Name _____ Date _____

Multiply a Vector by a Scalar - Guided Lesson Explanation

Explanation #1

Step 1: The perpendicular vector can be found by finding the cross product of both vectors.

The setup for a cross product would be:

$x = u_y \times v_z - u_z \times v_y$
$y = u_z \times v_x - u_x \times v_z$
$z = u_x \times v_y - u_y \times v_x$

Step 2: The values u = (2, 8, 0) and v = (4, 2, 6) are inserted.

$x = 8(6) - 0(2) = 48 - 0 = 48$

$y = 0(4) - 2(6) = 0 - 12 = -12$

$z = 2(2) - 8(4) = 4 - 32 = 28$

Step 3: Putting it all together gives the coordinates of the perpendicular vector:

(48, -12, 28).

Explanation #2

Step 1: The dot product of the given vectors tells us that:

$A.B = A_x B_x + A_y B_y + A_z B_z$

$= -3(7) + 0(8) + 5(9)$

$= -21 - 0 + 45 = 24$

Step 2: $\cos\theta = \frac{\vec{a}.\vec{b}}{|\vec{a}||\vec{b}|}$

$|\vec{a}| = \sqrt{a^2_x + a^2_y + a^2_z} = \sqrt{(-3)^2 + (0)^2 + (5)^2} = \sqrt{9 + 0 + 25} = \sqrt{34}$

$|\vec{b}| = \sqrt{b^2_x + b^2_y + b^2_z} = \sqrt{(7)^2 + (8)^2 + (9)^2} = \sqrt{49 + 64 + 81} = \sqrt{194}$

$$cos\theta = \frac{24}{\sqrt{34} \times \sqrt{194}} = 0.30$$

Name _____ Date _____

Step 3: Taking inverse on both sides to find the value of θ:

$$\theta = \cos^{-1}(0.3) = 72.54^{o}$$

Explanation #3

Step 1: The perpendicular vector can be found by finding the cross product of both vectors.

The setup for a cross product would be:

$x = u_y \times v_z - u_z \times v_y$
$y = u_z \times v_x - u_x \times v_z$
$z = u_x \times v_y - u_y \times v_x$

Step 2: The values u = (3, 6, 1) and v = (2, 2, 7) are inserted:

$x = 6(7) - 1(2) = 42 - 2 = 40$

$y = 1(2) - 3(7) = 2 - 21 = -19$

$z = 3(2) - 6(2) = 6 - 12 = -6$

Step 3: Putting it all together gives the coordinates of the perpendicular vector: (40, -19, -6).