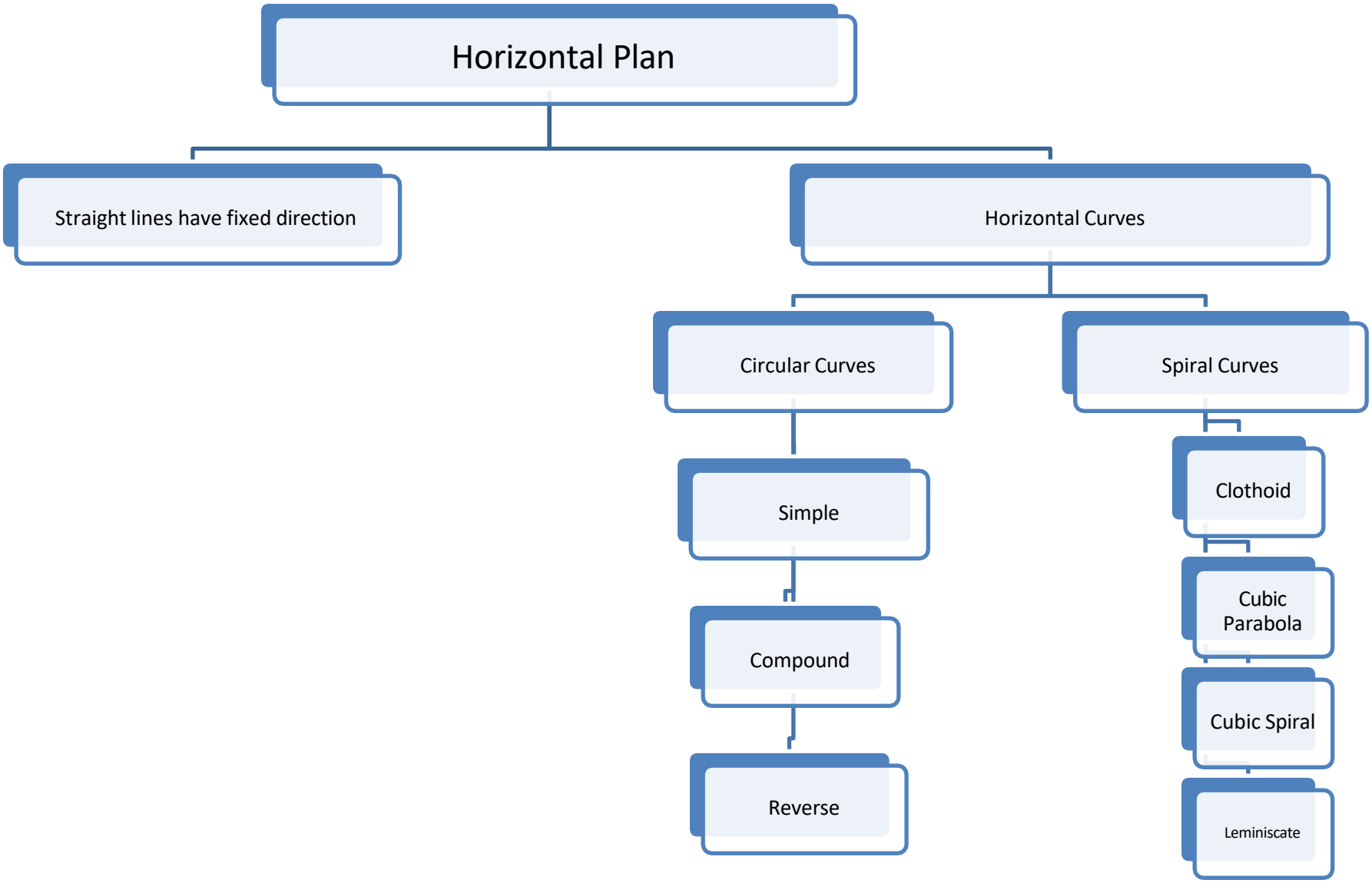
Engineering Surveying
2nd Stage

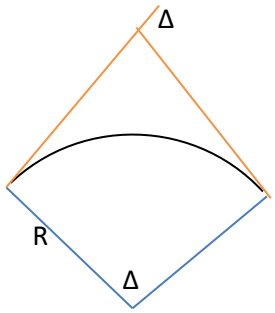
Horizontal Curve

Lec. Haneen Fadhil

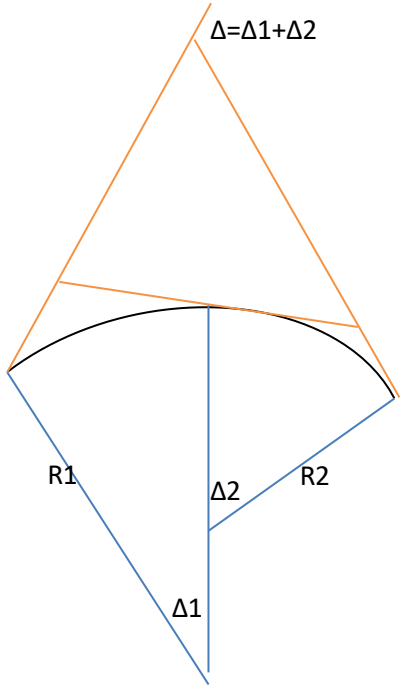
Horizontal Plan



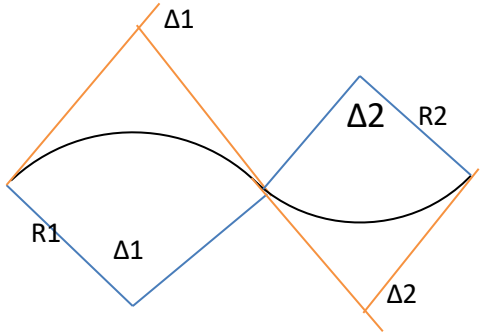
Circular Curves



Simple

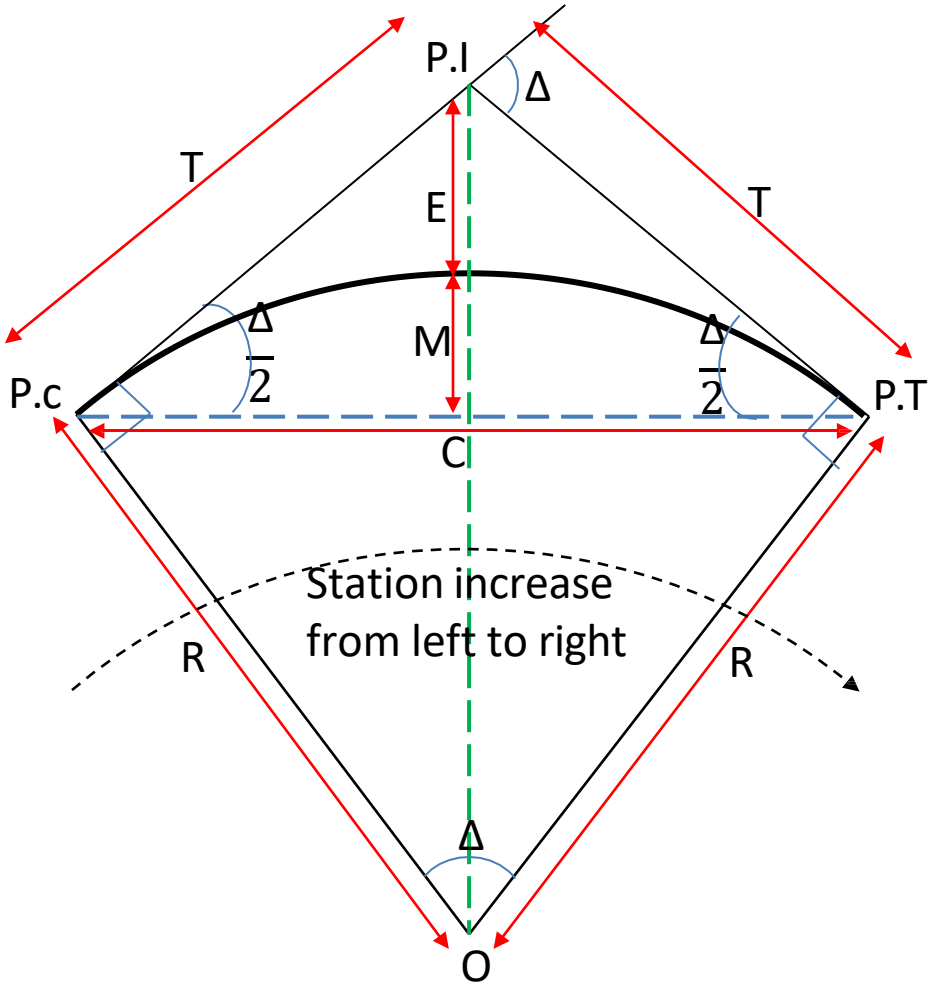


Compound



Reverse

Simple Circular Curve



Symbols & Terms of Simple Circular Curve

- Δ= Intersection angle , Deflection angle or Central angle
- R= Radius of curve
- T =Tangent length
- L= length of curve
- C= Chord length or L.C=long chord
- M=Middle distance
- E=External distance
- P.C=Point of curvature or B.C=Beginning of curve or T.C=Tangent to curve point
- P.I=Point of intersection or V=Vertex or I.P=Intersection point
- P.T=Point of tangency or E.C=End of curve or C.T=Curve to tangent point
- D=Degree of curve or Degree of curvature

