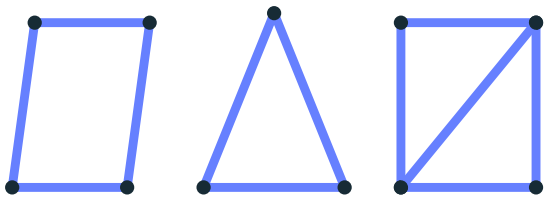
E CREATIVE ENGINEERING

HAMSTER LESSON #0000006

Build strength with triangles.

A diagonal brace helps a frame hold its shape.



Can lean | Holds shape | Add a brace

Use joints that can pivot.

TRY IT TODAY

Build a straw square. Test it. Add a brace.

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1. ❓ Why do so many bridges and roof frames contain triangles?
2. 🤦 A triangle made from rigid members holds its shape even when its joints can pivot. An unbraced four-sided frame can change shape more easily.
3. ⏳ The Warren truss was patented in 1848. Its repeating triangles became a familiar feature of metal bridges, putting geometry to work in structures that carry people and goods across a span.
4. 💡 Push gently on a square made from straws with flexible tape joints. It can lean into a diamond-like shape. Add a diagonal brace, and you divide the square into triangles that resist that movement.
5. 🔍 Shape is only part of good engineering. Materials, joints, loads, and supports also matter. Adding a triangle does not make every structure equally strong or safe.
6. 🌎 Engineers use these ideas to design useful structures under real limits. A successful design must meet a need while respecting constraints such as cost, available materials, and safety.
7. 🎯 Build a square with four equal short straw pieces and flexible tape joints. Predict how it will move under a gentle push, then test it. Add a longer diagonal brace and repeat a similar push. Your goal: less sideways movement. What improved? What would you change next?

References · NPS: Warren truss history · TeachEngineering: Straw bridges
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