Answer on Question #73166-Physics-Other

A cube of edge length a=8.20 m sits with one corner at the origin of a xyz coordinate system. A body diagonal is a line that extends from one corner to another through the center. In unit-vector notation , what is the body diagonal that extends from the corner at

(a) coordinates (0,0,0) ,

(b) coordinates (a,0,0),

(c) coordinates (0,a,0) , and

(d) coordinates (a,a,0) ?

(e) determine the angles that the body diagonals make with the adjacent edges .

(f) determine the length of the body diagonals.

Solution

(a)

$$a\hat{\imath} + a\hat{\jmath} + a\hat{k}$$

(b)

$$-a\hat{\imath} + a\hat{\jmath} + a\hat{k}$$

(c)

$$a\hat{\imath} - a\hat{\jmath} + a\hat{k}$$

(d)

$$-a\hat{\imath} - a\hat{\jmath} + a\hat{k}$$

(e)

$$\theta = \cos^{-1}\left(\frac{1}{\sqrt{3}}\right) \approx 54.7°$$

(f)

$$d = a\sqrt{3}$$

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