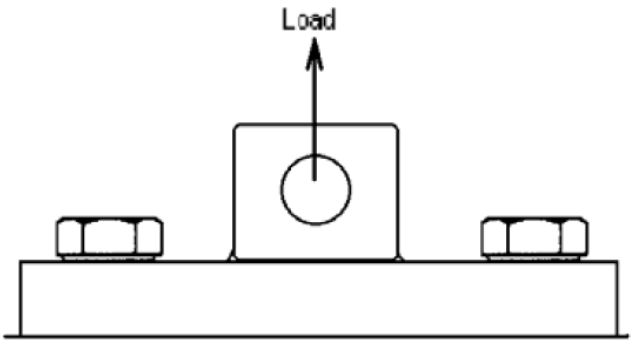
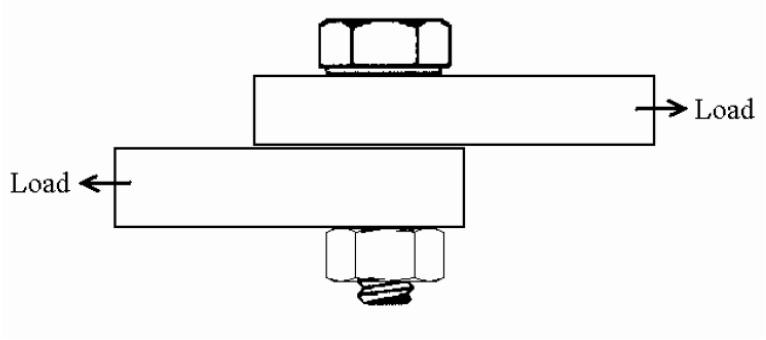
Recitation Assignment #3

Please do the following problems during your recitation session, including any additional problems given to you by your TA. Within 72hrs of your recitation session, you must upload the complete solutions to these problems to Sakai, so that your TAs can evaluate them in a timely fashion. **Please submit any .m files to Sakai. Your .m files should be named in the following format: NETIDRecitation3Problem#, where NETID is your NetID, and # is the problem number. For instance if your NetID was aaa111, and you were answering problem 3, your .m file would be named aaa111Recitation3Problem3.m. All of your .m files should be in the form of a function. If you do not meet these naming requirements, and do not save as a function, you will not receive credit for your submission.** Collaborative problems can be worked on in teams of up to 5 people, as long as each team member individually completes the problem uploads the solution as part of their own Sakai submission or shows the solution to their instructor individually, and lists the names of all collaborators in the Sakai submission. Collaboration and discussion of solutions is not permitted for questions labeled as individual problems.

1. [Collaborative] When designing structures, it is important to know the physical properties of your construction materials, and the forces that will be exerted on those materials after construction is complete. For example, we often use fasteners like bolts and screws to bear loads in static and mechanical constructions. Two of the types of loads that fasteners must bear are called tension and shear loads.



Tension Joint



Shear Joint

Images from and numbers adapted from Fastenal Technical Reference Guide, https://www.fastenal.com/content/documents/FastenalTechnicalReferenceGuide.pdf

Where tension loads put strain on the fastener lengthwise, in a stretching motion, and shear loads put strain on the fastener in a cross direction, in a bending or snapping motion. Fasteners are made from different materials, each with different tensile and shear "strengths." The strength of a material is defined as the maximum load that it can bear in a certain direction without deforming.

Material	Shear Strength (pounds/in^2)	Tensile Strength (pounds/in^2)
Grade 1 Low Carbon Steel	33,000	60,000
Grade 2 Low Carbon Steel	55,000	74,000
Grade 5 Medium Carbon Steel	85,000	120,000
Grade 8.2 Low Carbon Boron Steel	120,000	150,000

Write a function in MATLAB that has two inputs, a shear load (as the first input) and a tension load (as the second input). Have it return a string of the name of the **lowest grade material** from the table above that can handle those loads. For example, if you wrote:

```
gradeToUse = aaa111Recitation3Problem1(40000,80000);
disp(gradeToUse)
```

You would see the string "Grade 5 Medium Carbon Steel" printed to the command line. Please copy and paste the names from the table above to avoid typos, which could affect grading. **Please *do not* put user input statements (aka the "input" function) or print statements ("disp" or "display") in place of inputs and outputs in a function header, or anywhere in this program.**

2. [Individual] Write a MATLAB function that takes the final percentage of course credit that somebody receives in this class and returns the associated letter grade. If you don't know this breakdown, please see the syllabus.

   For example, if you wrote:

   ```
   myCourseGrade = aaa111Recitation3Problem2(77);
   disp(myCourseGrade)
   ```

   You would see the string "C+" in the command line. **Please *do not* put user input statements (aka the "input" function) or print statements ("disp" or "display") in place of inputs and outputs in a function header, or anywhere in this program.**

3. [Individual] Write a MATLAB function that takes an input number, x, and returns an output number, y, that will be of the following form:

$$y = -x \text{ when } x < 0$$

$$y = x^2 \text{ when } 0 \leq x \leq 1$$

$$y = \log(x) + 1 \text{ when } x > 1$$

Where log is the natural log (sometimes written “ln”). The natural log function in MATLAB is simply “log.” For example, if you wrote:

y = aaa111Recitation3Problem3(3);

The value in the variable y would be 2.0986. If you wrote:

y = aaa111Recitation3Problem3(-1);

The value in the variable y would be 1. If you wrote:

y = aaa111Recitation3Problem3(0.5);

The value in the variable y would be 0.25. **Please *do not* put user input statements (aka the “input” function) or print statements (“disp” or “display”) in place of inputs and outputs in a function header, or anywhere in this program.**