

**Mathematics Questions by Topic**

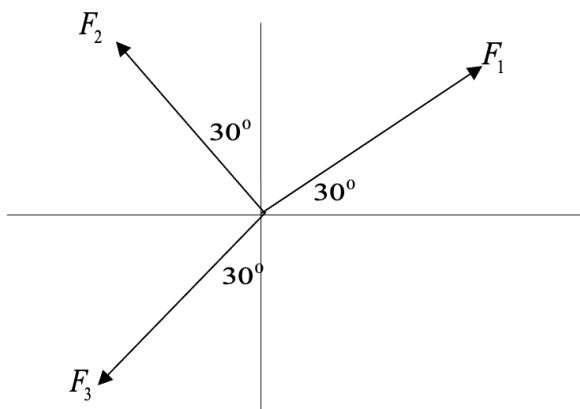
Motion and Force

Answer 38

Source: K9SM2Q11

**Question 38**

Three co-planar forces,  $F_1, F_2, F_3$  act on a particle in equilibrium as shown in the diagram below.



Then,

- A.  $F_1 = F_2 = F_3$
- B.  $3F_2 = \sqrt{3}F_1$  and  $F_2 = \frac{2}{3}F_3$
- C.  $F_1 = \sqrt{3}F_2$  and  $F_3 = 2F_2$
- D.  $\sqrt{3}F_1 = 3F_2$  and  $F_2 = \frac{3}{2}F_3$
- E.  $\sqrt{3}F_3 = 3F_2$  and  $F_1 = \frac{3}{2}F_3$

**ANSWER C**

Resolving horizontally (1)  $F_1 \cos(30^\circ) - F_2 \sin(30^\circ) - F_3 \sin(30^\circ) = 0$

Resolving vertically (2)  $F_1 \sin(30^\circ) + F_2 \cos(30^\circ) - F_3 \cos(30^\circ) = 0$

$$(1) \Rightarrow F_1 = \tan(30^\circ)(F_2 + F_3) \Rightarrow F_1 = \frac{1}{\sqrt{3}}(F_2 + F_3) \text{ so that } \sqrt{3}F_1 = F_2 + F_3$$

$$(2) \Rightarrow \tan(30^\circ)F_1 = F_3 - F_2 \Rightarrow \frac{\sqrt{3}}{3}F_1 = F_3 - F_2 \text{ so that } \sqrt{3}F_1 = 3(F_3 - F_2)$$

$$3F_3 - 3F_2 = F_2 + F_3 \Rightarrow F_3 = 2F_2 \text{ and } F_1 = \sqrt{3}F_2$$