Question #74267, Physics / Mechanics | Relativity |

Calculate the volume of a parallelepiped whose sides are given by the vectors

a = 3ˆi + 2ˆj + kˆ, b = −ˆi + 3ˆj and c = 2ˆi + 2ˆj + 5kˆ

Need to find the volume of the parallelepiped.

Coordinates of vectors – a = (3, 2, 1), b = (-1, 3, 0) and c = (2, 2, 5).

Solution:

Volume of parallelepiped $V = |a \bullet (b \ \text{x} \ c)|$

We find a triple product $V = \begin{vmatrix} a_x & a_y & a_z \\ b_x & b_y & b_z \\ c_x & c_y & c_z \end{vmatrix} = \begin{vmatrix} 3 & 2 & 1 \\ -1 & 3 & 0 \\ 2 & 2 & 5 \end{vmatrix} = 3 \cdot 3 \cdot 5 + 2 \cdot 0 \cdot 2 +$

$+1 \cdot (-1) \cdot 2 - 1 \cdot 3 \cdot 2 - 2 \cdot (-1) \cdot 5 - 3 \cdot 0 \cdot 2 = 47$

Answer: V = 47.