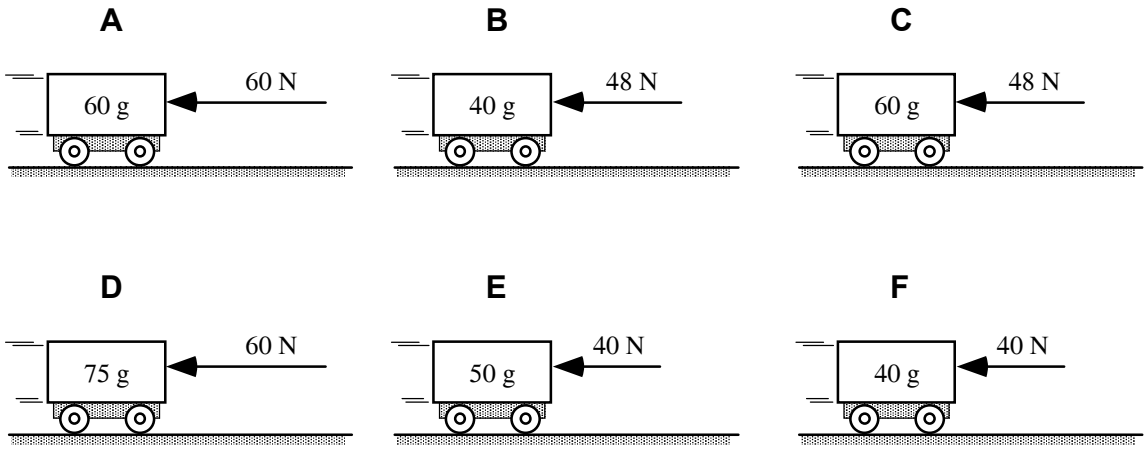
Ranking Task Sample II

Each ranking task will have a number of situations, or variations of a situation, that have varying values for two or three variables. Your task is to rank these variations on a specified basis. After ranking the items, you will be asked to explain how you determined your ranking sequence and the reasoning behind the way you used the values of the variables to reach your answer. An example of how to work the ranking tasks follows.

Example:

Shown below are six situations where a cart, which is initially moving to the right, has a force applied to it such that the force will cause the cart to come to a stop. All of the carts have the same initial speed, but the masses of the carts vary, as do the forces acting upon them.

Rank these situations, from greatest to least, on the basis of how long it will take each cart to stop.



Greatest 1___B___ 2___A___ 3___F___ 4___C___ 5___D___ 6___E___ Least

Or, all of these carts will require the same time to stop. _____

Please carefully explain your reasoning.

I think the time depends on the acceleration, so I divided the forces by the masses.

How sure were you of your ranking? (circle one)

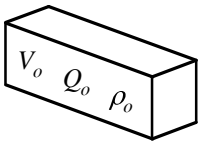
Basically Guessed				Sure				Very Sure	
1	2	3	(4)	5	6	7	8	9	10

Notice in this example that in one instance, two of the situations produced the same value of the ratio used to determine the ranking, and that the letters for the ones that tied are circled showing they were ranked equally (A and F). In another instance, three of the remaining situations have the same ranking and they are circled together (C and D and E), showing this result. In the same way, it is possible that all of the arrangements will give the same result for a particular basis. If that occurs, and only if that occurs, the option of all equal, or all the same, should be chosen.

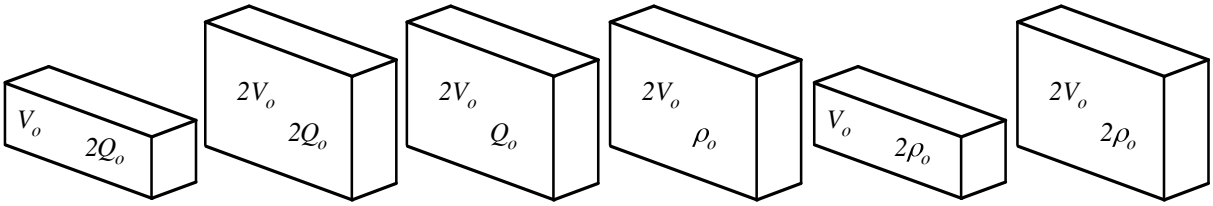
ELECTROSTATICS
RANKING TASKS (RT)

ET1-RT1: CHARGED INSULATING BLOCKS—CHARGE DENSITY

The block of insulating material shown at right has a volume V_o. An overall charge Q_o is spread evenly throughout the volume of the block so that the block has a uniform charge density ρ_o.



