EXAMPLE BY MEAN SECTIONAL AREA METHOD

EX→ Estimate the cost of Quantity of earthwork for a Portion of road from the following data:
Road width at formation surface is, B = 8 mt
Side slopes 2:1 in banking and $1\frac{1}{2}$:1 in cutting.
Length of chain is 30 mt.

Given Data

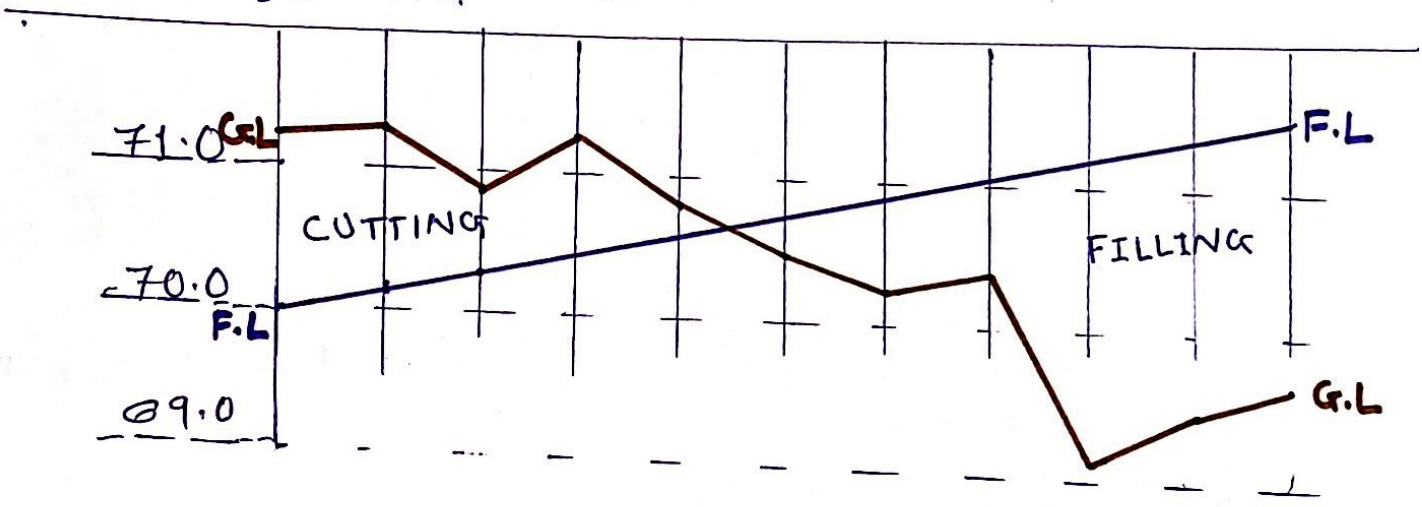
CHAINAGE....	20	21	22	23	24	25	26	27	28	29	30
GROUND LEVEL	71·20	71·25	70·90	71·25	70·80	70·45	70·20	70·35	69·10	69·45	69·70
FOR. LEVEL	70·0	70·15	70·3	70·45	70·60	70·75	70·90	71·05	71·20	71·35	71·50

FORMATION LEVEL —— UPWARD GRADIENT OF 1 IN 200

AS Length of Chain = 30 mt. and upward gradient 1 IN 200

SO, dis. Rise
200 - 1
30 - (?).

$$\frac{1 \times 30}{200} = \frac{3}{20} = 0.15$$

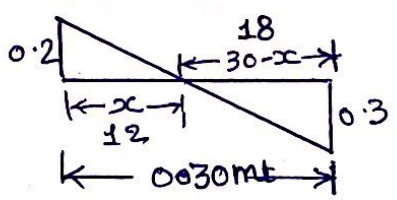


In this Example From chainage 24 to 25 the section passes through Cutting to Banking.

