Important Photogrammetry Stadia and Compass Surveying Formulas PDF

Formulas
Examples
with Units

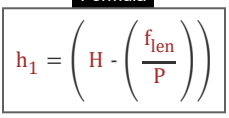
List of 17
Important Photogrammetry Stadia and Compass Surveying Formulas

1) Photogrammetry Formulas

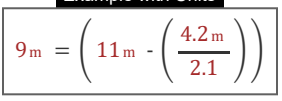
1.1) Elevation of Point, Line or Area Formula

Evaluate Formula

Formula



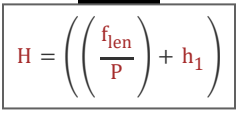
Example with Units



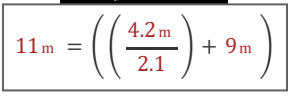
1.2) Flying Height of Airplane above Datum Formula

Evaluate Formula

Formula



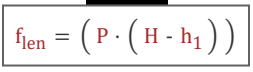
Example with Units



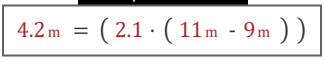
1.3) Focal Length of Lens given Photo Scale Formula

Evaluate Formula

Formula



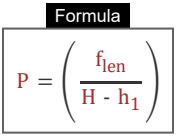
Example with Units



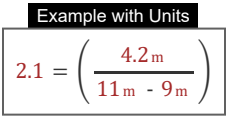
1.4) Photo Scale given Focal Length Formula

Evaluate Formula

Formula



Example with Units

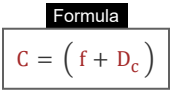


2) Stadia Surveying Formulas

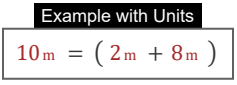
2.1) Additive Constant or Stadia Constant Formula

Evaluate Formula

Formula



Example with Units



2.2) Distance Equation given Index Error Formula

Evaluate Formula

Formula

$$D = \left(K_M \cdot \frac{s_i}{m - e} \right) + C_{add}$$

Example with Units

$$35.5\,\text{m} = \left(12 \cdot \frac{3\,\text{m}}{3.1 - 1.5} \right) + 13$$

2.3) Horizontal Distance between Center of Transit and Rod Formula

Evaluate Formula

Formula

$$H_{Horizontal} = \left(K \cdot R_i \cdot \left(\cos\left(a \right) \right)^2 \right) + \left(fc \cdot \cos\left(a \right) \right)$$

Example with Units

$$26.904\,\text{m} = \left(11.1 \cdot 3.2\,\text{m} \cdot \left(\cos\left(30° \right) \right)^2 \right) + \left(0.3048\,\text{m} \cdot \cos\left(30° \right) \right)$$

2.4) Horizontal Distance using Gradienter Formula

Evaluate Formula

Formula

$$D = s_i \cdot \frac{100 \cdot \cos\left(x \right)^2 \cdot 0.5 \cdot \sin\left(2 \cdot x \right)}{m \cdot c}$$

Example with Units

$$10.9857\,\text{m} = 3\,\text{m} \cdot \frac{100 \cdot \cos\left(20° \right)^2 \cdot 0.5 \cdot \sin\left(2 \cdot 20° \right)}{3.1 \cdot 2.5\,\text{m}}$$

2.5) Intercept on Rod between Two Sighting Wires Formula

Evaluate Formula

Formula

$$R = \frac{D_s}{\left(\frac{f}{R_i} \right) + C}$$

Example with Units

$$6.0235\,\text{m} = \frac{64\,\text{m}}{\left(\frac{2\,\text{m}}{3.2\,\text{m}} \right) + 10\,\text{m}}$$

2.6) Stadia Distance from Instrument Spindle to Rod Formula

Evaluate Formula

Formula

$$D_s = R \cdot \left(\left(\frac{f}{R_i} \right) + C \right)$$

Example with Units

$$63.75\,\text{m} = 6\,\text{m} \cdot \left(\left(\frac{2\,\text{m}}{3.2\,\text{m}} \right) + 10\,\text{m} \right)$$

2.7) Stadia Interval Formula

Evaluate Formula

Formula

$$S_i = m \cdot P_{screw}$$

Example with Units

$$15.5\,\text{m} = 3.1 \cdot 5\,\text{m}$$

2.8) Staff Intercept Formula

Evaluate Formula

Formula

$$s_i = D \cdot \left(\tan\left(\theta_1 \right) - \tan\left(\theta_2 \right) \right)$$

