Puzzle #79: Immaterial?

MoeZone

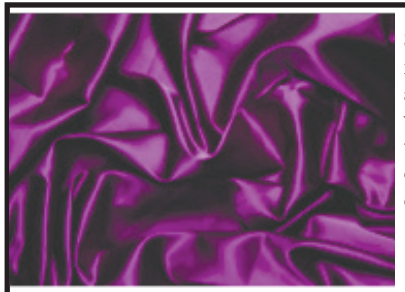
Real challenges for people living in the real world

Be safe!

Can you get hurt?
Can someone else get hurt?

Find something made of silk and compare it to other types of materials, like jeans or a smooth shirt. How are they the same? How are they different?

ELEMENTARY



Someone told me that there are animal fabrics and vegetable fabrics. Is that right? Where do these fabrics come from?

ADVANCED

I've heard that silk comes from a silk worm. How does it go from a silk worm to a nice silk material?

PROFESSIONAL

Send any solutions by Oct. 1, to Moe Benda at mbenda@d.umn.edu.
Best solutions and next puzzle will appear in HTF on Oct. 6.

Moe's quote:
Finding infinite solutions is pointless.

MoeZone Puzzle #78 solutions: Who's cooler?

ELEMENTARY PUZZLE

What shape of ice "cube" will take the longest to melt? Why do you think so?

Christine M. (Hibbing, 12): Round. I did this in art once where we had to find shapes with the most and the least surface area—and it was round. I think that would make the ice cube last the longest.

MOE'S NOTE: Christine—you are right! The sphere has the greatest volume while keeping the smallest outside. Nice!

ADVANCED PUZZLE

Why does an ice (solid water) and liquid water mixture stay at 32F until all of the ice is melted? What is going on?

Usually energy or heat is "seen" by a temperature change—rising in one, falling in the other. But, during melting—going from a solid to a liquid (this is a state change)—all of the energy is going to motion. Yes, motion. Imagine you are a water molecule, H2O. When you are in a solid form, you're not moving much, maybe not at all (at zero Kelvin). But as you start warming up, you move a little bit more with each rise in temperature until at one point, you are moving so fast, that you break ties with some of your neighbors. All of the energy is now going from taking an almost-at-rest molecule to one that is moving quite quickly. Remember that temperature is a measure of average kinetic energy and—on average—you're not as a group all moving quickly. You're still loosely connected to them, but you are moving about quite freely (liquid).

PROFESSIONAL PUZZLE

When the ice in my cooler starts to melt, should I dump out the water or leave it in there to keep my food cold? Why?

A cooler is getting warmer because it is getting energy from somewhere—like the sun beating down on it or from warm food inside. It takes twice as much energy to make water warmer than it does to make ice warmer. Below 32F, it's all ice. Once it makes it to 32F it will be a mixture of ice and water. Here, the energy isn't making the temperature rise, but melting the ice. Once the ice is all melted, then the energy is used to heat the water. It's a matter of surface area where the transfer of the heat energy happens: half-full with all water, only the surface of the water would be in contact with the warmer air in the cooler assuming the cooler is well insulated on its sides and bottom. If it were all ice cubes, instead of having just the top surface, we now have all six surfaces. So keep the water in there!

MOE'S NOTE: The only advantage to draining the water is to keep your food from getting soggy or from you having to reach down in and get your forearm cold!