

Answer Key

1 Vector translation review

1. $(6, 4)$.
2. $(3, 6)$.

2 Word embeddings

1. $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$.
2. $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$.
3. The vector is the same in both cases. In this embedding it represents the **male-to-female** / **feminine** direction; it also maps man to woman.
4. Yes: $\text{woman} - \text{man} = \begin{pmatrix} 3 \\ 8 \end{pmatrix} - \begin{pmatrix} 2 \\ 5 \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$, which matches Question 3.
5. Missing word: **princess**, at $(5, 6) + \begin{pmatrix} 1 \\ 3 \end{pmatrix} = (6, 9)$.

3 Translating English to Chinese

1. $\mathbf{t} = \begin{pmatrix} -15 \\ -10 \end{pmatrix}$.
2. Completed table:

English	English coords	Chinese	Chinese coords
man	(9,8)	男人	(-6,-2)
woman	(10,11)	女人	(-5,1)
boy	(7,8)	男孩	(-8,-2)
girl	(8,11)	女孩	(-7,1)
king	(8,6)	国王	(-7,-4)
queen	(9,9)	王妃	(-6,-1)
prince	(6,6)	王子	(-9,-4)
princess	(7,9)	公主	(-9,0)

Missing grid labels: (10,11) = woman, (9,9) = queen, (6,6) = prince, (7,9) = princess, and (-5,1) = 女人, (-8,-2) = 男孩, (-9,0) = 公主.

3. $\begin{pmatrix} -2 \\ 0 \end{pmatrix}$ represents the **adult/older to younger/child** direction (age/youth direction).
4. The pattern breaks for princess/公主 because 公主 is a separate lexicalised word, not a regular feminine form of 王子. Applying **t** to princess gives (-8,-1), but the actual 公主 is (-9,0).