

Component formula to solve a dot product of vectors in three dimensions

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$$a \cdot b = a_x b_x + a_y b_y + a_z b_z$$

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$$a = 6i + 2j + 10k$$
$$b = 12i + 3j + 5k$$

$$a \cdot b = 6 \times 12 + 2 \times 3 + 10 \times 5$$
$$a \cdot b = 72 + 6 + 50 = 128$$

$$a \cdot b = |a||b| \cos \theta$$

$$|a| = \sqrt{6^2 + 2^2 + 10^2} = \sqrt{140}$$

$$|b| = \sqrt{12^2 + 3^2 + 5^2} = \sqrt{178}$$

$$\cos \theta = \frac{a \cdot b}{|a||b|} = \frac{128}{\sqrt{140} \times \sqrt{178}} \approx 0.811$$

$$\theta \Rightarrow \cos^{-1} 0.811 \approx \underline{\underline{35.8^\circ}}$$

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