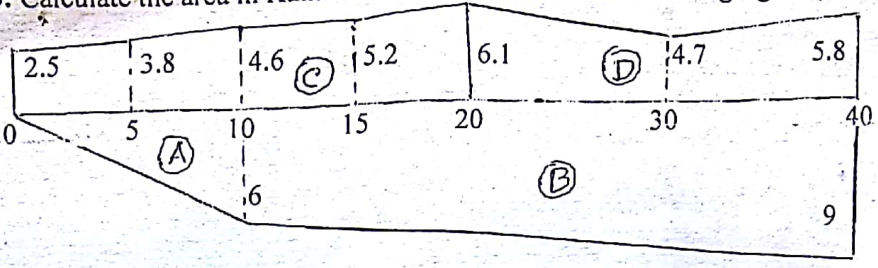
Prob. No. 5: Calculate the area in Katha and in Decimal from the following figure (dimensions are in m).



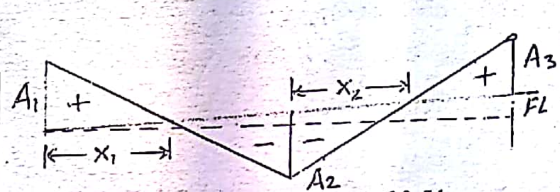
Solution: Area of part A = 1/2 x 10 x 6 = 30 m^2. Area of part B = 1/2 [6 + 9] 30 = 225 m^2.
Area of part C = 5/3 [2.5 + 6.1 + 4 (3.8 + 5.2) + 2 (4.6)] = 89.66 m^2.
Area of part D = 10/3 [6.1 + 5.8 + 4 (4.7)] = 102.33 m^2.
Therefore, total area = A+B+C+D = 30 +225 + 89.66 +102.33 = 447 m^2 = 447 x 10.7638 = 4811.5 sqft.
Area 4811.5 sqft. = **6.68 Katha = 11.05 Decimal.**

720 sq ft. = 1 Katha
435 " " = 1 Decimal

Prob. No. 6: Calculate the volume of earth work of an embankment whose formation width is 8 m and side slope is 2 : 1. The ground level along the centre line is as follows. Formation level at zero chainage is 115.
Chainage --- 0 50 100 and GL (m)---- 115.75 114.35 116.80 respectively,
The embankment has a rising gradient of 1 in 100 and the ground is level across the centre line.

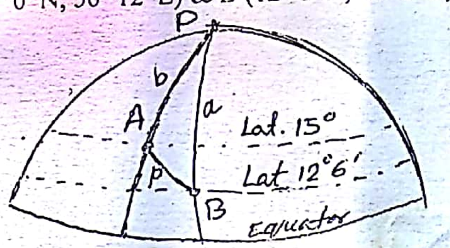
Solution: Rise per 50 m = 50/100 = 0.50 m

Chainage	GL	FL	Cutting (+)	Filling (–)	Section
0	115.75	115.00	0.75		A_1
50	114.35	115.50		1.15	A_2
100	116.80	116.00	0.80		A_3



$1.15\ x_1 = 37.5 - 0.75\ x_1$. $x_1 = 19.74$ m & $50 - x_1 = 30.26$ m. Similarly, $x_2 = 29.49$ m & $50 - x_2 = 20.51$ m.
$A_1 = (8 + 2 \times 0.75)\ 0.75 = 7.13\ m^2$, $A_2 = (8 + 2 \times 1.15)\ 1.15 = 11.85\ m^2$ & $A_3 = (8 + 2 \times 0.8)\ 0.8 = 7.68\ m^2$.
(a) Vol. from chainage 0 to 50: (+) = ½(7.13 + 0) 19.74 = 70.37 m^3 & (–) = ½(0 + 11.85) 30.26 = 179.29 m^3.
(b) Vol. from chainage 50--100: (–) = ½(11.85 + 0) 29.49 =174.73 m^3 & (+) = ½(0 +7.68) 20.51 = 78.76 m^3.
Total cutting = 70.37 m^3 + 78.76 m^3 = **149.13 m^3** and total filling = 179.29 m^3 + 174.73 m^3 = **354.02 m^3**.

Prob. No. 7: Find the shortest distance between two places A (15^0 0′ N, 50^0 12′ E) & B (12^0 6′ N, 54^0 0′ E)



Solution: In figure, the position of A and B have been shown.
In the spherical triangle ABP, b = AP = $90^0 - 15^0$ 0′ N = 75^0
a = BP = $90^0 - 12^0$ 6′ N = 77^0 54′ and p = 54^0 0′ – 50^0 12′ = 3^0 48′
From triangle APB, cos P = (cos p – cos a cos b) ÷ (sin a sin b)
or cos p = cos P sin a sin b + cos a cos b = 0.99661
Therefore, p = AB = 4^0 40′ = 280′ = 280 NM = **518.6 km.**

Prob. No. 8: Given the Greenwich civil time (G.C.T.) as 6h 40m 12s P.M. on July 2, 2015. Find the L.M.T. at the places having the longitudes (a) 72^0 30′ E, (b) 72^0 30′ W and (c) 110^0 32′ 30″E.

Solution:
(a) Longitude of the place = 72^0 30′ E. Now, 72^0 30′ E = 4h 50m 0s. Since the place is to the east of Greenwich, the local mean time (L.M.T.) will be more than the standard time.
Now, G.C.T. = 6h 40m 12s P.M. on July 2015.
or G.M.T. = 6h 40m 12s + 12h = 18h 40m 12s Past mid-night
Add longitude = 4h 50m 0s
Therefore L.M.T. = 23h 30m 12s = **11h 30m 12s P.M. on July 2.**
(b) Longitude of the place = 72^0 30′ W = 4h 50m 0s of time. Since the place is to the west of Greenwich, the local mean time (L.M.T.) will be lesser than the standard time.
Now G.M.T. = 6h 40m 12s P.M. = 18h 40m 12s Past mid-night
Subtract longitude = 4h 50m 0s
Therefore L.M.T. = 13h 40m 12s = **1h 40m 12s P.M. on July 2.**
(c) Longitude of the place = 110^0 32′ 30″E = 7h 22m 10s of time. Since the place is to the east of Greenwich, the local mean time (L.M.T.) will be more than the standard time.
Now G.M.T. = 6h 40m 12s P.M. = 18h 40m 12s Past mid-night
Add longitude = 7h 22m 10s
Therefore L.M.T. = 26h 02m 22s = 2h 02m 22s on July 3.
Therefore L.M.T. = 2h 02m 22s A.M. on July 3.

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