Homework Template

Chapter x

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LaTeX **Path:** *HW_1_Error_Analysis_Owen_Fitzgerald.tex*

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1 Problem 1

To measure the activity of a radioactive sample, two students count the alpha particles it emits. Student A watches for 3 minutes and counts 28 particles; Student B watches for 30 minutes and counts 310 particles. (a) What should Student A report for the average number emitted in 3 minutes, with his uncertainty? (b) What should Student B report for the average number emitted in 30 minutes, with her uncertainty? (c) What are the fractional uncertainties in the two measurements? Comment.

Solution 3.1
Section 3.2: The Square-Root Rule for a Counting Experiment

$$student_{A_{time}} = 3 \text{ minutes} = 180 \cdot s \quad student_{A \text{ emission rate}} = \frac{28}{3} \cdot \frac{particles}{minute} \tag{1.1}$$

$$student_{B_{time}} = 3 \text{ minutes} = 180 \cdot s \quad student_{B \text{ emission rate}} = \frac{300}{3} \cdot \frac{particles}{minute} \tag{1.2}$$

(a)

$$student_{A \text{ Emitted in 3 minutes}} = 28 \tag{1.3}$$

$$student_{A \text{ uncertainty}} = \sqrt{28} \approx 5.29150262212918... \tag{1.4}$$

$$student_{A \text{ uncertainty}} = \pm 5 particles emmited \tag{1.5}$$
