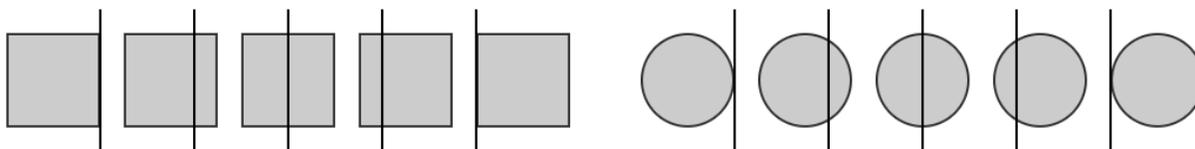
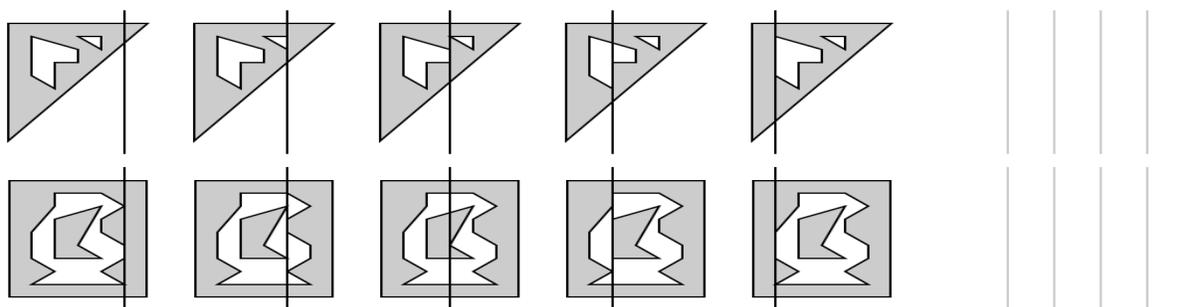


1 Traveling Through Dimensions

First stop: the one-dimensional world of *Lineland*! The civilians here are not familiar with triangles, squares, circles, etc. — only lines. One day, Shawn the Square and Jeremy the Circle (inhabitants from 2D *Flatland*) decided to visit Lineland. As they entered, the Linelanders would only see the part of them that intersected with their world.



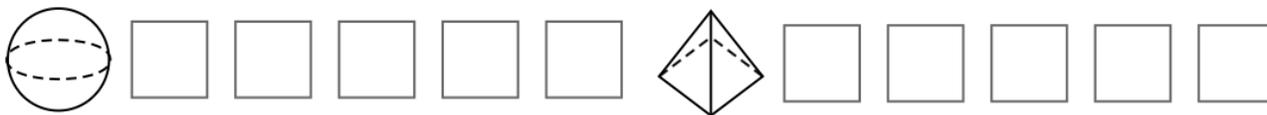
Shawn would only be seen as a line segment with a constant length. What about Jeremy? Wait, new peculiar shapes from Flatland are coming! Can you draw what they would like to Linelanders?



Look at the series of picture below. What capital letter of the alphabet corresponds to each series?



Now some beings from *Spaceland* are invading Flatland! Beware the sphere and the pyramid! Draw what the Flatlanders would see as each 3D object goes across Flatland.



The Spacelanders sent some vases to attack Flatland. Match each vase to the correct series of images.

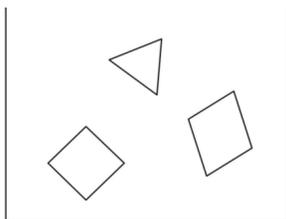


Flatland needs multiple observations to imagine 3D, but Spaceland (that's us!) tells by a glance. How would a 4D-lander see 3D objects? Can you imagine what 4D looks like? Hm... search up a *tesseract*.

2 Packing

2.1 In order to travel, you better pack your belongings!

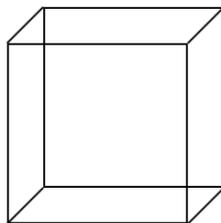
1. You want to pack your various items into a square box. All your belongings are of regular shapes. Which shapes can fit into the box and use the entire space?



2. Additionally, you have a bunch of different sized circles, and you want to make sure each size goes in a different box. Which box has the most space left over?
3. Do you wonder if square boxes are the best boxes to store items in? Given that all boxes have the same area, are there other boxes that fill more space with less cardboard (perimeter)?

2.2 Spaceland

However, you live in Spaceland, not Flatland! How does the requirements for packing a box change?



1. Which 3D regular shapes can fit together perfectly?
2. When filling a cubic box full of marbles, how should they be stacked in order to contain the most marbles?