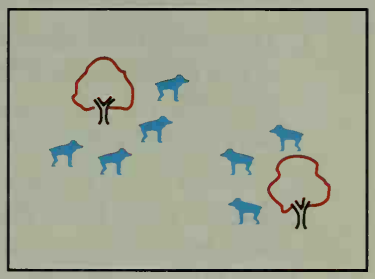
Territorial Monkeys (Chapter 2)

Materials: Ruler, protractor, compass

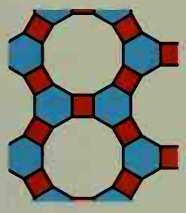


Imagine that scientists have placed two small troops of territorial monkeys in a rectangular enclosure containing two trees. By means of threat and some physical conflict, each troop stakes out its territory, with one of the trees serving as the troop's home tree. The final result is that each troop's territory is the set of all points inside the enclosure that are nearer to its home tree than to the other troop's home tree.

1. Make a diagram of the enclosure and the two trees. Figure out where to place the boundary between the two territories, making measurements with a ruler if you need to. You may also wish to use a protractor and/or a compass. Describe an efficient method for finding and drawing the boundary.
2. Suppose that a third home tree and a third monkey troop are added to the enclosure. Assuming that territories for three troops are established in the same way as for two troops, draw the new boundary. Describe a systematic method of determining the location of the boundary. Apply your method to one or two other arrangements of three trees. Write down anything interesting you notice about the shape of the boundary.
3. Extend your method to four or more trees. Draw at least two examples.

Tessellations (Chapter 3)

Materials: Ruler, protractor, compass



A *tessellation* is a repeating pattern of one or more shapes that covers the plane completely without any overlap. Tessellations often use regular polygons. A simple tessellation of squares is shown, along with a more complex tessellation that uses regular hexagons and dodecagons (12-gons), as well as squares.

Because a tessellation is a repeating pattern, the same number and type of polygons must meet at each vertex. In both tessellations shown above, notice that the sum of the angles that share each vertex is 360°, as it must be if the polygons are to cover the plane completely without any overlap.

1. Two other regular polygons (besides the square) can be used alone to create tessellations. Find these two polygons and draw tessellations using them.
2. Create several other tessellations that use a combination of regular polygons. Remember, you must find a *repeating* pattern that covers the plane.
3. Not all tessellations use regular polygons. Draw a tessellation that uses a *scalene* triangle.