Name: _____ANSWERs_____ **Section:** _____

Practice for exam2 – Solar Panels

A little robot you have to ship to space has to be powered by solar panels. A solar panel is made up of power cells, placed in rows and colums (see picture). When many power cells are put together, they provide a vertain total voltage. You are to determine if a design is sufficient to power your robot!

USE ONLY THE KNOWLEDGE TAUGHT IN CLASS AND IN VIDEOS.

Some data is known by the user, other is randomly generated.
- the user knows how many solar panels are used. This is always a whole value greater than *or equal to* 3.
- the following two values are **generated randomly** by MATLAB each time the code runs. These two values are always whole values. You must use rand() to generate one, randi() for the other.
  - the voltage of one cell used on a specific solar panel. The same cell is used throughout one solar panel, but may vary on the next solar panel. All cells have the same constrains: $8 \leq voltage \leq 14$
  - the number of rows on each solar panel is also constrained: $2 \leq nRows \leq 10$ *CORRECT
- the user knows how many cells are on each row, though also constrained: $5 \leq nCells \leq 10$

Using this data, you need to calculate the total voltage all the solar panels provide when combined together. These can be calculated as:

total voltage for one solar panel = number of cells on each row * voltage of one cell

Then, the total voltage overall is the sum of the total voltages for each panel.

```
** A little robot needs power! Let the sun help!

 How many solar panels are there (whole>=3): 3.6
    ERROR: (whole>=3): 2
    ERROR: (whole>=3): 3
 How many volts does the robot need (>200Volts): 200
    ERROR: (>200Volts): -5
    ERROR: (>200Volts): 222.22

 Solar panel #01
 One cell provides: 12 Volts
    This panel has 28 rows of cells.
       How many cells are on each of these rows (5<=whole<=10): 10

 Solar panel #02
 One cell provides: 14 Volts
    This panel has 21 rows of cells.
       How many cells are on each of these rows (5<=whole<=10): 5

 Solar panel #03
 One cell provides: 8 Volts
    This panel has 13 rows of cells.
       How many cells are on each of these rows (5<=whole<=10): 6

 ** You have a total of 238 volts when all is done.
    ** All good!
```
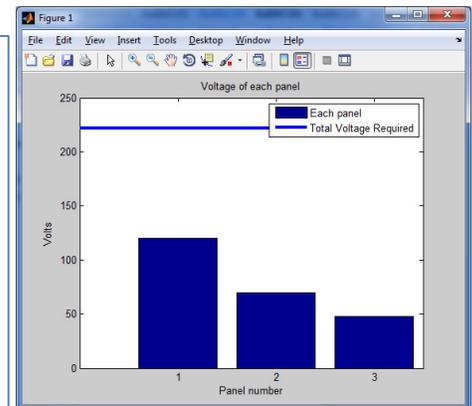
Figure 1 — Voltage of each panel (bar chart: Each panel / Total Voltage Required; Volts vs Panel number)

*Again, I won't penalize on that boundary. Though so far 100%of you have done what's written above (since honestly, noone could really guess what my boundaries were just by looking a the 28, 21, and 13…. ☺)

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 solar panels and voltage required are entered. show a TEST as soon as that works
- 5pts   use any loop you wish to go through each solar panel
- 6pts   randomly generate a voltage for one cell of each solar panel AND randomly generate a number of rows. ONE of these must be generated using the rand() function. Both these values are integers
- 5pts   display the solar panel's number, the voltage one cell provides and the number of rows the panel has,
- 3pts   THEN ask how many cells are on each row. ASSUME THE USER IS SMART AT THAT INSTANT, AND ALL VALUES ENTERED ARE CORRECT. i.e. no trap
- 5pts   calculate the total voltage for that panel, and store it in a vector for future plotting use
- 5pts   calculate the total voltage overall. Use a running total, or the `sum()` function, properly placed in the code
- 10pts   compare the total overall voltage with the voltage required to determine what message to indicate: "more panels" or "power is sufficient"
- 5pts   create a bar graph that shows the voltage of each panel. Use `bar(your vector);` only
- 8pts   add a horizontal line that shows the voltage required. (Note that if one panel alone crosses that line, you would know the others are for backup… but that's not something this code can do!)
- 4pts   format the plot as usual with all the necessary information

Extra Credit #1

Name the two default data types in MATLAB and write the four most common placeholders used in this class.

double and char

%d %f %c %s

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.

while isempty(numRows) || numRows<5 || numRows>10 || floor(numRows)~=numRows

numRows = input(' ERROR: bla bla : ');

end