

Mathematics Questions by Topic

Motion and Force

Answer 22

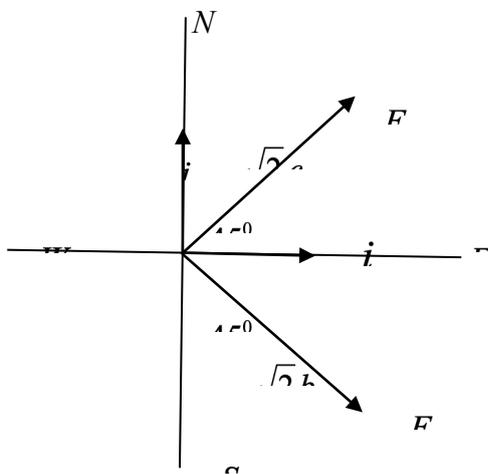
Source: K13SM2Q21

Question 22

A particle is acted upon by two forces. One has a magnitude of $\sqrt{2}b$ newtons and acts in the direction $S 45^\circ E$, the other has a magnitude of $\sqrt{2}c$ newtons and acts in the direction $N 45^\circ E$, where b and c are non-zero real positive constants. The magnitude of the resultant force is equal to

- A. $\sqrt{2}(b+c)$
- B. $\frac{\sqrt{2}}{2}(b+c)$
- C. $2\sqrt{2(b^2+c^2)}$
- D. $\sqrt{2(b^2+c^2)}$
- E. $2\sqrt{b^2+c^2}$

ANSWER D



1.1 MC Q11	
$[b \ -b] \rightarrow f1$	$[b \ -b]$
$[c \ c] \rightarrow f2$	$[c \ c]$
$\text{norm}(f1)$	$ b \cdot \sqrt{2}$
$\text{norm}(f2)$	$ c \cdot \sqrt{2}$
$f1+f2$	$[b+c \ c-b]$
$\text{norm}(f1+f2)$	$\sqrt{2} \cdot (b^2+c^2)$
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$$\underline{E}_1 = \sqrt{2}b(\sin(45^\circ)\underline{i} - \cos(45^\circ)\underline{j}) = b(\underline{i} - \underline{j}) \quad |\underline{E}_1| = \sqrt{2}b$$

$$\underline{E}_2 = \sqrt{2}c(\sin(45^\circ)\underline{i} + \cos(45^\circ)\underline{j}) = c(\underline{i} + \underline{j}) \quad |\underline{E}_2| = \sqrt{2}c$$

$$\underline{E}_1 + \underline{E}_2 = (b+c)\underline{i} + (c-b)\underline{j}$$

$$|\underline{E}_1 + \underline{E}_2| = \sqrt{(b+c)^2 + (c-b)^2} = \sqrt{b^2 + 2bc + c^2 + c^2 - 2bc + b^2} \\ = \sqrt{2(b^2 + c^2)}$$