

Stress Strain Work Sheet

Materials deform under loads. Deformation means they change shape. It is possible to experimentally determine the proportional relationship between the load (stress) in psi and the amount of deformation (strain) in inches.

In this experiment you will create a graph that illustrates the stress/strain proportionality as well as define the elastic limit and breaking strength of a monofilament fishing line.

Directions

Research Strength of materials terms and concepts. [Click here](#) to navigate to a website that offers clear explanations of strength of materials terms.

Create a stress/strain graph for a monofilament fishing line similar to the line used to attach the projectile to the trebuchet throwing arm.

Stress is calculated using this simple algebraic formula:

Stress = Load (lbs)/ Area (square inches)

Strain = The amount of elongation due to stress

Modulus of Elasticity (E) = Stress/Strain

Additional necessary formulas

Area of a Circle = $\pi * \text{Radius}^2$

1. Suspend a lightweight monofilament fishing line so that it hangs about 48" above the floor.
2. Drill 2 small (1/8") holes at the top (opposite quadrants) of a coffee can and attach a coat hanger to the holes on the coffee handle to make a handle similar to a paint can.
3. Attach the coffee can to the fishing line.
4. Measure the diameter of the fishing line using the dial calipers. Calculate the cross sectional area of the fishing line.
5. Measure the height of the coffee can above the floor. Measurements should be accurate to 1/16" or 1.5 mm. Record this measurement.
6. Weight out 1/8 lb of water and pour the water into the coffee can.
7. Measure the change in height of the coffee can above the floor caused by the stretching of the fishing line in response to the added mass of water it supports.
8. Calculate the stress acting on the fishing line (See worksheet). Record this value each time water (weight) is added to the coffee can.
9. Repeat steps 4 through 6 until the fishing line breaks.
10. Graph the results of the experiment using the Stress Strain Worksheet.