

54. Let $a = 30.0$ cm, $b = 20.0$ cm, and $c = 10.0$ cm. From the given hint, we write

$$\begin{aligned}\vec{\mu} &= \vec{\mu}_1 + \vec{\mu}_2 = iab(-\hat{k}) + iac(\hat{j}) \\ &= ia(c\hat{j} - b\hat{k}) \\ &= (5.00 \text{ A})(0.300 \text{ m})[(0.100 \text{ m})\hat{j} - (0.200 \text{ m})\hat{k}] \\ &= (0.150\hat{j} - 0.300\hat{k}) \text{ A}\cdot\text{m}^2.\end{aligned}$$

Thus, using the Pythagorean theorem,

$$\mu = \sqrt{(0.150)^2 + (0.300)^2} = 0.335 \text{ A}\cdot\text{m}^2 ,$$

and $\vec{\mu}$ is in the yz plane at angle θ to the $+y$ direction, where

$$\theta = \tan^{-1} \left(\frac{\mu_y}{\mu_x} \right) = \tan^{-1} \left(\frac{-0.300}{0.150} \right) = -63.4^\circ .$$