

2. We apply Newton's second law (Eq. 5-1 or, equivalently, Eq. 5-2). The net force applied on the chopping block is $\vec{F}_{\text{net}} = \vec{F}_1 + \vec{F}_2$, where the vector addition is done using unit-vector notation. The acceleration of the block is given by $\vec{a} = (\vec{F}_1 + \vec{F}_2) / m$.

(a) In the first case

$$\vec{F}_1 + \vec{F}_2 = [(3.0\text{N})\hat{i} + (4.0\text{N})\hat{j}] + [(-3.0\text{N})\hat{i} + (-4.0\text{N})\hat{j}] = 0$$

so $\vec{a} = 0$.

(b) In the second case, the acceleration \vec{a} equals

$$\frac{\vec{F}_1 + \vec{F}_2}{m} = \frac{((3.0\text{N})\hat{i} + (4.0\text{N})\hat{j}) + ((-3.0\text{N})\hat{i} + (4.0\text{N})\hat{j})}{2.0\text{kg}} = (4.0\text{m/s}^2)\hat{j}.$$

(c) In this final situation, \vec{a} is

$$\frac{\vec{F}_1 + \vec{F}_2}{m} = \frac{((3.0\text{N})\hat{i} + (4.0\text{N})\hat{j}) + ((3.0\text{N})\hat{i} + (-4.0\text{N})\hat{j})}{2.0\text{kg}} = (3.0\text{m/s}^2)\hat{i}.$$