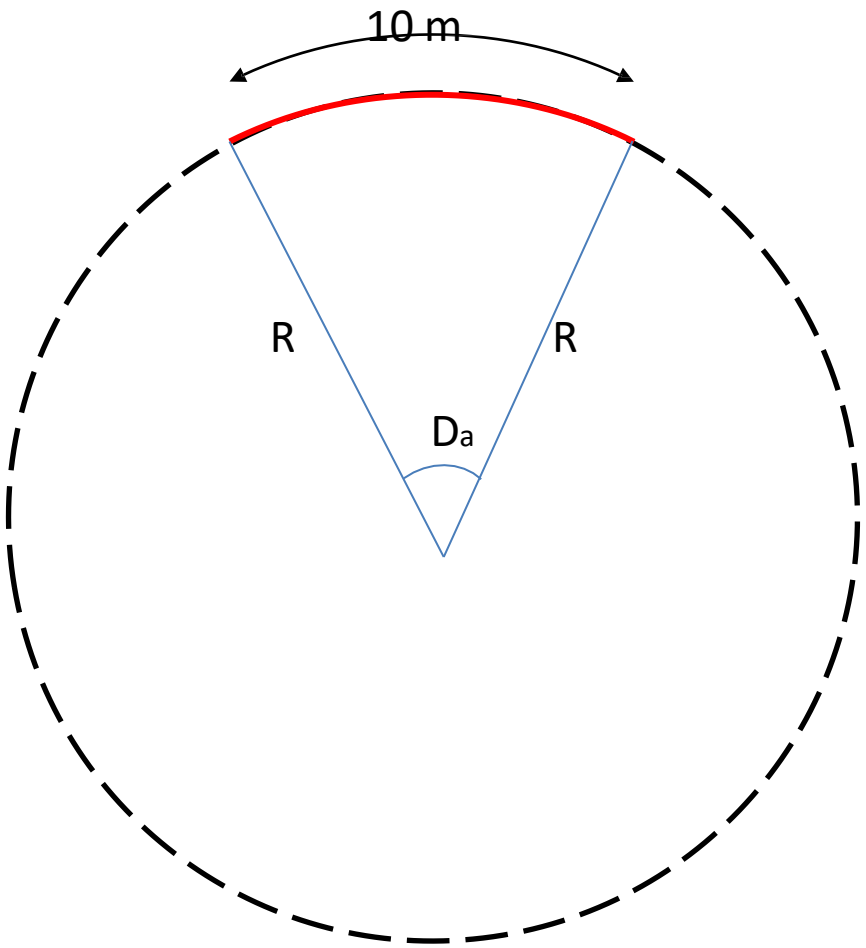
Degree of curvature

D_a^o : 10 m

360^o : $2\pi R$

$$D_a{}^o = \frac{3600}{2\pi R}$$

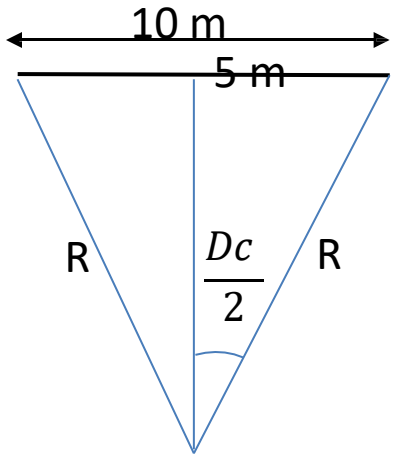
$$\mathbf{Da^o = \frac{573}{R}}$$



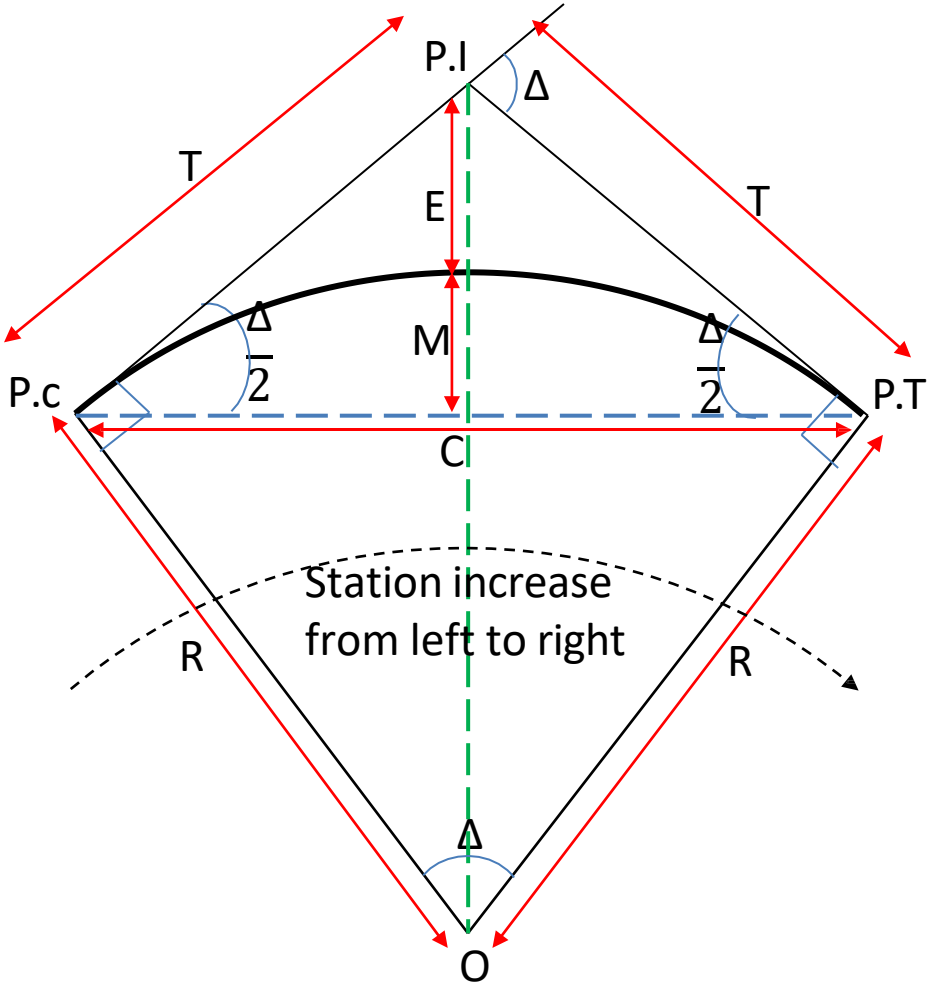
Degree of curvature

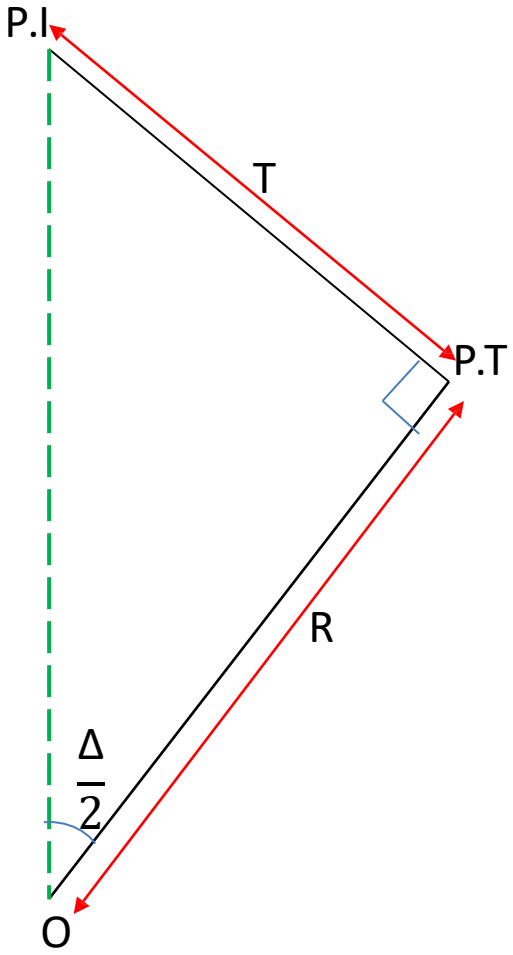
$\text{Sin } D_c^o = \frac{5}{R}$

$$\mathbf{Dc^o = \sin^{-1}\left(\frac{5}{R}\right)}$$



