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Answer-(4) Conditions to chain survey:

Chain Surveying is that type of surveying in which only linear measurements are made in the field. This type of surveying is suitable for surveyours of small extent on open ground to secure data for exact description of the boundaries of a piece of land or to take simple details.

The principle of chain triangulation is sometimes called is to provide a skeleton or framework consisting of a number of connected triangles, as triangle is the only simple figure that can be plotted from the length of its sides measurd in the field. To get good results in plotting, the framework should consist of triangles which are as nearly equilateral as possible.

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Derivation for Correction for Sag :-

$$y = \frac{P}{wg} \cosh\left(\frac{xwg}{P}\right)$$

g = gravitational acceleration

arc length between two support point at $x = -k/2$ & $x = +k/2$, found by usual methods via integration:

$$L = \int_{-k/2}^{+k/2} \sqrt{1 + (dy/dx)^2}\, dx$$

$$\therefore \quad a = \frac{P}{wg}$$

$$= \sqrt{1+(dy/dx)^2} = \sqrt{1+\left(\frac{d}{dx}\left(a\cosh\left(\frac{x}{a}\right)\right)\right)}$$

$$= \sqrt{1+\sinh^2\left(\frac{x}{a}\right)} = \cosh\left(\frac{x}{a}\right)$$

L is found by Integrating:

$$L = \int_{-k/2}^{+k/2} \cosh\left(\frac{x}{a}\right) dx = \left[a \sinh\left(\frac{x}{a}\right)\right]_{x=-k/2}^{x=+k/2}$$

$$= 2a \sinh\left(\frac{k}{2a}\right)$$

$$= \boxed{S = k - L} \quad \therefore S = Cs$$