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Problem 5

A bowling ball was timed with a stopwatch and the travel time was estimated at 2.40 s with an uncertainty of 0.10 s. The distance the path of the bowling lane was found to be 18.288 m with an uncertainty of 0.330 m. Find the speed, s_{m}.

$$\begin{aligned} s &= \frac{d}{t} \\ s &= \frac{18.288\,\mathrm{m}}{2.40\,\mathrm{s}} \\ &= 7.62\,\mathrm{m/s}. \end{aligned}$$

$$\begin{aligned} \Delta s &= |7.62| \sqrt{\left(\frac{0.330\,\mathrm{m}}{18.288\,\mathrm{m}}\right)^2 + \left(\frac{0.10\,\mathrm{s}}{2.40\,\mathrm{s}}\right)^2} \\ &= 0.345\,994\,942\,16\,\mathrm{m/s}. \end{aligned}$$

$$s_{\mathrm{m}} = 7.62 \pm 0.35\,\mathrm{m/s}.$$