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

$$\delta(x+y) = \sqrt{(\delta x)^2 + (\delta y)^2}$$

  - 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 $x = 1.20 \pm 0.12$ cm,
and the length as $y = 10.0 \pm 0.5$ cm.

- Find the measured volume of the cylinder (including uncertainty): $V = \pi/4\ x^2\ y$

- If you wanted to improve your accuracy, which dimension should you try to measure better?

Question 2

You want to find cos(θ) and you have measured the angle θ = 5 ± 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(θ)?