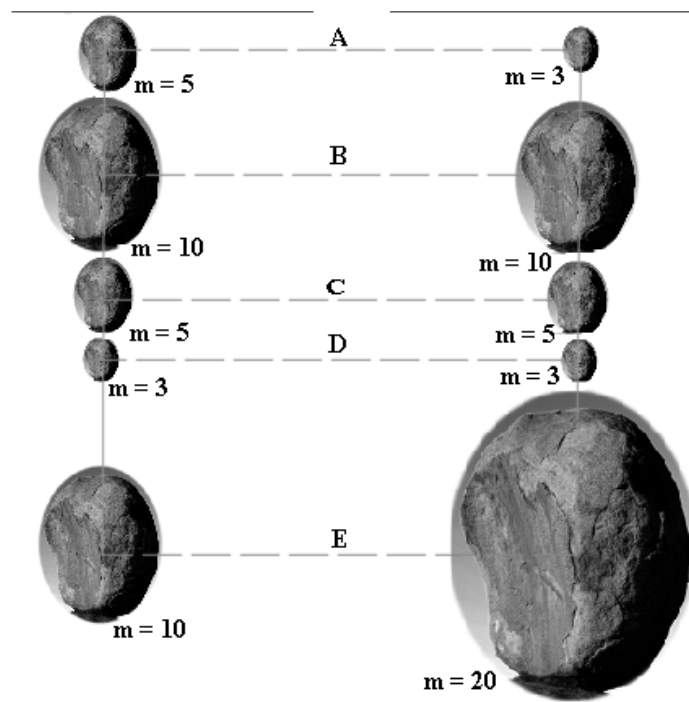


## Ranking Task for Gravity – How it Works

[Adapted from *Conceptual Astronomy and Physics Education Research (CAPER) Team, University of Arizona*]



The figures at the left show pairs of two rocky planets with masses ( $m$ ) separated by a distance ( $d$ ). Masses are in arbitrary units, and the distances between the centers of each pair of planets are exactly the same. (It is accurate enough to assume that all of the mass of the planet, or any body, is concentrated at a point right in the middle.)

01. Consider just the planets on the **left** side of each pair, A – E, when doing following: Rank the **left-side** planets according to the strength of the gravitational force on it, from greatest force to the least force. (Use A, B, C, D, and E.)

Greatest \_\_\_\_\_ Least

What logic did you use in ranking the planets the way you did?

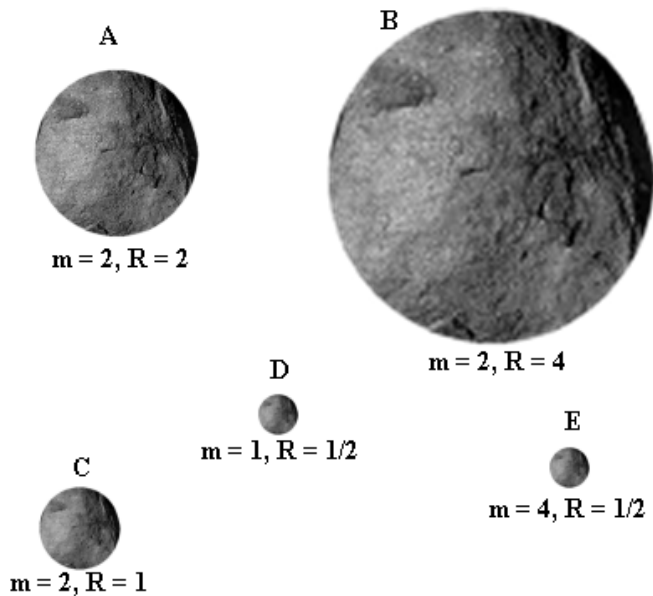
02. Consider just the planets on the **right** side of each pair, A – E, when doing the following: Rank the **right-side** planets according to the strength of the gravitational force on it, from greatest force to the least force. (Use A, B, C, D, and E.) Greatest \_\_\_\_\_ Least

What logic did you use in ranking the planets the way you did?

03. Using Newton’s Second Law,  $a = F/m$ , rank the acceleration, from greatest to least, that the planet located on the **right** side of each pair would experience due to the gravitational force exerted on it.

Greatest \_\_\_\_\_ Least

What logic did you use in ranking the planets in this way?



In this figure, we have 5 celestial worlds with different masses and radii. Since we are doing comparisons, the units may be arbitrary.

01. Rank these worlds according to the gravitational force that you would feel on each surface, from greatest to least (your mass stays the same):

greatest \_\_\_\_\_ least

Explain carefully the logic you used in making this ranking.

02. Let's say that you stepped on a scale on each world, A – E, and weighed yourself. From “the most” to “the least,” rank the worlds according to what you would weigh on it. Assume you do not change your mass while traveling between worlds.

most: \_\_\_\_\_ least

Explain carefully the logic you used in ranking this way.

Shown below is the Earth-Moon system to scale, along with 5 possible positions for a spacecraft traveling from the Earth to the Moon. Note that position C is exactly half-way between the Earth and the Moon.



03. Rank from greatest to least the strength of the total gravitational forces at positions A – E exerted by **both** the Earth and the Moon on the spacecraft. greatest \_\_\_\_\_ least

Explain carefully the logic you used in ranking this way.