Cut and Fill Problem

- Compute the total cut-and-fill for the following site
- The original elevations are:

	1	2	3	4	5
1	105	104	104	103	102
2	104	104	103	102	101
3	103	103	102	101	100
4	103	102	101	100	99
5	101	100	99	98	97

- The size of each cell is 25 ft. by 25 ft.
- The proposed site is at an elevation of 103 ft.

Cut and Fill Problem

- To compute the cut-and-fill compute the change in elevations (original elevations minus proposed elevations gives).

	1	2	3	4	5
1	2.00	1.00	1.00	0.00	-1.00
2	1.00	1.00	0.00	-1.00	-2.00
3	0.00	0.00	-1.00	-2.00	-3.00
4	0.00	-1.00	-2.00	-3.00	-4.00
5	-2.00	-3.00	-4.00	-5.00	-6.00

- Positive values indicate cut and negative values indicate fill.

Cut and Fill Problem

- The resulting cut-and-fill volumes for each cell in the entire grid system is:

	1	2	3	4
1	781.3	468.8	0.0	-625.0
2	312.5	0.0	-625.0	-1250.0
3	-156.3	-625.0	-1250.0	-1875.0
4	-937.5	-1562.5	-2187.5	-2812.5

- A sited model with a 5 x 5 grid system contains 4 x 4 cells

Cut and Fill Problem

- The resulting cut-and-fill volumes for each cell in the entire grid system is:

	1	2	3	4
1	28.94	17.36	0.00	-23.15
2	11.57	0.00	-23.15	-46.30
3	-5.79	-23.15	-46.30	-69.44
4	-34.72	-57.87	-81.02	-104.17

- Volumes converted to $yd.^3$

Cut and Fill Problem

- The total cut on this site may be estimated by summing the positive cut-and-fill volumes for each cell

	1	2	3	4
1	28.94	17.36	0.00	-23.15
2	11.57	0.00	-23.15	-46.30
3	-5.79	-23.15	-46.30	-69.44
4	-34.72	-57.87	-81.02	-104.17

- For this example the total is: 58 $yd.^3$

Cut and Fill Problem

- The total fill on this site may be estimated by summing the negative cut-and-fill volumes for each cell

	1	2	3	4
1	28.94	17.36	0.00	-23.15
2	11.57	0.00	-23.15	-46.30
3	-5.79	-23.15	-46.30	-69.44
4	-34.72	-57.87	-81.02	-104.17

- For this example the total is: -515 $yd.^3$

Cut and Fill Calculations

- An estimate of the cost of cut-and-fill for the entire site can be made by considering:
- On-site cost ($2.50/yd.^{3}) for total cut-and-fill volume:

$$\text{On site} = \left(\frac{\$2.50}{\text{yd.}^3}\right)(cut - fill) = \left(\frac{\$2.50}{\text{yd.}^3}\right)(58 - (-515))\,\text{yd.}^3$$

$$\text{On site} = \$1{,}432$$

- Note: since fill volume is always (-) negative, therefore to compute the total earthwork volume use (cut – fill)

Cut and Fill Calculations

- An estimate of the cost of cut-and-fill for the entire site can be made by considering:
- Off-site cost ($5.00/yd.^{3})

$$\text{Off site} = \left(\frac{\$5.00}{\text{yd.}^3}\right)|cut + fill| = \left(\frac{\$5.00}{\text{yd.}^3}\right)|58 - 515|\,\text{yd.}^3$$

$$\text{Off site} = \$2{,}285$$

$$\text{Total Cost} = \$1{,}432 + \$2{,}285 = \boxed{\$3{,}717}$$

- Note: since there may be more fill than cut, always take the absolute value of the sum |cut + fill|