Opti 501 **Solutions**

Problem 13) The cross-product $\boldsymbol{A}\times\boldsymbol{B}$ has a magnitude equal to the area of the base of the parallel-piped, and is perpendicular to this base. Dot-multiplication with $\boldsymbol{C}$ then yields the product of the base area with the projection of $\boldsymbol{C}$ on the normal to the base (i.e., the height of the parallel-piped). The product of the height and the base area is thus equal to the volume.

$(\boldsymbol{A}\times\boldsymbol{B})\cdot\boldsymbol{C}=\boldsymbol{A}\cdot(\boldsymbol{B}\times\boldsymbol{C})=\boldsymbol{B}\cdot(\boldsymbol{C}\times\boldsymbol{A})$ because all three combinations represent the volume of the *same* parallel-piped. Note that the volume calculated in this way may have a minus sign and so the order of cross-multiplication is important.
