✓ **Congratulations! You passed!**

Grade	Latest Submission	To pass 80% or	
received 100%	Grade 100%	higher	**Go to next item**

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1. Compute the projection matrix that allows us to project any vector $\mathbf{x} \in \mathbb{R}^3$ onto the subspace spanned by the   **2 / 2 points**

   basis vector $\mathbf{b} = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}$.

   Do the exercise using pen and paper. You can use the formula slide that comes with the corresponding lecture.

   ○ $\begin{bmatrix} \frac{1}{9} \end{bmatrix}$

   ◉ $\frac{1}{9}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 4 & 4 \\ 2 & 4 & 4 \end{bmatrix}$

   ○ $\begin{bmatrix} 1 & 2 & 2 \\ 2 & 4 & 4 \\ 2 & 4 & 4 \end{bmatrix}$

   ✓ **Correct**
   Well done!

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2. Given the projection matrix   **2 / 2 points**

   $\frac{1}{25}\begin{bmatrix} 9 & 0 & 12 \\ 0 & 0 & 0 \\ 12 & 0 & 16 \end{bmatrix}$

   project $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ onto the corresponding subspace, which is spanned by $\mathbf{b} = \begin{bmatrix} 3 \\ 0 \\ 4 \end{bmatrix}$.

   Do the exercise using pen and paper.

   ○ $\frac{1}{25}\begin{bmatrix} 5 \\ 10 \\ 10 \end{bmatrix}$

   ○ $\begin{bmatrix} 3 \\ 0 \\ 4 \end{bmatrix}$

   ◉ $\frac{1}{25}\begin{bmatrix} 21 \\ 0 \\ 28 \end{bmatrix}$

   ○ $\begin{bmatrix} 21 \\ 0 \\ 28 \end{bmatrix}$

   ✓ **Correct**
   Good job!

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3. Now, we compute the **reconstruction error**, i.e., the distance between the original data point and its projection   **1 / 1 point**
   onto a lower-dimensional subspace.

   Assume our original data point is $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ and its projection $\frac{1}{9}\begin{bmatrix} 5 \\ 10 \\ 10 \end{bmatrix}$. What is the reconstruction error?

   0.47

   ✓ **Correct**
   Well done!