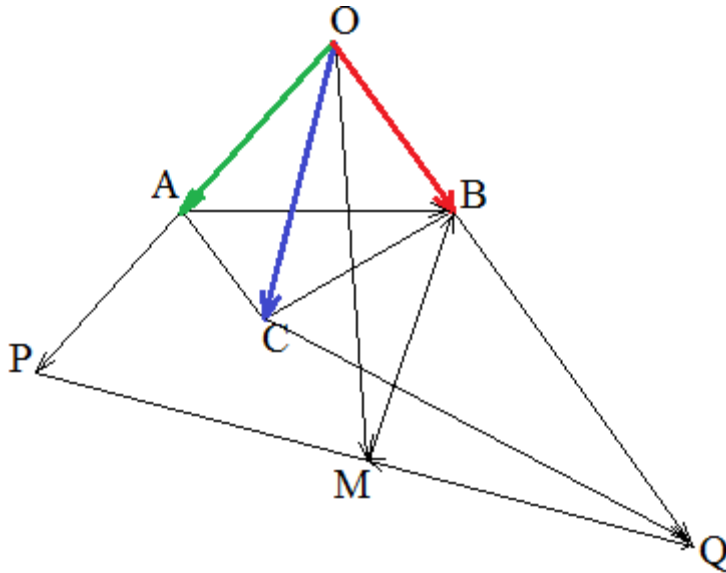


## Answer on Question #81181 – Math – Geometry

### Question

OABC is a tetrahedron and  $OA = a$ ,  $OB = b$  and  $OC = c$ . The points  $P$  and  $Q$  are such that  $OA = AP$  and  $2OB = BQ$ . The point  $M$  is the midpoint of  $PQ$ . Find (i)  $AB$ , (ii)  $PQ$ , (iii)  $CQ$ , (iv)  $QM$ , (v)  $MB$  and (vi)  $OM$  in terms of  $a$ ,  $b$  and  $c$ .

### Solution



Let  $\vec{OA} = \vec{a}$ ,  $\vec{OB} = \vec{b}$ ,  $\vec{OC} = \vec{c}$ .

Then

$$\vec{OP} = 2\vec{a}, \vec{OQ} = 3\vec{b}$$

$$\vec{OA} + \vec{AB} = \vec{OB} \Rightarrow \vec{AB} = \vec{b} - \vec{a}$$

$$\vec{OP} + \vec{PQ} = \vec{OQ} \Rightarrow \vec{PQ} = 3\vec{b} - 2\vec{a}$$

$$\vec{OC} + \vec{CQ} = \vec{OQ} \Rightarrow \vec{CQ} = 3\vec{b} - \vec{c}$$

$$\vec{QM} = -\frac{1}{2}\vec{PQ} = \vec{a} - \frac{3}{2}\vec{b}$$

$$\vec{OM} = \vec{OQ} + \vec{QM} = 3\vec{b} + \vec{a} - \frac{3}{2}\vec{b} = \vec{a} + \frac{3}{2}\vec{b}$$

$$\vec{OM} + \vec{MB} = \vec{OB} \Rightarrow \vec{MB} = \vec{b} - \left(\vec{a} + \frac{3}{2}\vec{b}\right) = -\vec{a} - \frac{1}{2}\vec{b}$$

**Answer:**

(i)  $\vec{AB} = \vec{b} - \vec{a}$ , (ii)  $\vec{PQ} = 3\vec{b} - 2\vec{a}$ , (iii)  $\vec{CQ} = 3\vec{b} - \vec{c}$ , (iv)  $\vec{QM} = \vec{a} - \frac{3}{2}\vec{b}$ ,

(v)  $\vec{MB} = -\vec{a} - \frac{1}{2}\vec{b}$ , (vi)  $\vec{OM} = \vec{a} + \frac{3}{2}\vec{b}$ .

Answer provided by <https://www.AssignmentExpert.com>