frac{(W^2) \cdot (U_l^3)}{24 \cdot (P_i^2)}$$

Example with Units

$$4.2715\text{ m} = \frac{(3\text{ kg/m}^2) \cdot (9\text{ m}^3)}{24 \cdot (8\text{ N}^2)}$$

Evaluate Formula 

2.2) Tape Cross-Sectional Area for Tension Correction to Measured Length Formula

Formula

$$A = ((P_f - P_i) \cdot s) \cdot \frac{100000}{C_p \cdot E_s}$$

Example with Units

$$4.1661\text{ m}^2 = ((11.1\text{ N} - 8\text{ N}) \cdot 10.993\text{ m}) \cdot \frac{100000}{4.09\text{ m} \cdot 200000\text{ MPa}}$$

Evaluate Formula 

2.3) Tape Elasticity Modulus given Tension Correction to Measured Length Formula

Formula

$$E_s = ((P_f - P_i) \cdot s) \cdot \frac{100000}{C_p \cdot A}$$

Example with Units

$$200290.93\text{ MPa} = ((11.1\text{ N} - 8\text{ N}) \cdot 10.993\text{ m}) \cdot \frac{100000}{4.09\text{ m} \cdot 4.16\text{ m}^2}$$

Evaluate Formula 

2.4) Tape Weight given Sag Correction of Unsupported Tape Formula

Formula

$$W = \left(\frac{C_s \cdot 24 \cdot (P_i^2)}{U_l^3} \right)^{\frac{1}{2}}$$

Example with Units

$$2.9998\text{ kg/m} = \left(\frac{4.271\text{ m} \cdot 24 \cdot (8\text{ N}^2)}{9\text{ m}^3} \right)^{\frac{1}{2}}$$

Evaluate Formula 

2.5) Tension Correction to Measured Length Formula

Formula

$$C_p = \left(((P_f - P_i) \cdot s) \cdot \frac{100000}{A \cdot E_s} \right)$$

Example with Units

$$4.0959\text{ m} = \left(((11.1\text{ N} - 8\text{ N}) \cdot 10.993\text{ m}) \cdot \frac{100000}{4.16\text{ m}^2 \cdot 200000\text{ MPa}} \right)$$

Evaluate Formula 



3) Orthometric Correction Formulas

3.1) Departure given Distance in Feet Formula

Formula

$$C_f = 0.0239 \cdot (F)^2$$

Example with Units

$$80.314_{ft} = 0.0239 \cdot (105_{ft})^2$$

Evaluate Formula 

3.2) Departure given Distance in Kilometers Formula

Formula

$$C_m = 0.0785 \cdot (K)^2$$

Example with Units

$$706.5_m = 0.0785 \cdot (3.0_{km})^2$$

Evaluate Formula 

3.3) Displacement given Distance in Feet Formula

Formula

$$R_f = 0.0033 \cdot (F)^2$$

Example with Units

$$11.0894_{ft} = 0.0033 \cdot (105_{ft})^2$$

Evaluate Formula 

3.4) Displacement given Distance in Kilometers Formula

Formula

$$R_f = 0.011 \cdot (D)^2$$

Example with Units

$$11.7254_{ft} = 0.011 \cdot (0.57_{km})^2$$

Evaluate Formula 

3.5) Displacement given Distance in Miles Formula

Formula

$$R_f = \frac{0.093 \cdot (M)^2}{5280}$$

Example with Units

$$12.2992_{ft} = \frac{0.093 \cdot (11.5_{mi})^2}{5280}$$

Evaluate Formula 

4) Slope Corrections Formulas

4.1) Horizontal Distance in Slope Measurements Formula

Formula

$$R = L \cdot \cos(x)$$

Example with Units

$$1.8794_m = 2_m \cdot \cos(20^\circ)$$

Evaluate Formula 

4.2) Horizontal offset given Slope Correction for Slopes of 10 Percent or Less Formula

Formula

$$\Delta H = (2 \cdot U_l \cdot Cs)^{\frac{1}{2}}$$

Example with Units

$$15.8745_m = (2 \cdot 9_m \cdot 14_m)^{\frac{1}{2}}$$

Evaluate Formula 

4.3) Slope Correction for Slopes Greater than 10 Percent Formula

Formula

$$Cs = \left(\frac{h^2}{2 \cdot U_l} \right) + \left(\frac{h^4}{8 \cdot U_l^3} \right)$$

Example with Units

$$14.2862_m = \left(\frac{13_m^2}{2 \cdot 9_m} \right) + \left(\frac{13_m^4}{8 \cdot 9_m^3} \right)$$