Tangent length

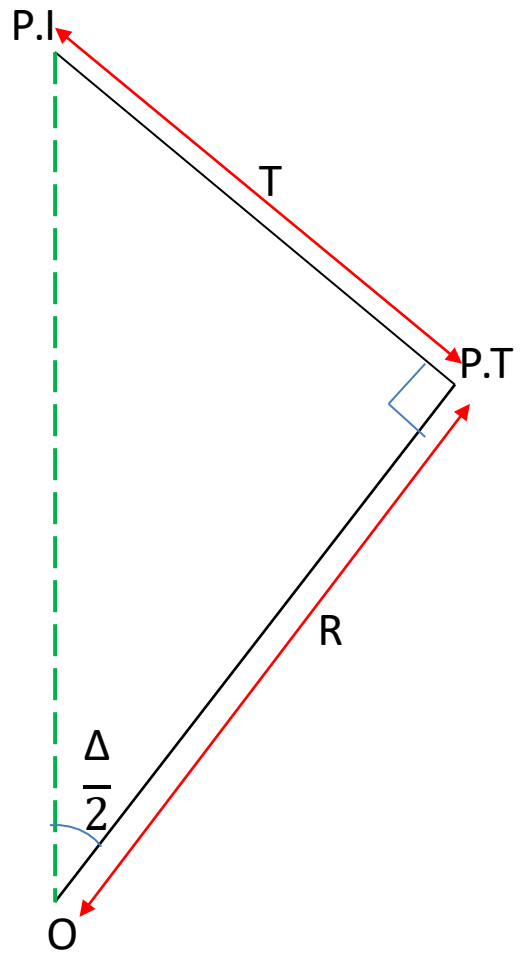




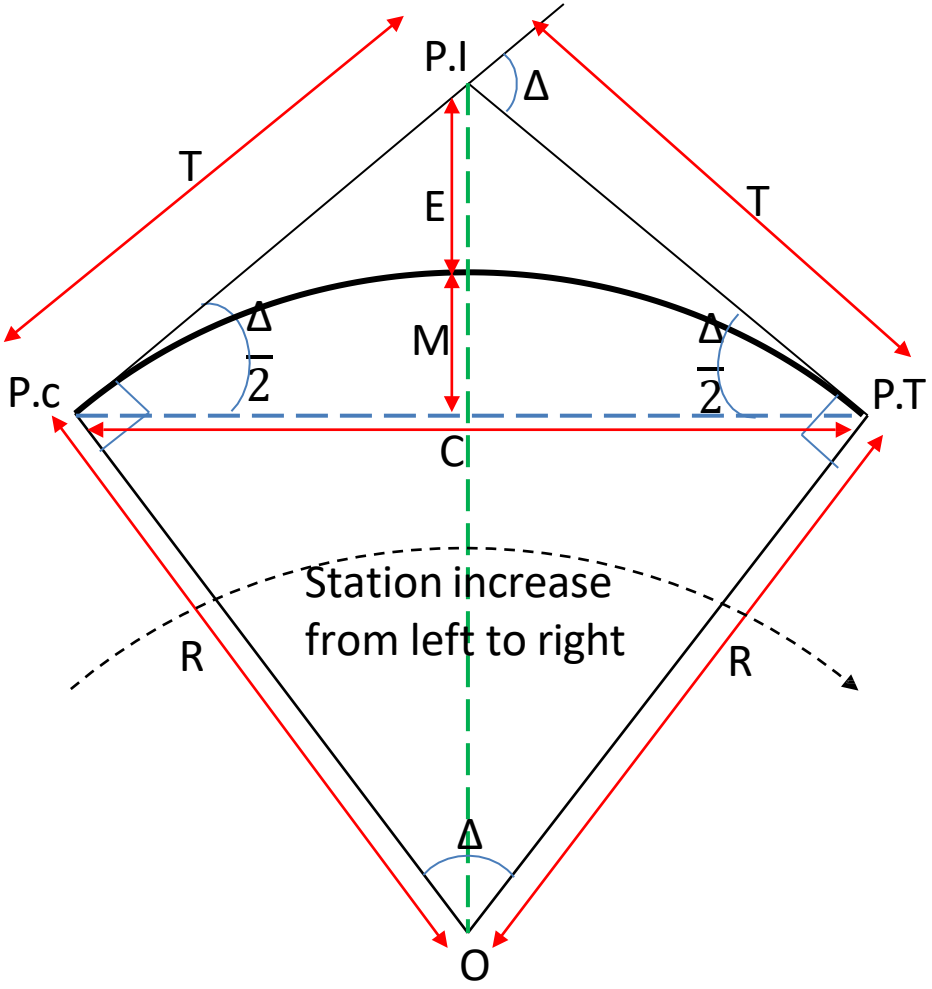
Tangent length

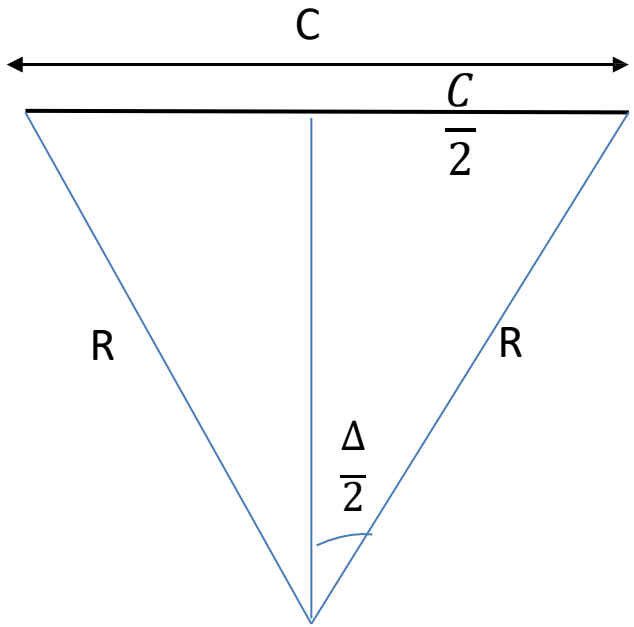
- $\tan \frac{\Delta}{2} = \frac{T}{R}$

$$\mathbf{T = R * tan \frac{\Delta}{2}}$$



Chord length

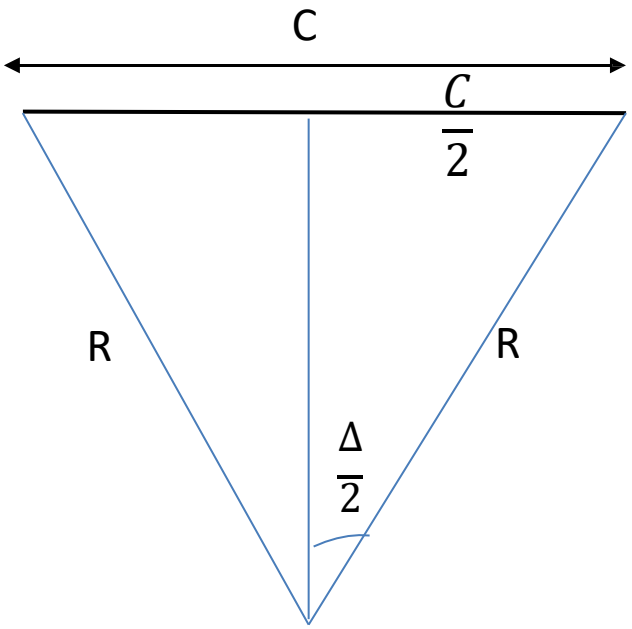




Chord length

- $\sin\frac{\Delta}{2} = \frac{\frac{C}{2}}{R}$

