Name: _____ANSWER_____ Section: _____

Practice for exam2 – Solar Panels

You are testing a new type of heat shield for water landings of a capsule. After testing, you analyze the different shield pieces, assess how much each piece has been damaged (in percentage), and compare to an acceptable percentage! Will it be safe or no?

USE *ONLY* THE KNOWLEDGE TAUGHT IN CLASS AND IN VIDEOS.

Some data is known by the user, other is randomly generated.

- the engineer knows how many pieces of heat shield were used. This is always a whole value greater than or equal to 3.
- the engineer knows how much percentage of damage they are willing to accept. This is a float between 10 and 70 both accepted. A 10 represents 10%.
- the engineer knows the surface area of each piece, in cm^2.
- the percentage of damage of each piece however is **generated randomly** by MATLAB each time the code runs. This is a floating value between 10 and 100, both excluded. Again, a 10 represents 10%.

Using this data, you need to calculate the total surface area, as well as the total damaged surface.

- The *total surface area* is calculated by adding all the surfaces given by the user.
- The *surface area damaged* on one shield is calculated as:

surface area damaged on one shield = percentage /100 * surface area of that shield.

The *overall surface area damaged* is the sum of those separate shield area damage.

Then, you can calculate the overall percentage of damage and conclude whether the new type of heat shield is good or bad: overall damage percentage = *overall surface area damaged/ total surface area* *100

```
  ** Heat Shield Analysis **

How many heat shield pieces are there (whole>=3): 6.6
   ERROR: (whole>=3): 2
   ERROR: (whole>=3): 3
How much percentage of damage are you willing to accept? (10<= p <=70): 9
   ERROR: (10<= p <=70): 71
   ERROR: (10<= p <=70): 25.65

What is the surface area of shield #01 (15<= s <=70 cm^2): 45.56
   Shield 56.2% destroyed (25.6cm^2)

What is the surface area of shield #02 (15<= s <=70 cm^2): 68.4
   Shield 46.2% destroyed (31.6cm^2)

What is the surface area of shield #03 (15<= s <=70 cm^2): 24
   Shield 16.8% destroyed (4.0cm^2)

   ** oh no! you have 44.37% damage!
```
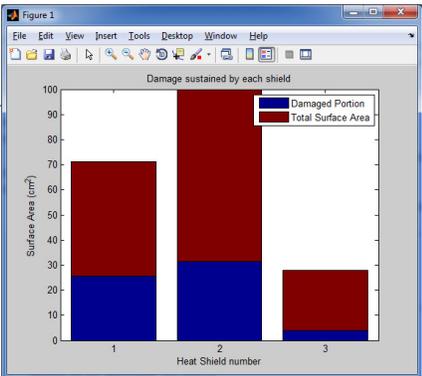

Do not trap. Assume valid inputs for this input only.

100pts Program Requirements:

3pts   name, purpose, section

5pts   useful comments

5pts   proper indentation

3pts   spacing

3pts   proper use of semi-colons

5pts   code runs (no red errors please. orange is ok for vectors, but comment out what crashes.)

5pts   show testing: as usual for each trap, once for the overall code. Remember: piece by piece. NOT all has to show.

No in any specific order:

- 5pts   the output must have some nice presentation/spacing. pay attention to \n and spacing!
- 10pts   prompt and trap the user when invalid amounts of shield pieces and accepted percentage are entered. show a TEST as soon as that works
- 5pts   use any loop you wish to go through each heat shield piece
- 5pts   indicate the shield's number and prompt the user for the surface area. ASSUME THE USER IS SMART AT THAT INSTANT, AND ALL VALUES ENTERED ARE CORRECT. i.e. no trap. Store that surface in a vector for future plotting.
- 6pts   randomly generate/display (1decimal) a percentage. Again, this is a float value between 10 and 100 both excluded.
- 5pts   calculate and display (1 decimal) the actual area destroyed for that shield piece. ALSO store in a vector (different than the first vector. Use a brand new one.) again due to future plotting.
- 10pts   calculate the total surface area AND the total damaged area overall. Use two running totals, or the `sum()` function, properly placed in the code
- 5pts   calculate the overall percentage destroyed
- 10pts   compare the overall percentage destroyed with the accepted to determine what message to indicate: "oh no!" or "this seems to work!"
- 3pts   create a stacked bar graph that shows the voltage of each panel. Assuming you have your two vectors mentioned above, created as we did in class, the syntax is exactly:

```
bar( [ vectorWithDamageSurfaceHere ; vectorWithEachSurfaceAreaHere ]' ,'stacked');
```

- 4pts   format the plot as usual with all the necessary information

Extra Credit #1

What are the two syntaxes of the input() command? Explain the difference briefly

Syntax

- `x = input(prompt)`
- `str = input(prompt,'s')`

one is for numerical inputs, the other for char inputs.

Extra Credit #2 (only counts if #1 is complete AND if the overall code works FIRST. NO CREDIT OTHERWISE)

Error check the section that was assumed valid. Complete this in the current file as you cannot submit a zip.

Algorithm:

- ==nice presentation==
- ==prompt and trap== ==amounts of shield pieces==
- prompt and trap ==accepted percentage==
- ==loop you wish to go through each heat shield piece==
  - indicate ==the shield's number== and
  - ==prompt== the user for the ==surface area.==
  - ==Store that surface in a vector==
  - ==randomly== generate
  - ==display== (1decimal) a ==percentage==
  - ==calculate== and ==display== ==actual area destroyed for that shield piece==.
  - ==store in a new vector==
- ==calculate== ==total surface area==
- calculate ==total damaged area overall==. (sum UNDER the loop, like mean())
- ==calculate== the ==overall== ==percentage destroyed==
- if : ==compare==
  - ==what message to indicate==: "oh no!" or "this seems to work!"
- ==create== a stacked bar
  ==`bar( [ vectorWithDamageSurfaceHere ; vectorWithEachSurfaceAreaHere ]' ,'stacked');`==
- ==format==