Breakout Reminder

• For each new question/breakout session
  • Previous leader is now the reporter
  • Next person in alphabetical order is the new leader
• Agree on Leader and Reporter at the start
• Can divide up the work in any way the group decides, can have different people try different approaches
Error Prop. Reminder

- Valid for independent random errors (Chap. 3)

- Addition/subtraction
  \[ \delta(x + y) = \sqrt{\left(\delta x\right)^2 + \left(\delta y\right)^2} \]

- Multiplication/division
  \[ \frac{\delta(xy)}{xy} = \sqrt{\left(\frac{\delta x}{x}\right)^2 + \left(\frac{\delta y}{y}\right)^2} \]

- Exponentiation
  \[ \frac{\delta(x^n)}{x^n} = n \frac{\delta x}{x} \]

- General
  \[ \delta[f(x, y)] = \sqrt{\left(\frac{\partial f}{\partial x} \delta x\right)^2 + \left(\frac{\partial f}{\partial y} \delta y\right)^2} \]
Question 1

You need to measure the volume of a cylinder. Your lab group measured the diameter as \( x = 1.20 \pm 0.12 \text{ cm} \), and the length as \( y = 10.0 \pm 0.5 \text{ cm} \).

• Find the measured volume of the cylinder (including uncertainty): \( V = \frac{\pi}{4} x^2 y \)

• If you wanted to improve your accuracy, which dimension should you try to measure better?
You want to find $\cos(\theta)$ and you have measured the angle $\theta = 5 \pm 15$ degrees

- Do the error propagation using the general formula

- Does this answer make sense? Why or why not?

- How else might you evaluate the best value and uncertainty for $\cos(\theta)$?