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Circular Curves on Highways and Roads Formulas

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List of 27 Circular Curves on Highways and Roads Formulas

Circular Curves on Highways and Roads

1) Approximate Chord Offset for Chord of Length

$$\text{fx } b = \frac{L_c^2}{R_c}$$

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

$$\text{ex } 150.7692\text{m} = \frac{(140\text{m})^2}{130\text{m}}$$

2) Central angle for Portion of Curve Approximate for Chord definition

$$\text{fx } d = \frac{D \cdot L_c}{100}$$

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

$$\text{ex } 84^\circ = \frac{60^\circ \cdot 140\text{m}}{100}$$

3) Central Angle for Portion of Curve Exact for Arc definition

$$\text{fx } d = \frac{D \cdot L_c}{100}$$

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

$$\text{ex } 84^\circ = \frac{60^\circ \cdot 140\text{m}}{100}$$



4) Central Angle of Curve for given Length of Curve

$$\text{fx } I = \frac{L_c \cdot D}{100}$$

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

$$\text{ex } 84^\circ = \frac{140\text{m} \cdot 60^\circ}{100}$$

5) Central Angle of Curve for given Length of Long Chord

$$\text{fx } I = \left(\frac{C}{2 \cdot R_c \cdot \sin\left(\frac{1}{2}\right)} \right)$$

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

$$\text{ex } 46.42474^\circ = \left(\frac{101\text{m}}{2 \cdot 130\text{m} \cdot \sin\left(\frac{1}{2}\right)} \right)$$


6) Central Angle of Curve for given Tangent Distance

$$\text{fx } I = \left(\frac{T}{\sin\left(\frac{1}{2}\right) \cdot R_c} \right)$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$\text{ex } 45.57898^\circ = \left(\frac{49.58\text{m}}{\sin\left(\frac{1}{2}\right) \cdot 130\text{m}} \right)$$




7) Degree of Curve for given Length of Curve 

$$fx \quad D = \frac{100 \cdot I}{L_c}$$

Open Calculator 

$$ex \quad 28.57143^\circ = \frac{100 \cdot 40^\circ}{140m}$$

8) Degree of Curve for given Radius of Curve 

$$fx \quad D = \left(\frac{5729.578}{R_c} \right) \cdot \left(\frac{\pi}{180} \right)$$

Open Calculator 

$$ex \quad 44.07368^\circ = \left(\frac{5729.578}{130m} \right) \cdot \left(\frac{\pi}{180} \right)$$

9) Degree of Curve when Central Angle for Portion of Curve 

$$fx \quad D = \frac{100 \cdot d}{L_c}$$

Open Calculator 

$$ex \quad 64.28571^\circ = \frac{100 \cdot 90^\circ}{140m}$$

10) Exact Length of Curve 

$$fx \quad L_c = \frac{100 \cdot I}{D}$$

Open Calculator 

$$ex \quad 66.66667m = \frac{100 \cdot 40^\circ}{60^\circ}$$



11) Exact Tangent Distance

$$fx \quad T = R_c \cdot \tan\left(\frac{1}{2}\right) \cdot I$$

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

$$ex \quad 49.58084m = 130m \cdot \tan\left(\frac{1}{2}\right) \cdot 40^\circ$$

12) External Distance

$$fx \quad E = R_c \cdot \left(\left(\sec\left(\frac{1}{2}\right) \cdot I \cdot \left(\frac{180}{\pi}\right) \right) - 1 \right)$$

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

$$ex \quad 5795.368m = 130m \cdot \left(\left(\sec\left(\frac{1}{2}\right) \cdot 40^\circ \cdot \left(\frac{180}{\pi}\right) \right) - 1 \right)$$

13) Length of Curve given Central Angle for portion of Curve

$$fx \quad L_c = \frac{d \cdot 100}{D}$$

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

$$ex \quad 150m = \frac{90^\circ \cdot 100}{60^\circ}$$

14) Length of Curve or Chord by Central Angle given Central Angle for Portion of Curve

$$fx \quad L_c = \frac{100 \cdot d}{D}$$

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

$$ex \quad 150m = \frac{100 \cdot 90^\circ}{60^\circ}$$



15) Length of Curve or Chord by Central Angle given Tangent Offset for Chord of Length

$$fx \quad L_c = \sqrt{a \cdot 2 \cdot R_c}$$

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

$$ex \quad 139.6424m = \sqrt{75m \cdot 2 \cdot 130m}$$

16) Length of Curve or Chord determined by Central Angle given Chord Offset for Chord of Length

$$fx \quad L_c = \sqrt{b \cdot R_c}$$

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

$$ex \quad 139.9679m = \sqrt{150.7m \cdot 130m}$$

17) Length of Long Chord

$$fx \quad C = 2 \cdot R_c \cdot \sin\left(\left(\frac{1}{2}\right) \cdot (I)\right)$$

