


### 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.

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### 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.

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### Cut and Fill Problem




- The resulting cut-and-fill volumes (ft<sup>3</sup>) 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

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### Cut and Fill Problem




- The resulting cut-and-fill volumes (yd<sup>3</sup>) 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

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### 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.<sup>3</sup>

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### 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.<sup>3</sup>

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## 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 (\$5/yd.<sup>3</sup>) for total cut-and-fill volume:

$$\text{Onsite} = \left( \frac{\$5}{\text{yd.}^3} \right) (\text{cut} - \text{fill}) = \left( \frac{\$5}{\text{yd.}^3} \right) (58 - (-515)) \text{yd.}^3$$

$$\text{Onsite} = \$2,865$$

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

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## 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 (\$25/yd.<sup>3</sup>)

$$\text{Off site} = \left( \frac{\$25}{\text{yd.}^3} \right) |\text{cut} + \text{fill}| = \left( \frac{\$25}{\text{yd.}^3} \right) |58 - 515| \text{yd.}^3$$

$$\text{Off site} = \$11,425$$

$$\text{TotalCost} = \$2,865 + \$11,425 = \boxed{\$14,290}$$

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

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