



Surveying Curves Formulas

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List of 21 Surveying Curves Formulas

Surveying Curves 🗗

Offsets from Long Chord &

1) Mid Ordinate given Ox

fx

Open Calculator 🚰

$$m L_{mo} = -\sqrt{R_{Mid~Ordinate}^2 - x^2} + O_x + R_{Mid~Ordinate}$$

 $\mathbf{ex} \left[2.012659 \mathrm{m} = -\sqrt{\left(40 \mathrm{m}\right)^2 - \left(3 \mathrm{m}\right)^2} + 1.9 \mathrm{m} + 40 \mathrm{m} \right]$

2) Mid Ordinate when Offsets from Long Chord is Used for Setting Out

fx

Open Calculator 🗗

$$L_{mo} = R_{Mid~Ordinate} - \sqrt{R_{Mid~Ordinate}^2 - \left(\frac{C}{2}\right)^2}$$

$$extbf{ex} \left[17.03399 ext{m} = 40 ext{m} - \sqrt{(40 ext{m})^2 - \left(rac{65.5 ext{m}}{2}
ight)^2}
ight]$$



3) Offset at Distance x from Mid-Point

fx

Open Calculator

Open Calculator 2

$$m O_x = \sqrt{R_{Mid~Ordinate}^2 - x^2} - (R_{Mid~Ordinate} - L_{mo})$$

$$\mathbf{ex} = 1.887341 \mathrm{m} = \sqrt{\left(40 \mathrm{m}\right)^2 - \left(3 \mathrm{m}\right)^2 - \left(40 \mathrm{m} - 2 \mathrm{m}\right)^2}$$

Perpendicular Offsets from Tangents &

4) Approximate Equation for Offset at Distance x from Mid-Point 6

$$oldsymbol{eta} {
m O}_{
m x} = rac{{
m x}^2}{2 \cdot {
m R}}$$

$$= 1.956522 \text{m} = \frac{\left(3 \text{m}\right)^2}{2 \cdot 2.3 \text{m}}$$

5) Radius given Approximate Equation for Offset 🗗



$$extbf{R} = rac{ ext{x}^2}{ ext{O}_{ ext{x}} \cdot 2}$$

$$2.368421 \text{m} = \frac{(3\text{m})^2}{1.9\text{m} \cdot 2}$$

Open Calculator



Setting Out Curve using Offsets from Chords &

6) Deflection Angle of First Chord

$$\delta 1 = \left(rac{\mathrm{C_1}}{2\cdot\mathrm{R_{Mid\ Ordinate}}}
ight)$$

Open Calculator 🚰

$$oxed{ex} 0.0625 = \left(rac{5 ext{m}}{2 \cdot 40 ext{m}}
ight)$$

7) First Offset given First Chord Length

 $\mathrm{CO}_1 = rac{\mathrm{C}_1^2}{2} \cdot \mathrm{R}_{\mathrm{Mid\ Ordinate}}$

Open Calculator 🗗

$$\boxed{\mathbf{6x}} 500\mathrm{m} = \frac{(5\mathrm{m})^2}{2} \cdot 40\mathrm{m}$$

8) Length of First Chord for given Deflection Angle of First Chord

fx $C_1 = \delta 1 \cdot 2 \cdot R_{ ext{Mid Ordinate}}$

Open Calculator 🗗

$$\boxed{\text{ex}} 5\text{m} = 0.0625 \cdot 2 \cdot 40\text{m}$$

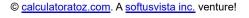
9) N-th Offset using Chords Produced C

 $oxed{\mathbf{K}} \mathbf{O}_{\mathrm{n}} = \left(rac{\mathrm{C}_{\mathrm{n}}}{2} \cdot \mathrm{R}_{\mathrm{Mid\ Ordinate}}
ight) \cdot \left(\mathrm{C}_{\mathrm{n-1}} + \mathrm{C}_{\mathrm{n}}
ight)}$

Open Calculator

$$extbf{ex} 1920 ext{m} = \left(rac{8 ext{m}}{2} \cdot 40 ext{m}
ight) \cdot (4 ext{m} + 8 ext{m})$$







Open Calculator

Open Calculator

Open Calculator

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10) Second Offset using Chord Lengths

 $\mathbf{K} \, \mathrm{O}_2 = \left(rac{\mathrm{C}_2}{2} \cdot \mathrm{R}_{\mathrm{Mid\ Ordinate}}
ight) \cdot (\mathrm{C}_1 + \mathrm{C}_2)$

Simple Circular Curve 🗗

11) Apex Distance

 $\mathbf{L}_{\mathrm{ad}} = \mathrm{R}_{\mathrm{Curve}} \cdot \left(\sec \left(rac{\Delta}{2}
ight) - 1
ight)$

