s== Directions for contributors: Please delete these directions before writing problem if layout is important. The QRP solve BringMN macro will delete them (and anything between s double equal and double equal s markup tags like those around this section) otherwise.

1) get a problem number from <https://qrproblems/faculty.org> after submitting a provisional problem title

2) Save this file as a docx file with the name “p#\_ problem title” where # is the problem number then fill the problem number in the heading above.

3) compose the problem in this template. Any variable parameters should be put in the form ##varname,[var type],[Base case value]##. var type can have value of num, txt, arr or img or up to three game variables g#\_num or g#\_txt where # is 1,2 or 3. More details and examples on the website. Repeated instances of the variable should be exactly the same as the first occurrence (use copy/paste). Denote different parts of the problem that will be computer checked with p==a==p, p==b==p…p==j== p (these will be replaced with a) b) later by a macro in QRP solve)

3a) for numerical Game variables copy and paste the following:

##varname,g1\_num,Basecase value##

##varname,g2\_num,Basecase value##

##varname,g3\_num,Basecase value##

For text Game variables copy and paste the following:

##varname,g1\_txt,Basecase value##

##varname,g2\_txt,Basecase value##

##varname,g3\_txt,Basecase value##

Replace the varname and the Bacecase values. You may only use a total of 3 game variables that must be of type g1\_???, g2\_??? And g3\_??? - where ??? is either txt of num. You can change the box length to fit the longest word of the options for that variable, but do not change its format or layout options.

4) Add different higher level qualitative questions at the end of the problem.

5) Delete these directions Open the QRPSolution template. –This bring the variable names into the solution template.

6) solve the problem – see QRPsolve template for directions on this.

7) Run Prep macro in QRPSolve template to prep this document and I/O files for upload

8) Upload required files to QRPproblems web site and provide metadata. A simple example is shown below and this can be deleted or replaced:

- Note anything included between the t== and ==t will be included with the base case values in the area denoted by u== and ==u in the final version. v== ==v denotes the header and will be only included on the first page of a multi problem assignment. w== ==w denotes the written response area that must be graded by a human or eliminated in the game version.

==s

t== The disc was made of ##material,txt,iron##, had a diameter of ##diam,g1\_num,1.0## meters and a thickness of ##thick,num,10## mm. If the ##material,txt,iron## costs $##price,g2\_ num,2.14## per pound, determine the

p==a==p volume of the disc in cubic centimeters

p==b==p specific gravity of the disc

p==c==p mass of the disc in kg

p==d==p the material cost (in $) for one of these discs

==t

s== The base case will go in the base case input tags below (please do not remove them) ==s

v== **Base Case Index = 1**

==v

u==

==u

w== Please answer two of the following in type written format and hand in with your assignment

i) Find a reference for the price of the material you were given. What was the price of this material 5 years ago, 10 years ago? Is this material more expensive than iron? Cite your reference(s)

ii) Comparing the disc above to a utility access cover in the middle of some streets (aka manhole covers). Would this be a good material for these covers? Why or why not? Besides making them out of different material what two different modifications could be performed on the discs to make them more suitable for this application.

iii) Investigate the history of the material on the web. When was this material discovered or made? How is it currently manufactured and where? Please cite at least two sources.

==w