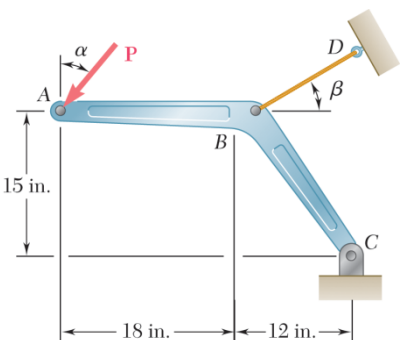




Computer Lab 1: Factor of Safety



A 4-kip force P forming an angle α with the vertical is applied as shown to member ABC , which is supported by a pin and bracket at C and by a cable BD forming an angle β with the horizontal. (a) Knowing that the ultimate load of the cable is 25 kips, write a computer program to construct a table of the values of the factor of safety of the cable for values of α and β from 0 to 45° , using increments in α and β corresponding to 0.1 increments in $\tan \alpha$ and $\tan \beta$. (b) Check that for any given value of α , the maximum value of the factor of safety is obtained for $\beta = 38.66^\circ$ and explain why. (c) Determine the smallest possible value of the factor of safety for $\beta = 38.66^\circ$, as well as the corresponding value of α , and explain the result obtained.

MATLAB/PYTHON REPORT Rubric

Create a code using MATLAB, Python, or other programming language that solves the problem, and verify your code results with manual calculations. Present your findings in a TYPED report, which follows the format below. Take care to follow instructions for the report closely.

1. **Cover page and formatting:** Title, author, date, pages numbered. Include a separate title page with the information listed and be sure the report follows the formatting outlined here. Include a table of contents, along with a list of figures and list of tables at the beginning of the report. All figures and tables must be labeled, numbered, and referenced by number in the body of the report. **(5 points)**
2. **Problem statement:** Givens, unknowns, and sketches. This part must clearly define the problem to a reader who is not familiar with the project and should include any images or sketches necessary to explain the original problem. Feel free to use the image included with the original assignment but the explanation of the problem has to be in your own words. **(10 points)**



3. **Theory Manual:** Derive any equations/formulas you used, and number them for reference. Define your variables, draw free body diagrams of the global system and any “cuts” you make, and include anything else that is necessary to explain the solution method. **(20 points)**
 - a. Note that this is a typed report. **All equations and work must be typed and presented in a professional manner.** Hand-drawn figures are fine, provided they are neat and scanned clearly.
4. **Programmer manual:** Explain the logic of your code and the methods used to implement your solution. Things to include: table with variables used and their description, table of user-built functions used and their description, flowcharts, explanations of main program/subroutines, etc. **(10 points)**
5. **Results and Analysis:** Include output figures and calculation results, as well as commentary and physical meaning of results. This should include written explanation and commentary, not just tables or code output. Figures should be referenced and explained in the text as well as the numerical results. Include hand calculations to validate your program. **(55 points)**
6. **Appendix:** Copy and paste your code here.
7. **Deliverables:** Upload on Canvas a pdf file and a .m or .py file.

Other notes: The best reports are not necessarily the longest; be clear and explain exactly what the reader needs to understand.