

Joe drives his car west to Buffalo.

$$\text{Speed } v = 63 \pm 4 \text{ km/hour}$$

$$\text{Time } t = 1.5 \pm 0.2 \text{ hours}$$

How far did Joe drive?

$$\begin{aligned} x &= v t \\ &= 63 \frac{\text{km}}{\text{hour}} \times 1.5 \text{ hour} = 94.5 \text{ km} \end{aligned}$$

What is the uncertainty in distance?

$$\begin{aligned} \frac{\Delta x}{x} &= \frac{\Delta v}{v} + \frac{\Delta t}{t} \\ &= \frac{4 \frac{\text{km}}{\text{hour}}}{63 \frac{\text{km}}{\text{hour}}} + \frac{0.2 \text{ hour}}{1.5 \text{ hour}} \\ &= 0.063 + 0.133 \\ &= 6.3\% + 13.3\% \\ &= 0.196 = 19.6\% \end{aligned}$$

So

$$\frac{\Delta x}{x} = 0.196 \quad \text{or a } 19.6\% \text{ uncertainty}$$

$$\Delta x = (0.196)(x) = (0.196)(94.5 \text{ km}) = 18.6 \text{ km}$$

$$\rightarrow \boxed{x = 94.5 \pm 18.6 \text{ km}}$$