Six additional charged insulating blocks are shown below. For each block, the volume is given as well as *either* the charge or the charge density.



Block A **Block B** **Block C** **Block D** **Block E** **Block F**

Rank the charge densities of the six blocks.

Greatest 1 ___*AEF*___ 2 _____ 3 _____ 4 ___*BD*___ 5 _____ 6 ___*C*___ Least

OR, the charge density is the same for all six blocks. ____

OR, the ranking for the charge density cannot be determined. ____

Carefully explain your reasoning.

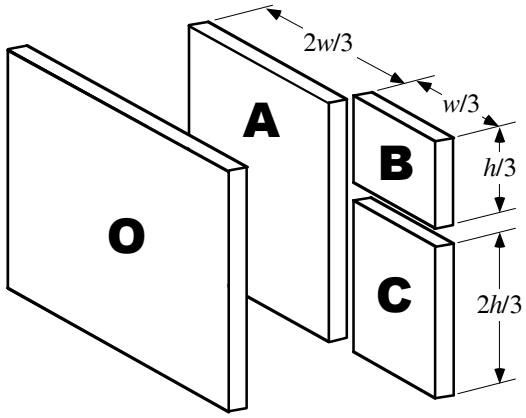
Charge density is defined as the ratio of total charge divided by volume, so you compute that for each block if not already given.

How sure were you of your ranking? (circle one)

Basically Guessed					Sure				Very Sure
1	2	3	4	5	6	7	8	9	10

ET1-RT2: Breaking a Charged Insulating Block—Charge Density

A block of insulating material (labeled O in the diagram) with a width *w,* height *h,* and thickness *t* has a positive charge $+Q_o$ distributed uniformly throughout its volume. The block is then broken into three pieces, A, B, and C, as shown.



Rank the charge densities of the original block O, piece A, piece B, and piece C.

Greatest 1 _____ 2 _____ 3 _____ 4 _____ Least

OR, the charge density is the same for all four pieces. __*X*__

OR, the ranking for the charge densities cannot be determined. ____

Carefully explain your reasoning.

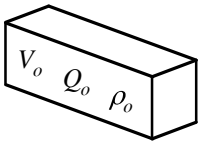
The charge density is not going to change because each block will have a charge proportional to its volume since the charge is uniformly distributed.

How sure were you of your ranking? (circle one)

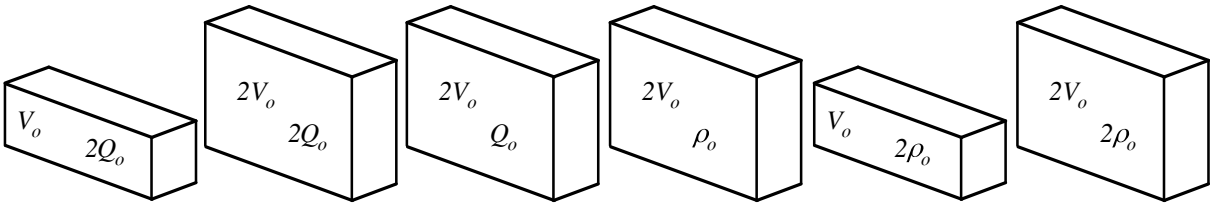
Basically Guessed					Sure				Very Sure
1	2	3	4	5	6	7	8	9	10

ET1-RT3: CHARGED INSULATING BLOCKS—CHARGE

The block of insulating material shown at right has a volume V_o. An overall charge Q_o is spread uniformly throughout the volume of the block so that the block has a charge density ρ_o.