Example with Units

$$3.9827\,\text{m} = 35.5\,\text{m} \cdot \left(\tan\left(25° \right) - \tan\left(19.5° \right) \right)$$

2.9) Staff Intercept in Gradienter given Horizontal Distance Formula

Evaluate Formula

Formula

$$s_i = \frac{D}{\frac{100 \cdot \cos\left(x \right)^2 \cdot 0.5 \cdot \sin\left(2 \cdot x \right)}{m \cdot c}}$$

Example with Units

$$9.6944\,\text{m} = \frac{35.5\,\text{m}}{\frac{100 \cdot \cos\left(20° \right)^2 \cdot 0.5 \cdot \sin\left(2 \cdot 20° \right)}{3.1 \cdot 2.5\,\text{m}}}$$

2.10) Staff Intercept in Gradienter given Vertical Distance Formula

Evaluate Formula

Formula

$$s_i = \frac{V}{\frac{100 \cdot \sin\left(2 \cdot x \right) \cdot 0.5 \cdot \sin\left(x \right)^2}{m \cdot c}}$$

Example with Units

$$8.2456\,\text{m} = \frac{4\,\text{m}}{\frac{100 \cdot \sin\left(2 \cdot 20° \right) \cdot 0.5 \cdot \sin\left(20° \right)^2}{3.1 \cdot 2.5\,\text{m}}}$$

2.11) Vertical Distance between Center of Transit and Rod Intersected by Middle Horizontal Crosshair Formula

Evaluate Formula

Formula

$$V = \frac{1}{2 \cdot \left(\left(K \cdot R_i \cdot \sin\left(2 \cdot a \right) \right) + \left(fc \cdot \sin\left(a \right) \right) \right)}$$

Example with Units

$$0.0162\,\text{m} = \frac{1}{2 \cdot \left(\left(11.1 \cdot 3.2\,\text{m} \cdot \sin\left(2 \cdot 30° \right) \right) + \left(0.3048\,\text{m} \cdot \sin\left(30° \right) \right) \right)}$$

2.12) Vertical Distance between Instrument Axis and Lower Vane Formula

Evaluate Formula

Formula

$$V = D \cdot \tan\left(\theta_2 \right)$$

Example with Units

$$12.5712\,\text{m} = 35.5\,\text{m} \cdot \tan\left(19.5° \right)$$

2.13) Vertical Distance using Gradienter Formula

Evaluate Formula

Formula

$$V = s_i \cdot \frac{100 \cdot \sin\left(2 \cdot x \right) \cdot 0.5 \cdot \sin\left(x \right)^2}{m \cdot c}$$

Example with Units

$$1.4553\,\text{m} = 3\,\text{m} \cdot \frac{100 \cdot \sin\left(2 \cdot 20° \right) \cdot 0.5 \cdot \sin\left(20° \right)^2}{3.1 \cdot 2.5\,\text{m}}$$

Variables used in list of Photogrammetry Stadia and Compass Surveying Formulas above

- **a** Vertical Inclination of Line of Sight *(Degree)*
- **c** Distance in One Turn *(Meter)*
- **C** Stadia Constant *(Meter)*
- C_{add} Additive Constant
- **D** Distance between Two Points *(Meter)*
- D_c Distance from Center *(Meter)*
- D_s Stadia Distance *(Meter)*
- **e** Index Error
- **f** Focal Length of Telescope *(Meter)*
- f_{len} Focal Length of Lens *(Meter)*
- **fc** Instrument Constant *(Meter)*
- **H** Flying Height of Airplane *(Meter)*
- h_1 Elevation of Point *(Meter)*
- $H_{Horizontal}$ Horizontal Distance *(Meter)*
- **K** Stadia Factor
- K_M Multiplying Constant
- **m** Revolution of Screw
- **P** Photo Scale
- P_{screw} Pitch Screw *(Meter)*
- **R** Intercept on Rod *(Meter)*
- R_i Rod Intercept *(Meter)*
- s_i Staff Intercept *(Meter)*
- S_i Stadia Interval *(Meter)*
- **V** Vertical Distance *(Meter)*
- **x** Vertical Angle *(Degree)*
- θ_1 Vertical Angle to Upper Vane *(Degree)*
- θ_2 Vertical Angle to Lower Vane *(Degree)*

Constants, Functions, Measurements used in list of Photogrammetry Stadia and Compass Surveying 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: **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.
- Functions: **tan**, tan(Angle)
  The tangent of an angle is a trigonometric ratio of the length of the side opposite an angle to the length of the side adjacent to an angle in a right triangle.
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion

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