Evaluate Formula 



4.4) Slope Correction for Slopes of 10 Percent or Less Formula

Formula

$$C_s = \frac{\Delta H^2}{2 \cdot U_1}$$

Example with Units

$$12.5\text{ m} = \frac{15\text{ m}^2}{2 \cdot 9\text{ m}}$$

Evaluate Formula 

5) Temperature Corrections Formulas

5.1) Pull-on Tape given Sag Correction between Points of Support Formula

Formula

$$P = \sqrt{\frac{-W^2 \cdot U_1^3}{24 \cdot C_s}}$$

Example with Units

$$8.0005\text{ N} = \sqrt{\frac{-3\text{ kg/m}^2 \cdot 9\text{ m}^3}{24 \cdot 4.271\text{ m}}}$$

Evaluate Formula 

5.2) Sag Correction between Points of Support Formula

Formula

$$C_s = - \left(W^2 \right) \cdot \frac{U_1^3}{24 \cdot P^2}$$

Example with Units

$$-4.2715\text{ m} = - \left(3\text{ kg/m}^2 \right) \cdot \frac{9\text{ m}^3}{24 \cdot 8.00\text{ N}^2}$$

Evaluate Formula 

5.3) Tape Weight per Foot for Sag Correction between Points of Support Formula

Formula

$$W = \sqrt{\frac{C_s \cdot 24 \cdot P^2}{U_1^3}}$$

Example with Units

$$2.9998\text{ kg/m} = \sqrt{\frac{4.271\text{ m} \cdot 24 \cdot 8.00\text{ N}^2}{9\text{ m}^3}}$$

Evaluate Formula 

5.4) Temperature Corrections for Incorrect Tape Length Formula

Formula

$$C_{\text{temp}} = \frac{(L_a - A_o) \cdot U_1}{A_o}$$

Example with Units

$$18.5\text{ m} = \frac{(5.5\text{ m} - 1.8\text{ m}) \cdot 9\text{ m}}{1.8\text{ m}}$$

Evaluate Formula 

5.5) Unsupported Tape Length given Sag Correction between Points of Support Formula

Formula

$$U_1 = \left(\frac{24 \cdot C_s \cdot P^2}{W^2} \right)^{\frac{1}{3}}$$

Example with Units

$$8.9997\text{ m} = \left(\frac{24 \cdot 4.271\text{ m} \cdot 8.00\text{ N}^2}{3\text{ kg/m}^2} \right)^{\frac{1}{3}}$$

Evaluate Formula 



Variables used in list of Measurement of Distance with Tapes Formulas above

- **A** Area of Tape (Square Meter)
- **A_o** Nominal Tape Length (Meter)
- **C** Correction to be Subtracted (Meter)
- **C_f** Departure in ft (Foot)
- **C_h** Correction to be Subtracted from Slope Distance (Meter)
- **C_m** Departure in Meter (Meter)
- **C_p** Tension Correction (Meter)
- **C_s** Sag Correction (Meter)
- **C_t** Length Correction due to Temperature (Meter)
- **C_{temp}** Temperature Corrections for Incorrect Tape Length (Meter)
- **C_s** Slope Correction (Meter)
- **D** Distance (Kilometer)
- **E_s** Modulus of Elasticity of Steel (Megapascal)
- **F** Distance in ft (Foot)
- **h** Elevation Difference (Meter)
- **K** Distance in Kilometers (Kilometer)
- **L** Slope Distance (Meter)
- **L_a** Actual Tape Length (Meter)
- **M** Distance in Miles (Mile)
- **P** Pull on Tape (Newton)
- **P_f** Final Tension (Newton)
- **P_i** Initial Tension (Newton)
- **R** Horizontal Distance (Meter)
- **R_f** Displacement in ft (Foot)
- **s** Measured Length (Meter)
- **t** Initial Temperature (Celsius)
- **T_f** Final Temperature (Celsius)
- **U_i** Unsupported Length (Meter)
- **W** Weight of Tape per Unit Length (Kilogram per Meter)
- **x** Vertical Angle (Degree)

Constants, Functions, Measurements used in list of Measurement of Distance with Tapes Formulas above

- **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:** **sqrt**, sqrt(Number)
A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- **Measurement:** **Length** in Meter (m), Foot (ft), Kilometer (km), Mile (mi)
Length Unit Conversion 
- **Measurement:** **Temperature** in Celsius (°C)
Temperature Unit Conversion 
- **Measurement:** **Area** in Square Meter (m²)
Area Unit Conversion 
- **Measurement:** **Pressure** in Megapascal (MPa)
Pressure Unit Conversion 
- **Measurement:** **Force** in Newton (N)
Force Unit Conversion 
- **Measurement:** **Angle** in Degree (°)
Angle Unit Conversion 
- **Measurement:** **Linear Mass Density** in Kilogram per Meter (kg/m)
Linear Mass Density Unit Conversion 



- ΔH Difference in Elevation (Meter)
- θ Slope Angle (Degree)



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