Matrix multiplication (by a vector):

$$\begin{pmatrix} m_{00} & m_{01} & m_{02} \\ m_{10} & m_{11} & m_{12} \\ m_{20} & m_{21} & m_{22} \end{pmatrix} \begin{pmatrix} v_0 \\ v_1 \\ v_2 \end{pmatrix} = \begin{pmatrix} m_{00}v_0 + m_{01}v_1 + m_{02}v_2 \\ m_{10}v_0 + m_{11}v_1 + m_{12}v_2 \\ m_{20}v_0 + m_{21}v_1 + m_{22}v_2 \end{pmatrix}$$

M $\quad$ v $\quad$ r

$$r_i = \sum_{j=0}^{2} M_{ij} v_j$$

M could be stored as a vector of vectors...

$$\begin{pmatrix} m_{00} & m_{01} & m_{02} \\ m_{10} & m_{11} & m_{12} \\ m_{20} & m_{21} & m_{22} \end{pmatrix} \begin{matrix} M[0] \\ M[1] \\ M[2] \end{matrix}$$

each M[i] is a vector<int>

in C++: $M_{ij} = M[i][j]$

inner prod. of two vectors u, v:

$$u \cdot v = \sum_{i=0}^{n-1} u_i v_i$$

$$\begin{pmatrix} u_0 \\ * \\ v_0 \end{pmatrix} + \begin{pmatrix} u_1 \\ * \\ v_1 \end{pmatrix} + \begin{pmatrix} u_2 \\ * \\ v_2 \end{pmatrix} = u \cdot v$$