Lab Skills Review Worksheet

SHOW YOUR WORK ON ALL CALCULATIONS

1. We made lots of measurements over the course of the semester, many using a ruler or a meter stick. In each case, we estimated the uncertainty in that measurement. Explain how and why the uncertainty in the width of a rectangular object would likely be different from the uncertainty in the width of a spherical object. (4 pts)
2. A stopwatch can usually measure to the nearest tenth of a second, or maybe even hundredth of a second. However, it wouldn’t make sense to use these amounts as the uncertainty in the measurement of someone, say, dropping a ball to the floor. Why? (4 pts)

How would you estimate the uncertainty in this type of measurement that involves human reaction time? (3 pts)

1. Suppose two different lab groups were making measurements of the initial velocity of a ball. One group measures the velocity of the ball to be 5.8 ± 0.3 m/s and the other measures 6.0 ± 0.1 m/s.
2. Which group’s measurement was more precise? Explain. (3 pts)
3. Are their measurements of velocity consistent with one another? Explain. (3 pts)
4. If you wanted to compare these two values with one another, would you use percent error or percent difference? Perform the calculation. (5 pts)
5. Your lab group performed an experiment to measure the acceleration due to gravity and obtained a value of 9.85 ± 0.05 m/s2. Would you use percent error or percent difference to measure the accuracy of your measurement? Perform the calculation. (5 pts)
6. You are measuring the height change of an object by subtracting two measurements of height. h1 = 20.35 ± 0.05 cm and h2 = 5.40 ± 0.05 cm. What would you quote as the final value for the change in height and its uncertainty? (5 pts)
7. You are measuring the area of a table’s surface. The length of the table is 1.25 ± 0.03 m and the width of the table is 0.64 ± 0.05 m. What would you quote as the final value for the area of the table’s surface and its uncertainty? (6 pts)
8. You are attempting to calculate from the equation . Using the measurements below, calculate the value of and its uncertainty. (8 pts)

1. Graph the following data as distance versus time in the same manner that we have made graphs all semester. Include a linear fit, error bars, and titles as appropriate. Print out a copy of the graph and attach it to this worksheet. (15 pts)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Distance (m) | | | Time (s) | | |
| 5.05 | ± | 0.05 | 2.35 | ± | 0.01 |
| 25.40 | ± | 0.05 | 4.55 | ± | 0.02 |
| 51.2 | ± | 0.1 | 8.95 | ± | 0.05 |
| 74.3 | ± | 0.2 | 12.1 | ± | 0.1 |
| 142.5 | ± | 0.5 | 25.4 | ± | 0.1 |
| 168 | ± | 0.8 | 30.4 | ± | 0.2 |
| 210 | ± | 1 | 36.6 | ± | 0.4 |
| 260 | ± | 3 | 45.8 | ± | 0.5 |
| 345 | ± | 4 | 59.2 | ± | 0.5 |

Perform a linear regression. What is the slope and y-intercept of this fit, with their uncertainties? List the values below: (6 pts)

Slope: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ y-intercept: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Would you consider this data to be well fit by a linear model? Explain why. (3 pts)