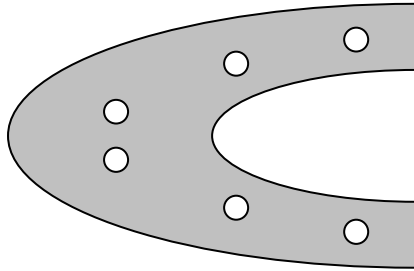


PUZZLE BASED LEARNING - SOLUTIONS

Horseshoe

There is a horseshoe with six holes for nails, as shown below:

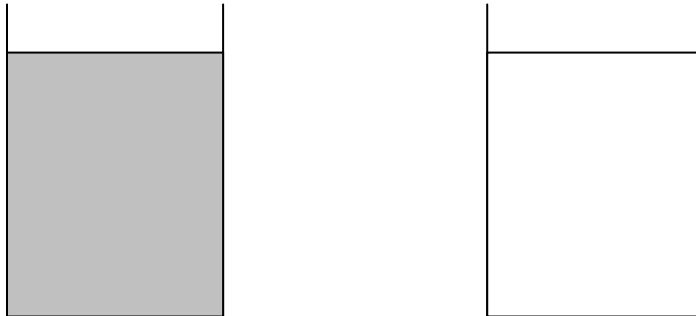


Using two straight-line cuts, chop it into six separate parts with a hole in each part.

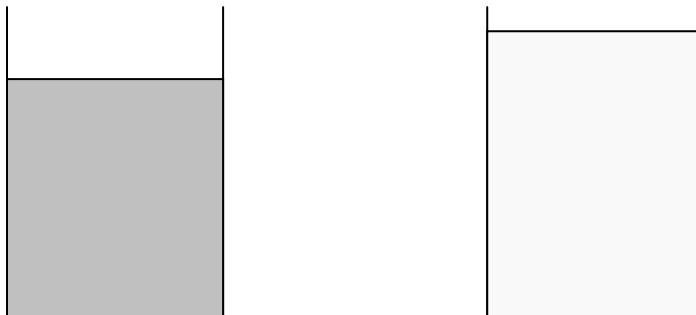
Make the first vertical cut to separate two holes, reposition the left separated piece above the right piece turning it by 90 degrees, and make the second vertical cut. The puzzle illustrates the difference between a problem and its model.

Juice

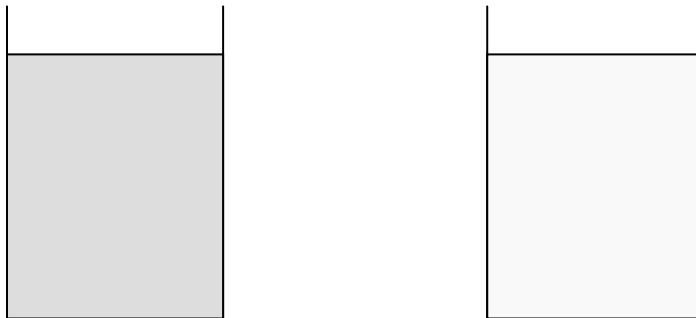
In front of you is a glass of water and a glass of juice. Their volumes are identical:



You take a full spoon of juice and put it in the glass of water:



After briefly stirring up the mixture, you put a full spoon of the mixture back into the glass of juice:

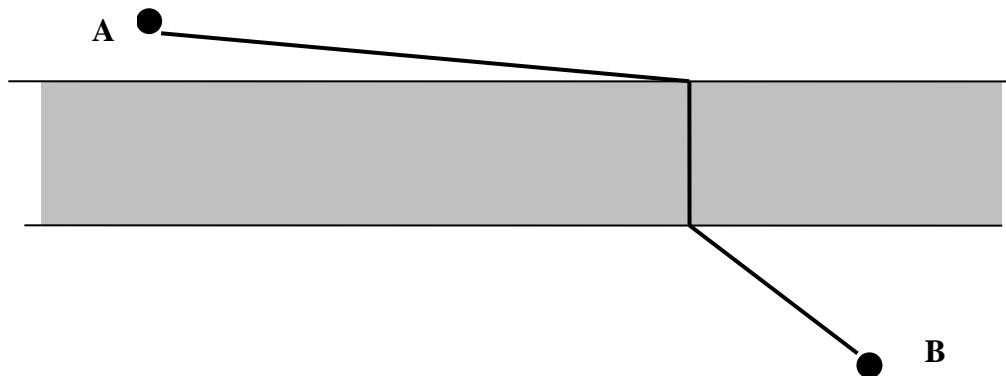


Which is greater: the amount of juice in the water or the amount of water in the juice?

The amounts are the same

Building a bridge

Suppose we have to build a road from city A to city B, but these cities are separated by a river. We'd like to minimise the length of the road between these cities. The bridge must be constructed perpendicular to the banks of the river. Now, the question is: where to build the bridge so as to minimise the total length of the road?



Since the solution doesn't depend on the width of the river, we can solve this by setting the width to be 0 - move the bottom bank of the river up to meet the top bank, and move B up by the same amount. Now the shortest distance between A and this raised version of B is a straight line. Call the point where this line meets the river P. This is where to build the bridge.

Chocolate

A rectangular chocolate bar consists of $m \times n$ small rectangles and you wish to break it into its constituent parts. At each step, you may pick up one piece and break it along any of its marked vertical or horizontal lines. How can we break the chocolate bar into single pieces with the minimum number of steps?

It does not matter : any sequence of breaks which leads to the final arrangement has to have the same number of breaks!