

Areas & Volumes

Civil Engineering

Quantities from ordinates and sections.

**Areas come from ordinates at a regular spacing;
volumes come from areas at a regular chainage.**

Simpson: $d/3$ (ends + 4 odds + 2 evens)

Simpson's rule

Odd ordinate count.

Needs even strip count

Trapezoidal rule

Slightly less exact.

Any number of strips

End area, two sections

Overstates on curves.

$$V = L(A_1 + A_2)/2$$

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✗ **Using Simpson on an odd strip count**

✓ **Even strips, odd ordinates**

Simpson's rule pairs strips, so it needs an even number of them. Deal with a leftover strip by the trapezoidal rule instead of forcing the count.

Educational reference. Earthwork quantities also need bulking and shrinkage factors from the contract specification.