$$\mathbf{C = 2*R*}\ \boldsymbol{sin}\ \frac{\boldsymbol{\Delta}}{\mathbf{2}}$$



length of curve

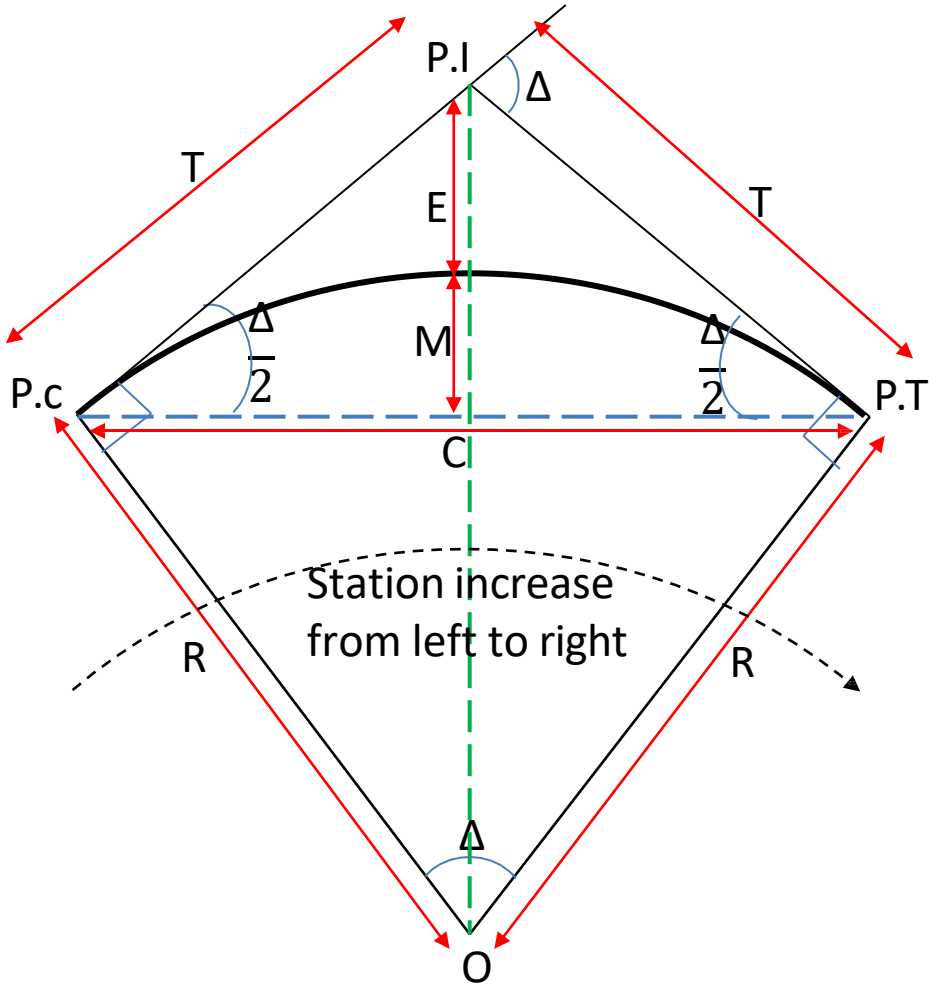
- Δ L
- 360^{o} $2\pi R$

- $L = \frac{\pi . R . \Delta^{o}}{180^{o}}$

L = R*Δrad

$$\frac{L}{\Delta^{o}} = \frac{10}{D^{o}}$$

L = 10* $\frac{\Delta^{o}}{D^{o}}$

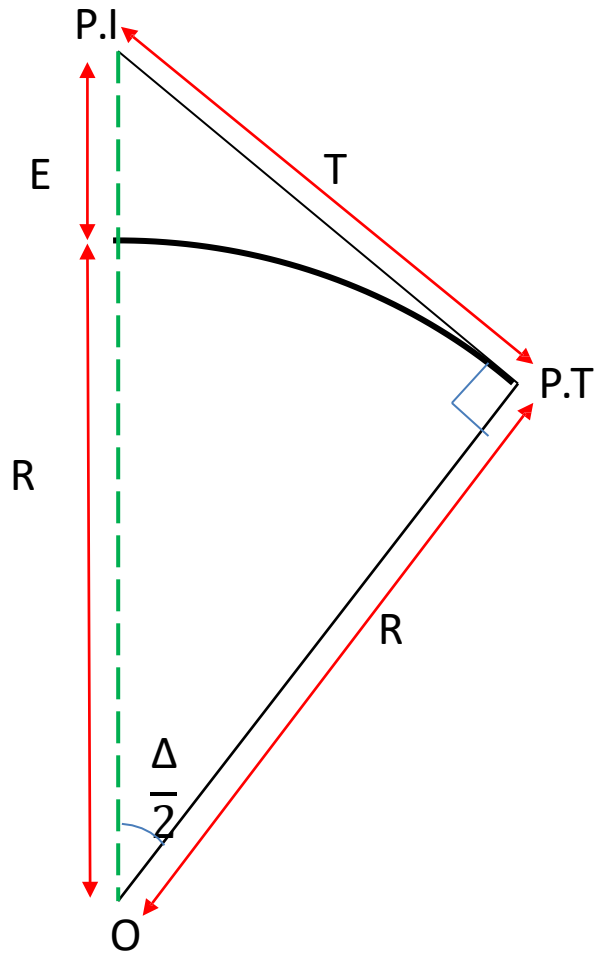


External distance

- $\cos\frac{\Delta}{2} = \frac{R}{R+E}$

