Example 3/ Profile on the center line (℄) for a road the staff reading as in table shown below. Elevation of B.M. = 30 m, the road slopping under point A = 0.7 m (at point H end road). Calculate the road slope and depth of cut and height of fill for each point while the distance between two points was 50 m.

staff reading B.S.	staff reading I.S	staff reading F.S	staff station	H.I	R.L	grade	Cut +	Fill −
1.216			B.M	31.216 I	30 (given)			
		1.424	A		29.792	29.092	0.7 (given)	
2.673			50					
		3.414	B	30.475 II	27.802	28.895		1.093
	3.828		50					
	1.333		C		26.647	28.697		2.05
		2.172	50					
			D		29.142	28.5	0.642	
			50					
			H		28.303	28.303		
			distance					

$$\text{slope}_{A\to H} = \frac{\Delta \text{grade}}{\Delta \text{distance}} = \frac{28.303 - 29.792}{200} = -0.395\%$$

Δg = last point − first point

grade point B = grade A − slope * distance$_{A\to B}$

$= 29.092 - \frac{0.395}{100} * 50 = 28.895^{m}$

grade point C = grade$_A$ − slope * distance$_{A\to C}$

$= 29.092 - \frac{0.395}{100} * 100 = 28.697^{m}$

grade point D = grade A − slope * distance$_{A\to D}$

$= 29.092 - \frac{0.395}{100} * 150 = 28.50^{m}$

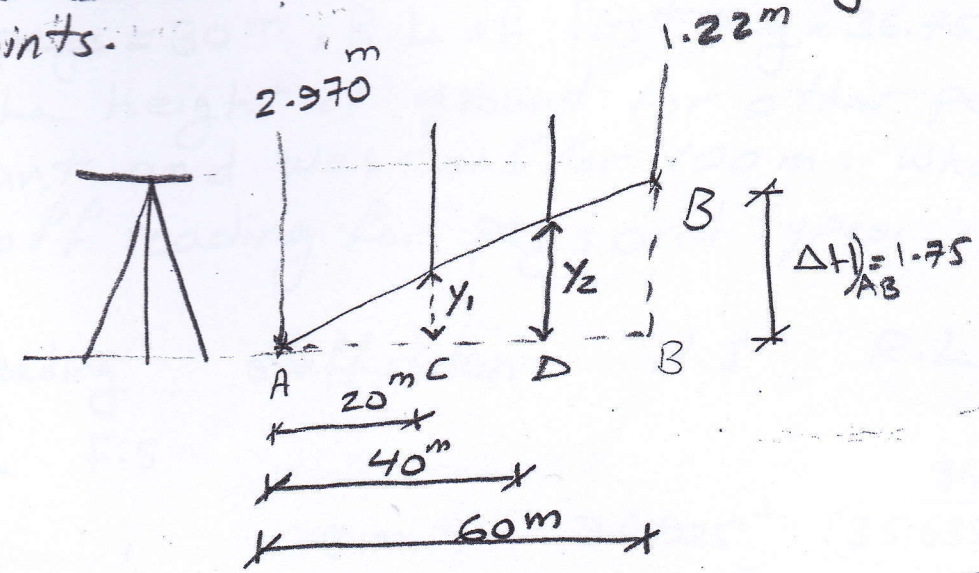
note:

* ground Elevation − grade elevation = + cut

⇒ ground Elevation − Cut = grade elevation

29.792 − 0.7 = 29.092

Example/ The staff reading on point A = 2.970 m and on point B = 1.22 m which distance between them = 60 m. What is the staff reading on two points on the line AB which is at 20 m from A and 40, respectively. Assume the slope between two points was constant and correct readings was taken on two points.



$\Delta H)_{AB} = 2.970 - 1.22 = 1.75^{m}$

$\frac{1.75}{60} = \frac{y_1}{20} \Rightarrow y_1 = 0.5833^{m}$

$\frac{1.75}{60} = \frac{y_2}{40} \Rightarrow y_2 = 1.167^{m}$

staff reading)$_C = 2.970 - 0.583 = 2.387^{m}$

staff reading)$_D = 2.97 - 1.167 = 1.803^{m}$

OR=

Example / In levelling operation B.M. = 35. reading of staffs as follows:

B.S 1.29, 3.115, 0.235, 3.755

F.S 0.025, 0.975, 3.565

At the end station 4 pegs were set up distance between pegs = 30 m, R.L of first peg = 36.755 m Assume the height of ground for other pegs was constant and was risen 1 m for 100 m. What is the staff reading for pegs and types. strength

staff reading		staff station	H.I	R.L
B.S	I.S.	F.S		
1.29		1	B.M.	36.925 (1)	given 35.635
3.115		0.025	A	40.015 (2)	36.90
0.235		0.975 (2)	B	39.275 (3)	39.04
3.755		3.565 (3)	C	39.465 (4)	35.71
	* 2.71	4	Peg 1	=	given 36.755
	** 2.41		Peg 2	=	37.055 *
	*** 2.11		Peg 3	=	37.355 **
	**** 1.81		Peg 4	=	37.655 ***

* staff reading)$_{peg1}$ = 39.465 − 36.755 = 2.71 m

* R.L)$_{peg2}$ = R.L)$_{peg1}$ + slope * distance$_{peg1 \to 2}$
= 36.755 + $\frac{1}{100}$ * 30 = 37.055 m

** R.L)$_{peg3}$ = R.L)$_{peg1}$ + slope * distance$_{1 \to 3}$
= 36.755 + $\frac{1}{100}$ * 60 = 37.355 m

*** R.L)$_{peg4}$ = R.L)$_{peg1}$ + slope * distance$_{1 \to 4}$
= 36.755 + $\frac{1}{100}$ * 90 = 37.655 m

** staff reading) $peg_2 = 39.465 - 37.055 = 2.41^{m}$

*** staff reading) $peg_3 = 39.465 - 37.355 = 2.11^{m}$

**** staff reading) $peg_4 = 39.465 - 37.655 = 1.81^{m}$

Ex/ Staff reading for instrument set up was shown below. Sort the type of staff reading in the table.

station	1	2	3	4
B.M	3.1		1.50	2.1
C			3.7	
B		0.85		
A	2.7	1.9		1.6
D				

Sol:-

station	staff reading B.S	I.S	F.S
B.M	3.1		
A	1.9		2.7
B	3.7		0.85
C	2.1		1.50
D			1.6