If the vector space has cols/rows, your basis must have cols/rows, respectively.

2D. W = span . Find a basis for $W^\perp$.

Simplify to integers. Note, $\dim(R^3) = 3$ & $\dim(W) = 2$.

¶. $W = \text{span of } [1,1,0,1], [0,1,1,0]$.

Find an orthonormal basis for $W$.

Write your answer in factored form, e.g., $(1/\sqrt{15})[1,2,3,4]$, with integer sum = sum of integers = $1+2+3+4 = 10$. Answer has radicals.

12'(4). $W = \text{span of } [1,1,0,1], [0,1,1,0]$.

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(a) $v = \begin{bmatrix} 0 \\ 2 \\ -1 \end{bmatrix}$, $\text{proj}_W v =$

Rational answer, write in factored form, e.g., $\frac{1}{\sqrt{3}}[1,2,2]$, not $[\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}]$. Integer sum = 3

(b) $v = \begin{bmatrix} 3 \\ 1 \\ 4 \end{bmatrix}$, $\text{proj}_W v =$

Rational answer, integer sum = 24.

For 16 and 20, $W = \text{the subspace of } R^4$ with orthonormal basis $\{w_1, w_2, w_3\} = \begin{bmatrix} \frac{1}{\sqrt{2}} \\ 0 \\ 0 \\ -1/\sqrt{2} \end{bmatrix}$, $\begin{bmatrix} 0 \\ 1 \\ 0 \\ 1/\sqrt{2} \end{bmatrix}$, $\begin{bmatrix} 1/\sqrt{2} \\ 0 \\ 0 \\ 0 \end{bmatrix}$.

16(2). Write $v = [1,0,2,3]^T$ as $w + u$ with $w \in W$ and $u \in W^\perp$.

Digit answers, checksum = sum of digits = 6.

20(2). Let $v = [1,2,-1,0]$. Find the distance between $v$ and $W$. Digit answer