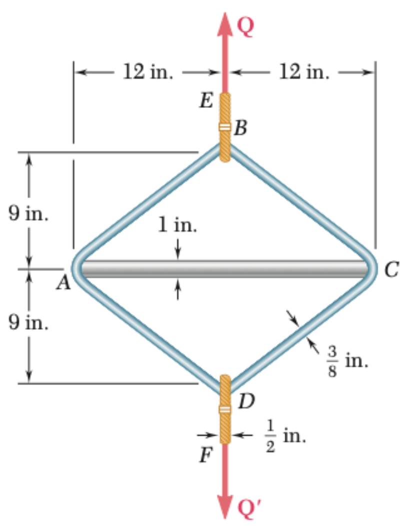
Assignment #4 - Computational Assignment to understand the vairance in a problem.

In Assignment #2 you were asked to develop a computational tool that can analyze a multi-member system subjected to various real-world scenarios based on homework style problem



PROBLEM 1.37

A steel loop *ABCD* of length 5 ft and of $\frac{3}{8}$-in. diameter is placed as shown around a 1-in.-diameter aluminum rod *AC*. Cables *BE* and *DF*, each of $\frac{1}{2}$-in. diameter, are used to apply the load **Q**. Knowing that the ultimate strength of the steel used for the loop and the cables is 70 ksi, and that the ultimate strength of the aluminum used for the rod is 38 ksi, determine the largest load **Q** that can be applied if an overall factor of safety of 3 is desired.

Part 1

For this assignment, please expand on your code to allow the user to select from the list of materials in the table below, I have also included the table as a .csv file in the description. Any of the three types of members in the problem should be able to be assigned the material properties of any of the items in the problem (the loop, the rod, or the cables). In addition, add a way to determine the weight of each member and the cost of each member from the information in the table. Submit this code update with the assignment to receive credit.

Material Type	Material	Modulus of Elasticity (Mpsi)	Poisson's Ratio	Yield Strength (ksi)	Strain to Failure (%)	Density (lb/in³)	Cost per lb ($)
Steel Alloy	AISI 1045	29.0	0.29	45	15.0	0.284	0.5
Steel Alloy	AISI 4140	29.7	0.28	60	12.0	0.284	0.8
Steel Alloy	AISI 4340	29.0	0.29	70	11.0	0.283	1.2
Steel Alloy	Stainless 304	28.0	0.3	30	45.0	0.29	2.0
Steel Alloy	Stainless 316	28.0	0.3	30	40.0	0.29	2.5
Aluminum Alloy	6061-T6	10.0	0.33	40	12.0	0.098	1.5
Aluminum Alloy	7075-T6	10.4	0.33	73	11.0	0.101	2.5
Aluminum Alloy	2024-T3	10.6	0.33	50	18.0	0.101	2.2
Aluminum Alloy	5083-H116	10.2	0.34	35	14.0	0.096	2.0
Aluminum Alloy	7050-T7451	10.3	0.33	63	10.0	0.102	3.0
Titanium Alloy	Ti-6Al-4V	16.5	0.34	120	14.0	0.16	25.0
Titanium Alloy	Grade 2 Titanium	14.5	0.34	50	20.0	0.163	15.0
Titanium Alloy	Beta-C Titanium	17.0	0.35	140	10.0	0.175	30.0
Thermoplastic	Nylon 6/6	0.4	0.39	8	100.0	0.041	3.0
Thermoplastic	Polycarbonate	0.34	0.37	10	120.0	0.043	5.0
Thermoplastic	PTFE (Teflon)	0.08	0.45	3	300.0	0.032	10.0
Thermoplastic	UHMWPE	0.1	0.42	4	250.0	0.034	8.0
Thermoset	Epoxy	0.5	0.35	12	2.0	0.042	6.0
Thermoset	Phenolic	0.6	0.3	8	1.0	0.045	4.0
Thermoset	Polyester Resin	0.55	0.32	10	3.0	0.044	7.0
Thermoset	Vinyl Ester Resin	0.52	0.31	9	2.5	0.046	6.5

Part 2
Use the code to solve the initial problem given as 1.37 above with Stainless 304 steel for the steel components and AL6061-T6 for the aluminum components.

Part 3
Using this original configuration, determine the weight of the four components (AC, ABCD, BE/DF) and the total weight of the entire structure. Assume a length of the cables BE and DF and to be 3 ft each.

Part 4
Assuming that you would like to be efficient with the materials that you are using, adjust the geometry of any of the members of the problem to ensure that all members have a safety factor of approximately 2.5, thereby ensuring that you are not over designing any part of the structure. (Please keep the same material choices as in part 2 for this part)

Part 5
Repeat part 4, but now you are free to select any materials from the list. Using a safety factor of 2.5 re-solve the problem but try to reduce the total weight of the structure.

Part 6
Repeat part 4, but now you are free to select any materials from the list. Using a safety factor of 2.5 re-solve the problem but try to reduce the total cost of the structure.