M E 345 - Instrumentation, Measurements, and Statistics

Today, we will:

- Introduce the course and instructor: **John M. Cimbala, 863-2739, jmc6@psu.edu**
- Briefly go over the course website at **www.mne.psu.edu/me345**
- Review first pdf module: **Introduction to Mechanical Engineering Measurements**
- Do some practice questions and example problems
- If time, show some hints about plotting in Excel.

Practice Questions:

1. How many significant digits are in each of these numbers?

Number	Number of sig. digits	Exponential notation
603.		
600		
600		
0.007		
1.005		
7		
7.		
50.		
0.01070		
732,000		
732,000		
732,000		
732,000.		

2. What is 2.00/3.0?

Example: Significant digits

Given: 3 measurements with 3 different instruments

i) 134,290 (5 significant digits)
ii) 0.2875 (4 significant digits)
iii) 29.473 (5 significant digits)

(*a*) To do: Round each number to 3 significant digits.

Solution:

(*b*) To do: Add the 3 numbers and report the answer to the appropriate number of significant digits.

i) 134,290 (5 significant digits)
ii) 0.2875 (4 significant digits)
iii) 29.473 (5 significant digits)

Solution:

(*c*) To do: Multiply the first two numbers and report the answer to the appropriate number of significant digits.

i) 134,290 (5 significant digits)
ii) 0.2875 (4 significant digits)
iii) 29.473 (5 significant digits)

Solution:

Example: Significant digits – Gas mileage calculations

(*a*) **Given**: You travel 210.0 miles in your new car, and use 7.00 gallons of gas.

To do: Calculate your gas mileage in units of miles per gallon. Give your answer to the appropriate number of significant digits.

Solution:

(*b*) **Given**: You estimate that your car gets 28 miles per gallon. Gas costs $3.899 per gallon.

To do: How much does it cost to travel 455 miles? Give your answer to the appropriate number of significant digits.

Solution:

(*c*) **Given**: You fill up your tank, drive 316.5 miles, and pay $44.89 to fill up your tank again. Gas costs $3.799 per gallon. [Assume we fill the tank to exactly the same level.]

To do: Calculate your gas mileage in units of miles per gallon. Give your answer to the appropriate number of significant digits.

Solution:

Example: Significant digits – pressure

Given:

- Atmospheric pressure P_{atm} = 101.3 kPa
- Gage pressure at point 1 is 1,350 Pa
- Gage pressure is defined as $P_{gage} = P - P_{atm}$, where P = absolute pressure

To do: Calculate the absolute pressure at location 1, taking into account the appropriate number of significant digits.

Solution: