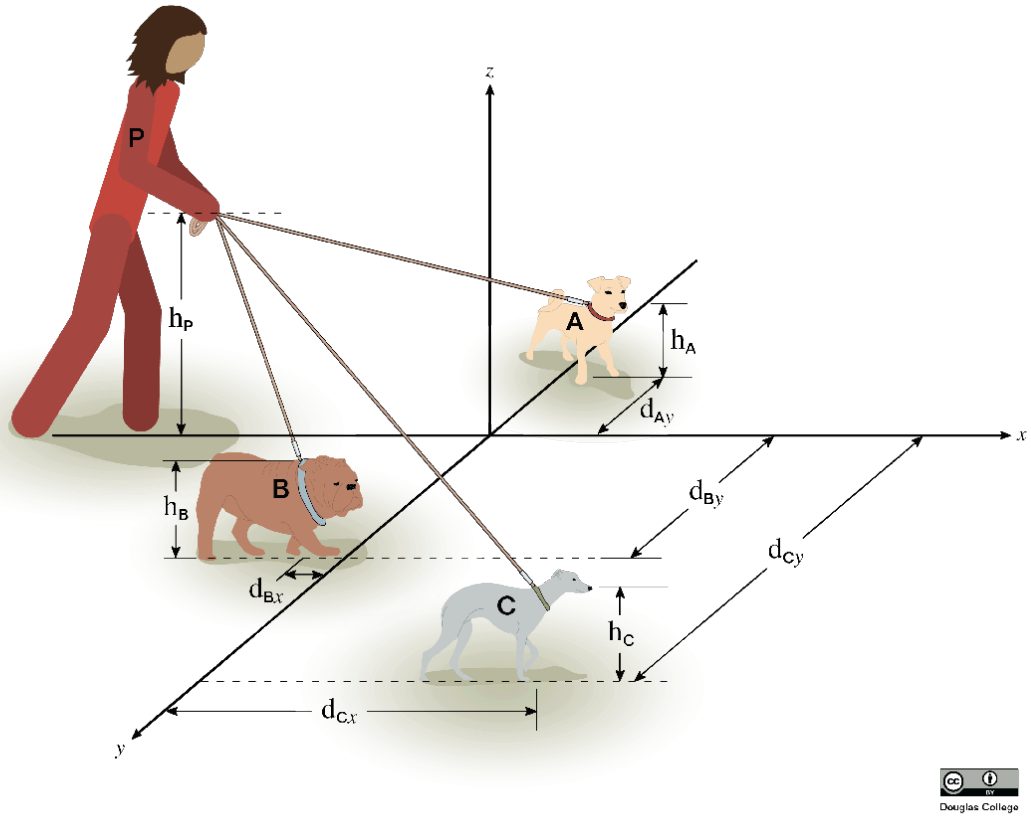
21-S-2.7-RP-02



Penguina is walking her three dogs, Alpaca, Bird, and Cat. If Penguina's hand is L ft away from the origin, find the position vectors of all the dogs relative to Penguina's hand.

Find Penguina's distance d_{Px} along the x axis from the origin.

$L = \sqrt{{d_{Px}}^2 + {h_P}^2}$

$\Rightarrow d_{Px} = \sqrt{L^2 - {h_P}^2}$

Find the position vectors of Penguina's dogs relative to her hand.

$\vec{r}_{PA} = d_{Px}\hat{i} - d_{Ay}\hat{j} + (h_A - h_P)\hat{k}$

$\vec{r}_{PB} = (d_{Px} - d_{Bx})\hat{i} + d_{By}\hat{j} + (h_B - h_P)\hat{k}$

$\vec{r}_{PC} = (d_{Px} + d_{Cx})\hat{i} + d_{Cy}\hat{j} + (h_C - h_P)\hat{k}$

Find the distance of each dog from Penguina's hand.

$$d_{PA} = \sqrt{{d_{Px}}^2 + {d_{Ay}}^2 + (h_A - h_P)^2}$$

$$d_{PB} = \sqrt{(d_{Px} - d_{Bx})^2 + {d_{By}}^2 + (h_B - h_P)^2}$$

$$d_{PC} = \sqrt{(d_{Px} + d_{Cx})^2 + {d_{Cy}}^2 + (h_C - h_P)^2}$$