$\boxed{\text{Check point 1}}$

P_{xy}

$$P_x = R_x P = \begin{pmatrix} 1 & 0 & 0 \\ 0 & \cos\frac{\pi}{4} & -\sin\frac{\pi}{4} \\ 0 & \sin\frac{\pi}{4} & \cos\frac{\pi}{4} \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

$$P_x = \begin{pmatrix} 1 \\ \cos\frac{\pi}{4} - \sin\frac{\pi}{4} \\ \sin\frac{\pi}{4} + \cos\frac{\pi}{4} \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \\ \sqrt{2} \end{pmatrix}$$

$$P_{xy} = R_y P_x = \begin{pmatrix} \cos\frac{\pi}{4} & 0 & \sin\frac{\pi}{4} \\ 0 & 1. & 0 \\ -\sin\frac{\pi}{4} & 0 & \cos\frac{\pi}{4} \end{pmatrix} \begin{pmatrix} 1 \\ 0 \\ \sqrt{2} \end{pmatrix}$$

$$P_{xy} = \begin{pmatrix} \frac{\sqrt{2}}{2} + 1 \\ 0 \\ -\frac{\sqrt{2}}{2} + 1 \end{pmatrix}$$

$$P_{xy} = \begin{pmatrix} 1 + \frac{\sqrt{2}}{2} \\ 0 \\ 1 - \frac{\sqrt{2}}{2} \end{pmatrix}$$

Checkpoint 2

$$P_y = R_y P = \begin{pmatrix} \cos\frac{\pi}{4} & 0 & \sin\frac{\pi}{4} \\ 0 & 1 & 0 \\ -\sin\frac{\pi}{4} & 0 & \cos\frac{\pi}{4} \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

$$P_y = \begin{pmatrix} \sqrt{2} \\ 1 \\ 0 \end{pmatrix}$$

$$P_{yx} = R_x P_y = \begin{pmatrix} 1 & 0 & 0 \\ 0 & \cos\frac{\pi}{4} & -\sin\frac{\pi}{4} \\ 0 & \sin\frac{\pi}{4} & \cos\frac{\pi}{4} \end{pmatrix} \begin{pmatrix} \sqrt{2} \\ 1 \\ 0 \end{pmatrix}$$

$$P_{yx} = \begin{pmatrix} \sqrt{2} \\ \frac{\sqrt{2}}{2} \\ \frac{\sqrt{2}}{2} \end{pmatrix}$$

$$P_{yx} = \begin{pmatrix} 2\cos\frac{\pi}{4} \\ \cos\frac{\pi}{4} \\ \cos\frac{\pi}{4} \end{pmatrix}$$

Checkpoint 3

$$T \text{ world cube} = \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix} + \begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix} = \begin{pmatrix} 3 \\ 0 \\ 3 \end{pmatrix}$$

Checkpoint 4

$$\frac{t}{2} \text{ world cube} = \cancel{\begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & \sqrt{2}/2 & -\sqrt{2}/2 & 1 \\ 0 & \sqrt{2}/2 & \sqrt{2}/2 & 2 \\ 0 & 0 & 0 & 1 \end{pmatrix}} \quad \begin{pmatrix} 3 \\ 1-\sqrt{2} \\ 2 \end{pmatrix}$$

Checkpoint 6

Increasing focal length, the object appear closer than it is actually are. (appear bigger, closer in the image frame)