SHOW ALL WORK!!!!
REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

Charges $Q_1$, $Q_2$, and $Q_3$ are at three corners of a square of side $a$.

(a) Calculate the electric field, magnitude and direction, at point $P$ due to these charges. Use the coordinate system shown.

(b) Determine the electric potential at point $P$ due to these charges, using the usual choice for $V = 0$.

\[
Q_1 = +4.72 \times 10^{-6} \text{ C} \quad Q_2 = -3.25 \times 10^{-6} \text{ C} \\
Q_3 = +2.75 \times 10^{-6} \text{ C} \quad a = 1.25 \text{ cm}
\]

\[
E_x = \frac{k|Q_1|}{a^2} - \frac{k|Q_2|}{2a^2} \cos 45^\circ = 2.055 \times 10^8 \frac{\text{N}}{\text{C}}
\]

\[
E_y = -\frac{k|Q_3|}{2a^2} \sin 45^\circ + \frac{k|Q_3|}{a^2} = 9.211 \times 10^7 \frac{\text{N}}{\text{C}}
\]

\[
|\vec{E}| = \sqrt{E_x^2 + E_y^2} = 2.25 \times 10^8 \frac{\text{N}}{\text{C}}
\]

\[
\theta = \tan^{-1} \left( \frac{E_y}{E_x} \right) = 24.1^\circ \text{ above (CCW) the x-axis}
\]

\[
V = V_1 + V_2 + V_3 = \frac{kQ_1}{a} + \frac{kQ_2}{1.5a} + \frac{kQ_3}{a} = (3.395 + (-1.652) + 1.978) \times 10^6 \text{ V}
\]

\[
V = 3.72 \times 10^6 \text{ V}
\]