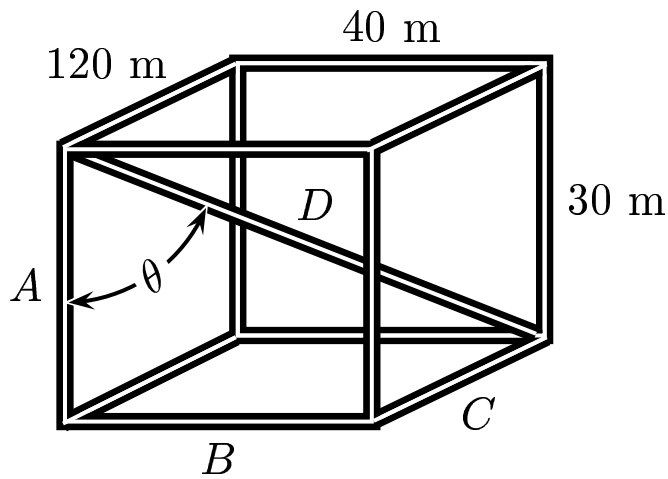


$Work = (Force\ parallel\ to\ displacement) (Displacement)$.



Consider a rectangular parallel piped (block) with sides $A = 30$ m, $B = 40$ m, and $C = 120$ m, as shown in the figure below.

What is the angle θ between the body diagonal D and the front-left edge A of the block?

- A) $\theta \approx 68^\circ$
- B) $\theta \approx 71^\circ$
- C) $\theta \approx 74^\circ$
- D) $\theta \approx 77^\circ$
- E) $\theta \approx 80^\circ$

$$\text{Note : } \|\vec{A}\| = \sqrt{A^2} = A = 30 \text{ m},$$

$$\begin{aligned}\|\vec{D}\| &= \sqrt{A^2 + B^2 + C^2} \\ &= 10\sqrt{3^2 + 4^2 + 12^2} = 130 \text{ m},\end{aligned}$$

$$\begin{aligned}\vec{A} \cdot \vec{D} &= A \hat{i} \cdot (A \hat{i} + B \hat{j} + C \hat{k}) \\ &= A^2 = (30 \text{ m})^2 = 900 \text{ m}, \quad \text{and}\end{aligned}$$

$$\vec{A} \cdot \vec{D} = \|\vec{A}\| \|\vec{D}\| \cos \theta, \quad \text{so}$$

$$\begin{aligned}\theta &= \arccos \left[\frac{\vec{A} \cdot \vec{D}}{\|\vec{A}\| \|\vec{D}\|} \right] \\ &= \arccos \left[\frac{(900 \text{ m})}{(30 \text{ m})(130 \text{ m})} \right] \\ &= \arccos [0.230769] \\ &= 76.6576^\circ.\end{aligned}$$

Answer **D**.

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