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by parmenides51

1   In triangle ABC, angle C is right and the two catheti are both length 1. For one given the choice of the point P on the cathetus BC, the point Q on the hypotenuse and the point R are plotted on the second cathetus so that PQ is parallel to AC and QR is parallel to BC. Thereby the triangle is divided into three parts. Determine the locations of point P for which the rectangular part has a larger area than each of the other two parts.

2   Determine all sets of real numbers x, y, z which satisfy the system of equations

$$\begin{cases} xy = z \\ xz = y \\ yz = x \end{cases}$$

3   This year's gift idea from BabyMath consists of a series of nine colored plastic containers of decreasing size, alternating in shape like a cube and a sphere. All containers can open and close with a convenient hinge, and each container can hold just about anything next in line. The largest and smallest container are both cubes. Determine the relationship between the edge lengths of these cubes.

4   Regarding a natural number n, it is stated that the number n^2 has 7 as the second to last digit. What is the last digit of n^2?

5   In a ballroom, seven gentlemen A, B, C, D, E, F and G sit directly across from seven queens a, b, c, d, e, f and g in random order. When the gentlemen rise and walks across the dance floor to bow to each of their ladies, someone notices that at least two of the men travel equally long distances. Will it always be like this? The figure shows an example. In the example, $|Bb| = |Ee|$ and $|Dd| = |Cc|$.
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