$$\frac{0.2}{x} = \frac{0.3}{30-x}$$

$\therefore x = 12$

$30 - x = 30 - 12 = 18$

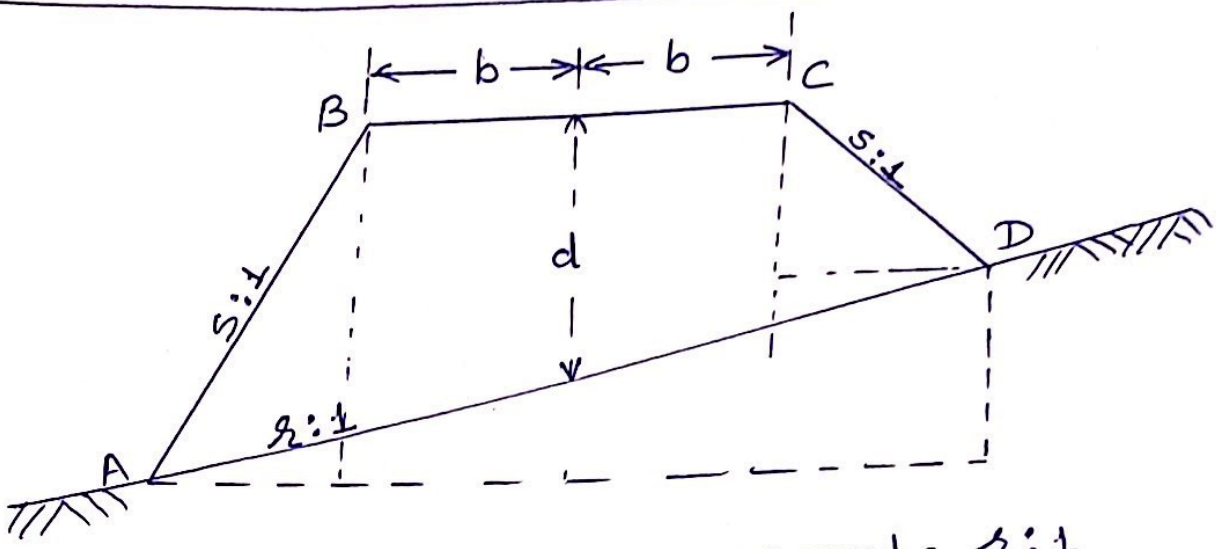


CALCULATION OF QUANTITY.

Given → B = 8 mt S = 2 in Banking S = 1½ in Cutting.

CHAINAGE	R.L. of GROUND R.L	R.L. of FORMATION F.L	Depth or Height d	Central Area Bd	Side Area Sd^2	Whole section Area $[Bd+Sd^2]$	Mean Section Area	Length in between station L	Cutting Q+y $(Bd+Sd^2)\times L$	Banking Q+y $(Bd+Sd^2)\times L$
20	71·20	70·00	−1·20	9·60	2·16	11·76	–	–	–	–
21	71·25	70·15	−1·10	8·80	1·82	10·62	11·19	30	335·7	
22	70·90	70·30	−0·60	4·80	0·54	5·34	7·98	30	239·4	
23	71·25	70·45	−0·80	6·40	0·96	7·36	6·35	30	190·5	
24	70·80	70·60	−0·20	1·60	0·06	1·66	4·51	30	135·3	
	0	0	0	0	0	0	0·83	12	9·9	
	Passes from Cutting to Banking									
25	70·45	70·75	0·30	2·40	0·18	2·58	1·29	18	–	23·2
26	70·20	70·90	0·70	5·60	0·98	6·58	4·58	30	–	137·4
27	70·35	71·05	0·70	5·60	0·98	6·58	6·58	30	–	197·4
28	69·10	71·20	2·10	16·80	8·82	25·62	16·10	30	–	483·0
29	69·45	71·35	1·90	15·20	7·22	22·42	24·02	30	–	720·6
30	69·70	71·50	1·80	14·40	6·48	20·88	21·65	30		649·5
								TOTAL =	910·8 cum	2211·1 cu.m.

EARTHWORK IN HILLY ROAD.



Transverse slop or cross section of ground = R:1
Half formation width = b side slop = S:1
Depth of cutting or Height of bank at center = d.

$$\text{Area} = \frac{Sb^2 + R^2(2bd + Sd^2)}{R^2 - S^2}$$

Ex → Calculate the Quantity of earthwork of a hill road in side-long ground. For a length of 200 metre from 5 to 10 chainage, tangent of the angle of transverse slope of ground (tanθ) is equal to 0.1 i.e. 0.1 althrough as measured by Ghat Tracer The length of chain is 20 metre. The formation Width of the road is 7 metre and slope bank is 2:1. R.L of ground and Formation level at the centre of the road are as follows:-

CHAINAGE	DISTANCE	R.L. OF GROUND AT CENTER	R.L. OF FORMATION AT CENTER
5	100	200.00	201.20
6	120	199.75	201.80
7	140	200.50	202.40
8	160	201.70	203.00
9	180	202.40	203.60
10	200	201.50	204.20

AS GIVEN $\tan\theta = 0.1$

Ratio of side slope, HOR : Verti = $1 : 0.1 = 10 : 1$

$B = 7 \therefore b = \frac{7}{2} = 3.5 \quad S = 2 \quad r = 10$

CHAINAGE OR STATION.	Ht of bank Diff of R.L & F.L m	Sect. Area = $\frac{Sb^2 + r^2(2bd + sd^2)}{r^2 - s^2}$ sq.m	Mean Sect. Area. sq.m	Dis. L m	Quantity cu.m.
1	2	3	4	5	6
5	1.20	$\frac{(2\times3.5^2) + 10^2(2\times3.5\times1.2 + 2\times1.20^2)}{10^2 - 2^2} = 12.00$	—	—	—
6	2.05	$\frac{(2\times3.5^2) + 10^2(2\times3.5\times2.05 + 2\times2.05^2)}{10^2 - 2^2} = 23.96$	17.98	20	359.60
7	1.90	$\frac{(2\times3.5^2) + 10^2(2\times3.5\times1.9 + 2\times1.90^2)}{10^2 - 2^2} = 21.63$	22.80	20	456.00
8	1.30	$\frac{(2\times3.5^2) + 10^2(2\times3.5\times1.30 + 2\times1.30^2)}{10^2 - 2^2} = 13.26$	17.45	20	349.00
9	1.20	$\frac{(2\times3.5^2) + 10^2(2\times3.5\times1.2 + 2\times1.20^2)}{10^2 - 2^2} = 12.00$	12.63	20	252.60
10	2.70	$\frac{(2\times3.5^2) + 10^2(2\times3.5\times2.70 + 2\times2.70^2)}{10^2 - 2^2} = 35.13$	23.57	20	471.40
			TOTAL =		1888.60 cu.m.