Six additional charged insulating blocks are shown below. For each block, the volume is given as well as *either* the charge or the charge density of the block.



Block A **Block B** **Block C** **Block D** **Block E** **Block F**

Rank the overall charge of the six blocks.

Greatest 1 ___*F*___ 2 ___*ABDE*___ 3 _____ 4 _____ 5 _____ 6 ___*C*___ Least

OR, the charge is the same for all six blocks. ____

OR, the ranking for the charge cannot be determined. ____

Carefully explain your reasoning.

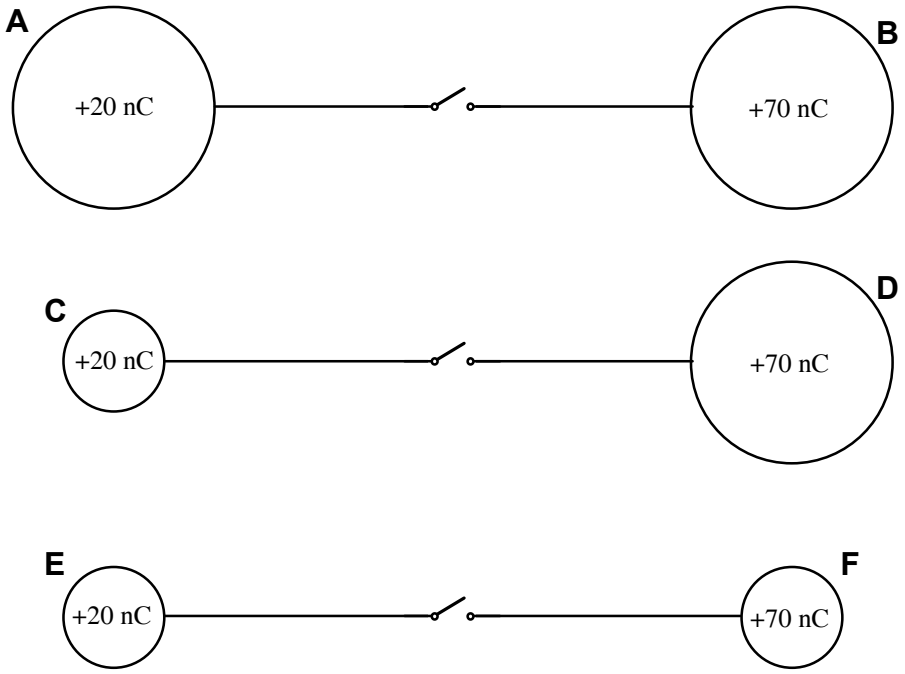
To determine the total charge for the blocks where it is not given we need to multiply the charge density by the volume and then rank the blocks.

How sure were you of your ranking? (circle one)

Basically Guessed					Sure				Very Sure
1	2	3	4	5	6	7	8	9	10

ET1-RT4: PAIRS OF CONNECTED CHARGED CONDUCTORS—CHARGE

Three pairs of charged, isolated, conducting spheres are connected with wires and switches. The spheres are very far apart. The large spheres have twice the radius of the small spheres. Each sphere on the left has a charge of +20 nC and each sphere on the right has a charge of +70 nC before the switches are closed.



Rank the electric charge of the spheres after all of the switches are closed.

Greatest 1 ___*D*___ 2 ___*ABEF*___ 3 _____ 4 _____ 5 _____ 6 ___*C*___ Least

OR, the electric charge is the same for all six spheres. _____

OR, the ranking of the electric charge cannot be determined. _____

Carefully explain your reasoning.

The charges will move until the potential of each sphere will be the same. Equal size spheres will share the charge equally, but where the sizes differ the larger sphere will have the larger charge.

How sure were you of your ranking? (circle one)

Basically Guessed					Sure				Very Sure
1	2	3	4	5	6	7	8	9	10