II. Q. Ratios in Similar Solids

Ratios in Similar Solids

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One-dimensional measure refers to distance or length (number of segments). Other manifestations or embodiments of distance are height, perimeter, altitude, length of diagonals, edge, etc.

Two-dimensional measure refers to area (number of squares). Manifestations of this for working with solids include painting outside surfaces, or wall-papering, carpeting, tiling, and so on.

Three-dimensional measure refers to volume (number of cubes). Manifestations include filling the space inside a solid with a liquid or sand.

The Main Story

The ratio of corresponding one-dimensional measures of two similar solids is $\frac{a}{b}$ when…

…the ratio of corresponding two-dimensional measures of two similar solids is $\frac{a^2}{b^2}$, and when…

…the ratio of corresponding three-dimensional measures of two similar solids is $\frac{a^3}{b^3}$.

Example:

The ratio of corresponding one-dimensional measures of two similar pyramids is $\frac{4}{5}$ when…

…the ratio of corresponding two-dimensional measures of two similar pyramids is $\frac{4^2}{5^2}=\frac{16}{25}$, and when…

…the ratio of corresponding three-dimensional measures of two similar pyramids is $\frac{4^3}{5^3}=\frac{64}{125}$.

More typically, when the ratio of the altitudes of two similar pyramids is $\frac{4}{5}$, then the ratio of the areas of two corresponding sides is $\frac{4^2}{5^2}=\frac{16}{25}$, and the ratio of their volumes is $\frac{4^3}{5^3}=\frac{64}{125}$.