

## Volumen und Oberfläche eines Spats

Der Spat ist gegeben durch die Eckpunkte A, B, D und E.

$$A \left( \begin{array}{|c|c|c|} \hline 0 & 0 & 0 \\ \hline \end{array} \right)$$

$$B \left( \begin{array}{|c|c|c|} \hline 1 & 7 & 1 \\ \hline \end{array} \right)$$

$$D \left( \begin{array}{|c|c|c|} \hline -8 & 8 & 18 \\ \hline \end{array} \right)$$

$$E \left( \begin{array}{|c|c|c|} \hline 7 & 2 & 2 \\ \hline \end{array} \right)$$

$$AB = \begin{array}{|c|} \hline 1 \\ \hline 7 \\ \hline 1 \\ \hline \end{array} \quad AD = \begin{array}{|c|} \hline -8 \\ \hline 8 \\ \hline 18 \\ \hline \end{array} \quad AE = \begin{array}{|c|} \hline 7 \\ \hline 2 \\ \hline 2 \\ \hline \end{array}$$

$$c = b + AD \quad C \left( \begin{array}{|c|c|c|} \hline -7 & 15 & 19 \\ \hline \end{array} \right)$$

$$f = b + AE \quad F \left( \begin{array}{|c|c|c|} \hline 8 & 9 & 3 \\ \hline \end{array} \right)$$

$$g = c + AE \quad G \left( \begin{array}{|c|c|c|} \hline 0 & 17 & 21 \\ \hline \end{array} \right)$$

$$h = d + AE \quad H \left( \begin{array}{|c|c|c|} \hline -1 & 10 & 20 \\ \hline \end{array} \right)$$

Volumen:

$$V = \text{Betrag}(\det(AB \ AC \ AD)) = \begin{vmatrix} 1 & -8 & 7 \\ 7 & 8 & 2 \\ 1 & 18 & 2 \end{vmatrix} \\ = \begin{vmatrix} 902 \end{vmatrix} = \boxed{902}$$

$$AB \times AD = \begin{array}{|c|} \hline 118 \\ \hline -26 \\ \hline 64 \\ \hline \end{array}$$

$$A_{ABCD} = \text{Betrag}(AB \times AD) = \boxed{136,73332}$$

$$AB \times AE = \begin{array}{|c|} \hline 12 \\ \hline 5 \\ \hline -47 \\ \hline \end{array}$$

$$A_{ABFE} = \text{Betrag}(AB \times AE) = \boxed{48,764741}$$

$$AD \times AE = \begin{array}{|c|} \hline -20 \\ \hline 142 \\ \hline -72 \\ \hline \end{array}$$

$$A_{ADHE} = \text{Betrag}(AD \times AE) = \boxed{160,46183}$$

Oberfläche:

$$O = 2 * (A_{ABCD} + A_{ABFE} + A_{ADHE}) = \boxed{691,91978}$$