$$E = R\left(\frac{1}{\cos\frac{\Delta}{2}} - 1\right)$$

$$E = T.\tan\frac{\Delta}{4}$$

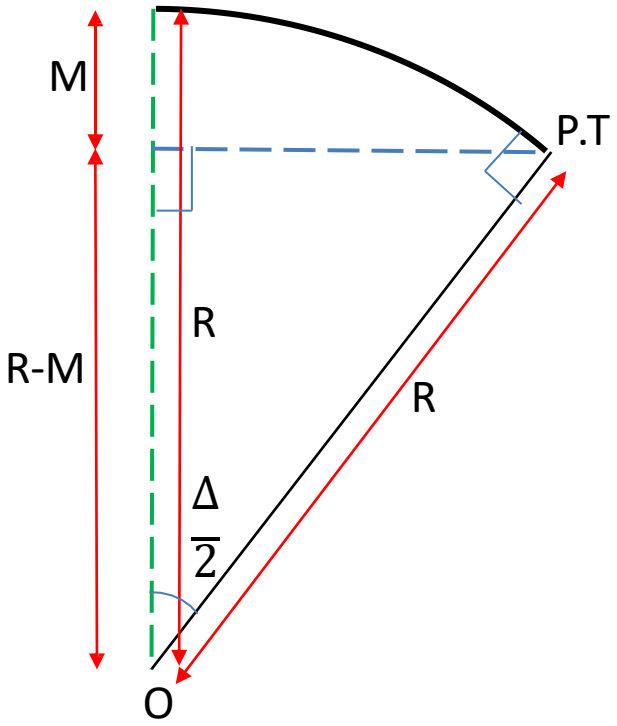


Middle distance

- $\cos\frac{\Delta}{2} = \frac{R-M}{R}$

$$\mathbf{M= R\left(1 - cos\,\frac{\Delta}{2}\right)}$$

$$\mathbf{M= R\left[1 - \sqrt{1 - \left(\frac{C}{2R}\right)^2}\,\right]}$$



Stations

- Stat. P.C= Stat. P.I – T
- Stat. P.T= Stat. P.C + L
- 2T>L>C

Example

