Dot product of two vectors

To take the dot product of two vectors a and b, we multiply the vectors' like coordinates and then add the products together. In other words, we multiply the x coordinates of the two vectors, then add this to the product of the y coordinates. If we have vectors in three-dimensional space, we'll add the product of the z coordinates as well.

If we're given the vectors $a\langle a_1, a_2\rangle$ and $b\langle b_1, b_2\rangle$, then the dot product of a and b will be

$$a \cdot b = a_1 b_1 + a_2 b_2$$

Example

Find the dot product the vectors.

$$a = \langle 2,1 \rangle$$

$$b = \langle 6, -2 \rangle$$

To find the dot product of the vectors a and b, we'll multiply like coordinates and then add the products together.

$$a \cdot b = (2)(6) + (1)(-2)$$

$$a \cdot b = 12 - 2$$

$$a \cdot b = 10$$

The dot product of the vectors a and b is $a \cdot b = 10$.

Example

Find the dot product the vectors.

$$c = 2i - 6j + k$$

$$d = 2j - 3k$$

Converting our vectors into standard form, we get

$$c = \langle 2, -6, 1 \rangle$$

$$d = \langle 0, 2, -3 \rangle$$

To find the dot product of the vectors c and d, we'll multiply like coordinates and then add the products together.

$$c \cdot d = (2)(0) + (-6)(2) + (1)(-3)$$

$$c \cdot d = 0 - 12 - 3$$

$$c \cdot d = -15$$

The dot product of the vectors c and d is $c \cdot d = -15$.