Example: Correction due to Sag

1. A 30-m tape is supported only at its ends and under a steady pull of 8 kg. If the tape weighs 0.91 kg, determine the sag correction and the correct distance between the ends of the tape.

\[
C_s = \frac{W^2 L}{24 P^2} = \frac{(0.91)^2(30)}{24(8)^2} = 0.0162 \text{ m}
\]

\[
L' = L - C_s = 30 - 0.0162 = 29.9838 \text{ m}
\]

Note: The effect of sag always causes shortening of the tape.

2. A 50-m tape weighs 2kg and is supported at its end points and at the 8-m and 25-m marks. If a pull of 6 kg is applied, determine the ff:
   a) Correction due to sag between the 0-m and 8-m marks, the 8-m and 25-m marks, and the 25-m and 50-m marks,
   b) Correction due to sag for one tape length, and
   c) Correct distance between the ends of the tape.

\[
C_s = \frac{W^2 L}{24 P^2} = \frac{(2)^2(50)}{24(6)^2} = 0.0361 \text{ m}
\]

\[
L' = L - C_s = 50 - 0.0361 = 49.9639 \text{ m}
\]

Elementary Surveying Notes of A.M. Fillone, DLSU-Manila
a) Determine correction due to sag for the three spans

\[ C_{s1} = \frac{w^2 L^3}{24 P^2} = \frac{(0.04)^2 (8)^3}{24 (6)^2} = +0.0009 \text{ m} \]
\[ C_{s2} = \frac{w^2 L^3}{24 P^2} = \frac{(0.04)^2 (17)^3}{24 (6)^2} = +0.0091 \text{ m} \]
\[ C_{s3} = \frac{w^2 L^3}{24 P^2} = \frac{(0.04)^2 (25)^3}{24 (6)^2} = +0.0289 \text{ m} \]

b) Determine total sag correction for one tape length

\[ C_s = C_{s1} + C_{s2} + C_{s3} = 0.0009 + 0.0091 + 0.0289 \]
\[ C_s = 0.0389 \text{ m} \]

c) Determine correct distance between tape ends

\[ L' = L - C_s = 50 - 0.0389 = 49.9611 \text{ m} \]