- Compute the elements of the simple circular curve if you know:
- R=250 m , Δ=52º36’ and station of P.I=14 + 80

- Da^{o} = $\frac{573}{R} = \frac{573}{250} = 2.292^{0} = 2^{0}17'31"$

Da^{o} = 2º18′

- $T = R * tan\frac{\Delta}{2} = 250 * tan\frac{52^{o}36'}{2}$

$T = 123.56$ m

- C = 2*R* $sin\frac{\Delta}{2}$ = 2*250 * $sin\frac{52^{o}36'}{2}$

C = 221.54 m

- L = $\frac{\pi.R.\Delta^{o}}{180^{o}} = \frac{\pi*250*52^{o}36'}{180^{o}}$

L = 229.51 m

- E= R($\frac{1}{cos\frac{\Delta}{2}} - 1$) = 250 ($\frac{1}{cos\ \frac{52^o36'}{2}} - 1$)

E=28.87 m

- M= R($1 - cos\ \frac{\Delta}{2}$) = 250($1 - cos\ \frac{52^o36'}{2}$)

M= 25.88 m

- Stat. P.C = Stat. P.I – T = (14+80) – (1+23.56)

Stat. P.C=(13+56.44)

- Stat. P.T= Stat. P.C + L = (13+56.44)+ (2+29.51)

Stat. P.T=(15+85.95)

- 2T>L>C