 $\boxed{ 37.13781 \mathrm{m} = 200 \mathrm{m} \cdot \left(\sec \left(\frac{65°}{2} \right) - 1 \right) }$

- 12) Deflection Angle given Length of Curve
- $\Delta = \frac{L_{Curve}}{R_{Curve}}$

 $42.97183^{\circ} = \frac{150 \text{m}}{200 \text{m}}$

- 13) Length of Curve
- fx $ext{L}_{ ext{Curve}} = ext{R}_{ ext{Curve}} \cdot \Delta$
- $226.8928m = 200m \cdot 65^{\circ}$



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14) Length of Curve if 20m Chord Definition 6

 $\mathbb{E}\left[\mathrm{L}_{\mathrm{Curve}} = 20 \cdot rac{\Delta}{\mathrm{D}} \cdot \left(rac{180}{\pi}
ight)
ight]$

Open Calculator

 $\texttt{ex} \ 61.90476 \text{m} = 20 \cdot \frac{65^{\circ}}{21} \cdot \left(\frac{180}{\pi}\right)$

15) Length of Curve if 30m Chord Definition

 $\mathbf{L}_{\mathrm{Curve}} = 30 \cdot rac{\Delta}{\mathrm{D}} \cdot \left(rac{180}{\pi}
ight)$

Open Calculator 🖸

16) Mid Ordinate

 $\mathbf{L}_{\mathrm{mo}} = \mathrm{R}_{\mathrm{Curve}} \cdot \left(1 - \mathrm{cos}\!\left(rac{\Delta}{2}
ight)
ight)$

Open Calculator 🖸

 $\boxed{31.32171\mathrm{m} = 200\mathrm{m} \cdot \left(1 - \cos\!\left(\frac{65°}{2}\right)\right)}$





17) Radius given Apex Distance 🔽

 $ext{R}_{ ext{Curve}} = rac{ ext{L}_{ ext{ad}}}{\sec\left(rac{\Delta}{2}
ight) - 1}$

Open Calculator 🗗

 $\boxed{118.4776\mathrm{m} = \frac{22\mathrm{m}}{\sec\left(\frac{65^{\circ}}{2}\right) - 1}}$

18) Radius of Curve given Length

 $m R_{Curve} = rac{L_{Curve}}{\Delta}$

Open Calculator

= $132.221 \mathrm{m} = \frac{150 \mathrm{m}}{65 \degree}$

19) Radius of Curve given Long Chord

 $ext{fx} egin{aligned} ext{R}_{ ext{Curve}} &= rac{ ext{C}}{2 \cdot \sin \left(rac{\Delta}{2}
ight)} \end{aligned}$

Open Calculator

 $egin{aligned} \mathsf{ex} \ \mathsf{60.95296m} = rac{65.5\mathrm{m}}{2\cdot\sin\left(rac{65^{\circ}}{2}
ight)} \end{aligned}$

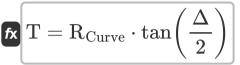


20) Radius of Curve given Tangent

 $ext{R}_{ ext{Curve}} = rac{ ext{T}}{ an(rac{\Delta}{2})}$

Open Calculator

21) Tangent Length



Open Calculator

$$\boxed{ 27.4141 \mathrm{m} = 200 \mathrm{m} \cdot \mathrm{tan} \bigg(\frac{65}{2} \bigg) }$$



Variables Used

- **C** Length of Long Chord (*Meter*)
- C₁ First Sub Chord (Meter)
- C₂ Second Sub Chord (Meter)
- C_n Last Sub Chord (Meter)
- C_{n-1} Sub Chord n-1 (Meter)
- D Angle for Arc
- Lad Apex Distance (Meter)
- L_{Curve} Length of Curve (Meter)
- L_{mo} Mid Ordinate (Meter)
- O₁ First Offset (Meter)
- O₂ Second Offset (Meter)
- On Offset n (Meter)
- O_x Offset at x (Meter)
- R Radius of Curve (Meter)
- R_{Curve} Curve Radius (Meter)
- R_{Mid} Ordinate Radius of Curve for Mid Ordinate (Meter)
- T Tangent Length (Meter)
- X Distance x (Meter)
- A Deflection Angle (Degree)
- δ1 Deflection Angle 1





Constants, Functions, Measurements used

- Constant: pi, 3.14159265358979323846264338327950288
 Archimedes' constant
- Function: cos, cos(Angle)

 Trigonometric cosine function
- Function: **sec**, sec(Angle)

 Trigonometric secant function
- Function: sin, sin(Angle)

 Trigonometric sine function
- Function: sqrt, sqrt(Number)
 Square root function
- Function: tan, tan(Angle)
 Trigonometric tangent function
- Measurement: Length in Meter (m)
 Length Unit Conversion
- Measurement: Angle in Degree (°)
 Angle Unit Conversion





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