Glow-in-the-Dark Geometry

The Big Idea:

Students explore the attributes of shapes and make them glow!

Students Will Need:

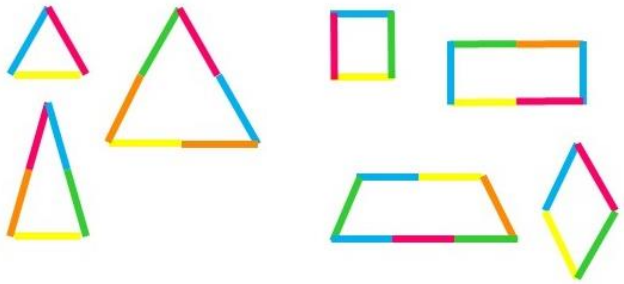
- ★ Glowsticks: 20-25 per person, or more if you have them!
- ★ If you don't have glowsticks on hand, try whole crayons, markers, pencils, straws, chopsticks, toothpicks or any other set of objects that are roughly the same length.
- ★ An area that can be made dark

The Math Behind the Scenes:

- ★ Geometry: K.G.B.4, K.G.B.6, 1.G.A.2, 2.G.A.1, 3.G.A.1, 4.G.A.2, 5.G.B.3
- ★ Angle measurement: 4.MD.C

Introducing... Shapes that Glow!

1. Invite students to try these challenges using the glowsticks as line segments.
   - ★ Make different sized triangles.
   - ★ How many different 4-sided shapes can you make and name?
   - ★ How about shapes with 5 or 6 sides?

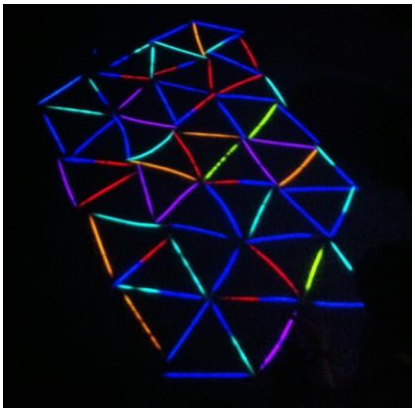


2. Flick off the lights briefly to show off the shapes!

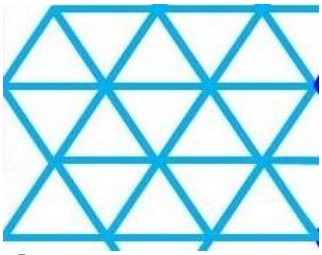
Hit the Floor

Explain to students that flat shapes with straight sides are called **polygons**. And if all sides and angles are equal, they're **regular polygons**. Now they're going to cover the floor with **repeating polygons**. See if they can figure out which shapes fit together with no gaps or overlaps.

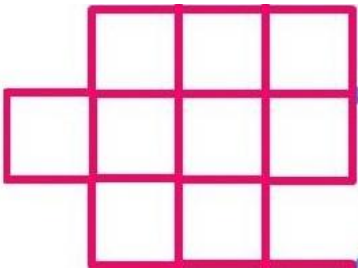
1. Each student experiments to see what shapes fit together. They pick one that works, and lay sticks on the floor to repeat that shape over and over to create a lattice.
2. You (the teacher) can **build triangles to start**, since it's easy to morph from that lattice to the other two shapes.
3. **Flick off the lights** to see everyone's floor patterns glow! Ask students to angle their cameras to show off their work.
4. Now discuss the lattices kids discovered.



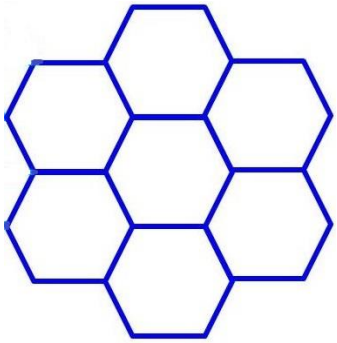
5. One is the **equilateral triangle**. Ask why triangles can tile like this …discuss how each angle must be **60 degrees**, so 6 triangles neatly come together to fill 360 degrees.



6. Now show students how we can remove a few sticks slanting to the right to make **rhombi** (plural of **rhombus** - diamonds).
   - ★ Ask: Is this rhombus a regular polygon?...No! It has equal sides, but does not have equal angles.
   - ★ What do you call a rhombus where the angles are all equal? Let students think about this until they realize: it's a **square**. See if anyone made squares.
   - ★ Why do squares fit together so well? Each angle is now 90 degrees, and 4 x 90 is 360!



7. Add back the sticks you removed, and now ask what 3rd shape you can make. Show how if you remove 6 sticks that come together in a point, you make a **hexagon**. Remove a few more each hexagon in the lattice.
   - ★ See if students can figure out the degrees in each angle, knowing it came from equilateral triangles.
   - ★ Why do those angles fit together well? Each angle is now 120 degrees, and 3 x 120 is 360!



8. See if regular pentagons, octagons, etc. can fit together – and discuss!

Students can then practice and review on Khan Academy!

3rd Grade - Quadrilaterals (video and practice problems):
https://www.khanacademy.org/math/cc-third-grade-math/quadrilaterals-3rd

4th Grade - Measuring angles (video and practice problems):
https://www.khanacademy.org/math/cc-fourth-grade-math/imp-geometry-2

5th Grade - Properties of shapes (video and practice problems):
https://www.khanacademy.org/math/cc-fifth-grade-math/properties-of-shapes#properties-shapes