

15 Magic Ribbons

Authors:	Myfanwy Evans (Uni Potsdam),
	Frank Lutz (TU Berlin)

Project: Thematic Einstein Semester 2021 "Geometric and Topological Structure of Materials"

Challenge

Far, far up in the north is the home of the elves. When winter is near, the elves help Santa Claire to wrap presents with their magic ribbons. Spheric sounds ring upon touching the strings.

In the past year, the elves faced a special challenge when Santa Claire asked them to wrap a chocolate torus. They cut open one of their ribbons, wound it around the chocolate torus and used magic to glue the ribbon back together. One of the elves realized that the ribbon on the torus became knotted, but soon forgot about it.



Every year, the magic ribbons are returned to the elves and stored to be reused for the next season. The special ribbon ended up in a bag with nine other ribbons. When the elves took out the ribbons in their preparations for this year's festivities, the ribbons appeared somewhat "entangled", and it took them quite some time to disentangle nine of them. Only then they remembered that one of the ten is special.

Which one is the special ribbon that was wrapped around the chocolate torus last year?







Ribbon no. 1.

Ribbon no. 2.

Ribbon no. 3.







Ribbon no. 5.



Ribbon no. 6.







Ribbon no. 7.

Ribbon no. 8.

Ribbon no. 9.



Ribbon no. 10.



Artwork: Friederike Hofmann

Possible answers:

- 1. Ribbon no. 1.
- 2. Ribbon no. 2.
- 3. Ribbon no. 3.
- 4. Ribbon no. 4.
- 5. Ribbon no. 5.
- 6. Ribbon no. 6.
- 7. Ribbon no. 7.
- 8. Ribbon no. 8.
- 9. Ribbon no. 9.
- 10. Ribbon no. 10.

Project reference:

Physical properties of materials are governed to a large extent by their microstructure. Some materials are highly ordered like crystals, some are polycrystalline like rocks or metals, others are cellular like soap or metallic foams, are disordered like amorphous solids, and some even are entangled like DNA.

The Thematic Einstein Semester 2021 "Geometric and Topological Structure of Materials" was devoted to illuminate recent mathematical developments for a better understanding of materials by identifying or computing essential structural properties—eventually leading to improvements in production processes or to new designs of materials with controlled properties.