Question 5.4 & 5.5 are not required and I didn’t solve them to you girls.
From Previous question for \( \triangle ABC \)

\[
\frac{AB}{\sin(A\hat{B}C)} = \frac{CB}{\sin(B\hat{A}C)}
\]

\( \therefore (B\hat{A}C) = \sqrt{ } \)

- Put the theodolite @ point 
  - then set a Zero reading @ point \( A \)  and open an angle equal to \( 180 - (B\hat{A}C) \)

- Some one put the Zero of a tape @ \( C' \) and move in front of the theodolite until be seen from the theodolite @ point \( D \)

- Calculate the distance between two parallel lines \( (AA') \)

\[
AA' = AC' \sin (A\hat{C}'D) = \sqrt{ }
\]

Then we compare \( AA' \) length with 10m

make line CD parallel to AB above or below \( C'D' \)

Note: Making parallel lines by erecting two perpendiculars on CD line have the same length by right angle method \( \# \)
5.5

Tools: theodolite

- Measure angles (CDB) and (ABO)
- Measure DB by stadia method (or tangential method)

Calculate $\alpha$

$$\alpha = 180 - (CDB + ABO)$$

$$\frac{DB}{\sin \alpha} = \frac{L}{\sin (ABO)} \Rightarrow L = \frac{DB \cdot \sin (ABO)}{\sin \alpha}$$

Put the theodolite @ D and direct it toward point C and adjust the telescope to be horizontal.

Someone hold the staff @ E and move toward point D and be ranged by person @ D until the difference between upper stadia and lower stadia readings (R) are equal to $\frac{L}{K(100)}$ @ point D.

So, this point is the intersection of AB and CD.

5.6

$\text{R.L.}_C = ??$

$$\text{Substitute } D_{AB} = KY \cos^2 \theta$$

$$D_{AB} = 100(2.04-1) \times \cos^2 (8)$$

$$D_{AB} = 101.99 \text{ m}$$

$$A'B = 101.99 \text{ m}$$

$$\frac{A'C}{\sin (61^\circ 22' 37'')} = \frac{101.99}{\sin [180 - (58^\circ 16' 24'' + 61^\circ 22' 37'')] }$$

$$\therefore A'C = 103.01 \text{ m}$$

$$\text{R.L.}_C = \text{R.L.}_A + i_{A} + A'C \times \tan (30^\circ 18' 00'')$$

$$\text{R.L.}_C = 970.34 + 1.65 + 103.01 \times \tan (30^\circ 18' 00'')$$

$$\therefore \text{R.L.}_C = 1032.18 \text{ m}$$
Station | Point | \( \gamma \) | Slope Readings (m) | HI (m)  
A | B | -5° 30' | 2.15, 1.95, 1.75 | 1.40  
A | B | 1° 30' | 1.80, 1.65, 1.50 |  
B | C | 12° 00' | 2.21, 2.05, 1.89 | 1.30  

- Elevation of B and C  
- Distances AB and BC

\[ D_{ABM} = K \times \cos \gamma \]  
\[ = 100 \times (2.15 - 1.75) \times \cos^2 (-5° 30') \]  
\[ D_{ABM} = 39.63 \text{ m} \]  
\[ X = D_{ABM} \times \tan (-5° 30') \]  
\[ X = 3.82 \text{ m} \]  
\[ E_A = E_{B_M} + 1.45 + X - 1.40 = 504.37 \text{ m} \]  

\[ D_{AB} = K \times G_i \times (\gamma) \]  
\[ = 100 \times (1.8 - 1.5) \times G_i \times (1° 30') \]  
\[ D_{AB} = 29.98 \text{ m} \]  
\[ Y = D_{AB} \times \tan (1° 30') \]  
\[ Y = 0.79 \text{ m} \]  
\[ E_B = E_A + 1.45 + Y - 1.65 = 504.91 \text{ m} \]  

\[ D_{BC} = K \times \cos \gamma \]  
\[ = 100 \times (2.21 - 1.89) \times \cos^2 (12° 00') \]  
\[ D_{BC} = 30.62 \text{ m} \]  
\[ Z_2 = D_{BC} \times \tan (12° 00') \]  
\[ Z_2 = 6.51 \text{ m} \]
### Table

<table>
<thead>
<tr>
<th>Staff Station</th>
<th>Azimuth</th>
<th>Staff Heights (m)</th>
<th>Zenith Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>30° 20' 40&quot;</td>
<td>1.515, 2.025</td>
<td>8° 00'</td>
</tr>
<tr>
<td>B</td>
<td>140° 40' 20&quot;</td>
<td>2.055, 3.110</td>
<td>95° 00'</td>
</tr>
</tbody>
</table>

- Mean slope between A and B

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**Solution**

\[ D_{OA} = x_{OA} \cos^2(8) \]
\[ = 100 \times (2-0.25-1) \times \cos^2(8) \]
\[ D_{OA} = 100.51 \text{ m} \]
\[ X = D_{OA} \tan(8) = 14.13 \text{ m} \]
\[ E_A = H - x - 1.515 \]
\[ E_A = H - 12.62 \]

\[ D_{OB} = x_{OB} \cos^2(15) \]
\[ = 100 \times (2-1-0) \times \cos^2(15) \]
\[ D_{OB} = 20.94 \text{ m} \]
\[ y = D_{OB} \tan(-5) = 18.32 \text{ m} \]
\[ E_B = H - y - 2.055 \]
\[ E_B = H - 20.38 \]

\[ \hat{H} = \hat{X} = \hat{X}_{OA} = 110° 19' 40" \]

\[ \hat{A} = H - 12.62 \]

\[ AB^2 = OA^2 + OB^2 - 2(OA)(OB) \cos(\hat{A}) \]
\[ AB = 261.87 \text{ m} \]

**Slope**

\[ \frac{E_B - E_A}{AB} \]
\[ = \frac{(H - 70.38) - (H - 12.62)}{261.87} \]