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

$$ex \quad 88.92524m = 2 \cdot 130m \cdot \sin\left(\left(\frac{1}{2}\right) \cdot (40^\circ)\right)$$


18) Radius of Curve

$$fx \quad R_c = \frac{5729.578}{D \cdot \left(\frac{180}{\pi}\right)}$$

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

$$ex \quad 95.49297m = \frac{5729.578}{60^\circ \cdot \left(\frac{180}{\pi}\right)}$$



19) Radius of Curve Exact for Chord 

$$fx \quad R_c = \frac{50}{\sin\left(\frac{1}{2}\right) \cdot (D)}$$

Open Calculator 


$$ex \quad 99.59103m = \frac{50}{\sin\left(\frac{1}{2}\right) \cdot (60^\circ)}$$

20) Radius of Curve given Chord offset for Chord of Length 

$$fx \quad R_c = \frac{L_c^2}{b}$$

Open Calculator 

$$ex \quad 130.0597m = \frac{(140m)^2}{150.7m}$$

21) Radius of Curve given Length of Long Chord 

$$fx \quad R_c = \frac{C}{2 \cdot \sin\left(\frac{1}{2}\right) \cdot (I)}$$

Open Calculator 

$$ex \quad 150.8804m = \frac{101m}{2 \cdot \sin\left(\frac{1}{2}\right) \cdot (40^\circ)}$$



22) Radius of Curve given Tangent offset for Chord of Length

$$\text{fx } R_c = \frac{L_c^2}{2 \cdot a}$$

[Open Calculator !\[\]\(6605b201d6f14d9b3bcb8ab5f274d107_img.jpg\)](#)

$$\text{ex } 130.6667\text{m} = \frac{(140\text{m})^2}{2 \cdot 75\text{m}}$$

23) Radius of Curve using Degree of Curve

$$\text{fx } R_c = \frac{50}{\sin\left(\frac{1}{2}\right) \cdot (D)}$$

[Open Calculator !\[\]\(e8fb589d58dad1692debababa5e928b6_img.jpg\)](#)

$$\text{ex } 99.59103\text{m} = \frac{50}{\sin\left(\frac{1}{2}\right) \cdot (60^\circ)}$$


24) Radius of Curve using External Distance

$$\text{fx } R_c = \frac{E}{\left(\sec\left(\frac{1}{2}\right) \cdot \left(I \cdot \left(\frac{180}{\pi}\right)\right)\right) - 1}$$

[Open Calculator !\[\]\(4688aadfd656ded00cd6bdfae55089a9_img.jpg\)](#)

$$\text{ex } 129.9917\text{m} = \frac{5795\text{m}}{\left(\sec\left(\frac{1}{2}\right) \cdot \left(40^\circ \cdot \left(\frac{180}{\pi}\right)\right)\right) - 1}$$




25) Radius of Curve using Midordinate 

$$fx \quad R_c = \frac{M}{1 - \left(\cos\left(\frac{1}{2}\right) \cdot (I)\right)}$$

Open Calculator 


$$ex \quad 130.3792m = \frac{50.5m}{1 - \left(\cos\left(\frac{1}{2}\right) \cdot (40^\circ)\right)}$$

26) Radius of Curve using Tangent Distance 

$$fx \quad R_c = \frac{T}{\sin\left(\frac{1}{2}\right) \cdot (I)}$$

Open Calculator 

$$ex \quad 148.1317m = \frac{49.58m}{\sin\left(\frac{1}{2}\right) \cdot (40^\circ)}$$

27) Tangent Offset for Chord of Length 

$$fx \quad a = \frac{L_c^2}{2 \cdot R_c}$$

Open Calculator 

$$ex \quad 75.38462m = \frac{(140m)^2}{2 \cdot 130m}$$





Variables Used

- **a** Tangent Offset (Meter)
- **b** Chord Offset (Meter)
- **C** Length of long Chord (Meter)
- **d** Central Angle for Portion of Curve (Degree)
- **D** Degree of Curve (Degree)
- **E** External Distance (Meter)
- **I** Central Angle of Curve (Degree)
- **L_C** Length of Curve (Meter)
- **M** Midordinate (Meter)
- **R_C** Radius of Circular Curve (Meter)
- **T** Tangent Distance (Meter)



Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288
Archimedes' constant
- **Function:** **cos**, $\cos(\text{Angle})$
Trigonometric cosine function
- **Function:** **sec**, $\sec(\text{Angle})$
Trigonometric secant function
- **Function:** **sin**, $\sin(\text{Angle})$
Trigonometric sine function
- **Function:** **sqrt**, $\text{sqrt}(\text{Number})$
Square root function
- **Function:** **tan**, $\tan(\text{Angle})$
Trigonometric tangent function
- **Measurement:** **Length** in Meter (m)
Length Unit Conversion 
- **Measurement:** **Angle** in Degree ($^{\circ}$)
Angle Unit Conversion 



Check other formula lists

- [Circular Curves on Highways and Roads Formulas](#) 

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