EXPLORE STEM CHALLENGE

RULE BOOK

2025

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Introduction

“Worthy are you, our Lord and God, to receive glory and honor and power, for you created all things, and by your will they existed and were created.” (Revelation 4:11, ESV)

Welcome to the Explore STEM Challenge hosted by Answers in Genesis! The Explore STEM Challenge exists to give young adults ages 14–18 an opportunity to collaborate in a friendly competition while learning about a STEM topic from a biblical worldview. This is a one-day, hands-on design competition where participants are presented with a design task related to a STEM topic. Each participating team will create a design that will be evaluated by a panel of experts, and the top three winning designs will be awarded a monetary prize. Participating young adults will also hear from keynote speakers that love God’s Word and are experts in or related to the topic of the design challenge.

The challenge will take place in the Answers Center located at the Ark Encounter in Williamstown, Kentucky. The challenge will occur the day prior to the free Creation College Expo event that is also hosted by Answers in Genesis at the Ark Encounter. We encourage participating teams to stay for the free Creation College Expo during the days following the STEM challenge to learn more about Christian institutions across the country who hold to biblical authority and young-earth creation. To learn more about the free Creation College Expo, visit AnswersInGenesis.org/outreach/event/creation-college-expo-2025.

Participation

All young adults ages 14–18 are welcome to participate in the Explore STEM Challenge. All members must be between the ages of 14–18 on the day of the competition to be eligible to enter as a team in the challenge. Teams can be comprised of 2 to 4 members but cannot exceed a maximum of 4 members. Each team is required to have an adult coach (21 years or older) to enter. Please note, the coach is responsible for the supervision, management, and registration of their team.

Registration

Teams can register and find additional details for the cost of registration at the Answers STEM website: **GetAnswers.org/stem**.

Challenge

Each year, participants will be presented with a design challenge related to a topic in the STEM field. Teams are required to design their project following the stipulations outlined in the Design Rules section of the rule book. Each team’s design will be evaluated by a panel of experts that will judge the designs by the outlined criteria in the Design Evaluation section of the rule book.

For the 2025 Explore STEM Challenge, participants will be tasked with creating a balsa bridge.

Throughout history, God has commanded people to build. From ancient constructions like the ark during the global flood (Genesis 6:13–22) to modern technology like the smartphone, humans have achieved amazing feats in architecture and design. While humans have made incredible things, God is the ultimate Creator. Many engineers have been inspired by designs they see in the natural world and imitate God's design in their constructions. Mimicking God's design from living things is called biomimicry. Airplanes are often modeled after bird flight, velcro was invented because burrs from plants were sticking to clothes and pets, and even bridge builders get inspiration from ants! Army ants can fill in gaps with their bodies and build "living" bridges that other ants use to walk across!

We also see God's provision when people make constructions for the glory of God, such as Noah's ark (Genesis 6:18), as well as God's discipline when people construct for their own glory rather than God's, such as with the tower of Babel (Genesis 11:8). The 2025 Explore STEM challenge balsa bridge design task will provide a unique opportunity for teams to apply these biblical principles when considering the design of their bridges. As humans take dominion over the earth and multiply and fill it, building bridges is a natural part of overcoming natural obstacles to connect to resources. Materials and designs have changed over time, and your challenge is to use balsa and another material to construct a bridge that is the strongest for its mass. Our prayer is that this challenge would encourage and equip teams to stand on the authority of God's Word when presented with construction projects and the benefits they can bring to all of mankind.

Equipment

All 2025 balsa bridge designs must include the following components:

- 1/8" square balsa strips (not basswood)
- A non-metallic material bonded to the wood to form a composite
- Adhesive applied at the joints

All materials for building the bridge will be supplied by the team. You may seek sponsorships and cooperation from people and groups within your community, but it is the responsibility of the team members to design and build the bridge under the guidance of the adult coach.

We encourage creativity and experimentation for the bridge construction. Teams should incorporate a non-metallic composite component (e.g., 3D-printed materials, fiberglass, string) into their bridge. However, the composite component should not exceed more than 20% of the bridge construction materials by mass. Please be aware that if any material used appears to be unsafe (see Design Rules), the panel of experts will disqualify the bridge from the challenge. Materials should be, to the greatest extent possible, built by the team to meet the needs of their design and manufactured to those specifications, not purchased as a kit to be assembled.

Design Rules

Dimensions and Materials

Participants will place their constructed bridge on a stress table. The stress table will be constructed from plywood with a rectangular gap of 30 x 20 cm cut in the middle.

Each team's bridge will need to span a gap of 30 cm. The bridge mass should not exceed 35 grams.

Bridge Dimensions

Length Max 400 mm

Width 60–80 mm

Height Max. 100 mm (may not extend more than 20 mm below the loading surface)

Bridge Materials

1. Bridges must be constructed of 1/8" square balsa wood members for beams.
    a. The balsa wood may be notched, cut, sanded, or laminated in any manner but must still be identifiable as balsa wood.
    b. Any commonly available adhesive may be used at the joints.
    c. Total mass of the bridge, including all components, should not exceed 35 grams.
2. Composite materials should be incorporated into the design as gussets, laminated segments, or other linking elements, but may not serve as main beams/members of the bridge.
    a. Materials such as fiberglass, plastics, 3D-printed plastics, or similar elements are acceptable.
    b. These materials should not constitute more than 20% of the mass of the bridge. (Include a photo or other verification in the presentation.)
    c. You may NOT use any metallic components in the bridge design.
3. Bridges should NOT be painted, coated with glue or epoxy, or have paper on the joints (unless that is your composite material).

Design Evaluation

A panel of experts will evaluate all participating teams the day of the challenge. Evaluation will occur in two ways. Each team will be required to test their design as well as present their design to the panel of experts.

Testing

Teams will be required to weigh their bridges and then place their bridges to be tested on a stress table. The stress table will be constructed using rigid plywood with a gap cut in the center to simulate the span of the bridge. The gap will measure 20 x 30 cm. A 15-centimeter-long bar made of 2.5 cm steel square tubing will be inserted through the center of the bridge, perpendicular to the main beams, to support the weight for stress testing. Your bridge must be designed to accommodate this bar in the center.

The panel of experts will evaluate the bridge design using the criteria in the rubric, evaluating the use of materials and incorporation of the composite material.

The bridge will then be tested by measuring the load-bearing capacity. Weight will be added to the bar until the judges determine a failure has occurred (broken member, separated parts, etc.). Decisions of the judges are final. The efficiency of the bridge will be used in the scoring: Efficiency = load supported / mass of bridge.

Refer to the video posted on the event page to familiarize your team with the testing setup.

Team Presentation

All teams are required to present their design to the panel of experts through a poster or digital presentation. If you are using a digital presentation, you must bring an HDMI compatible device to connect and present from. All presentations must not exceed 5 minutes and must include the following (but not necessarily in this order):

1. Design process of the bridge, including the truss pattern or inspiration for the style.
    a. Include a verification of the mass of your composite material with respect to the total mass of your bridge.
2. Team communication and collaboration.
3. Demonstration of an understanding of the laws of nature and forces involved in the engineering of the bridge.
4. Application of a biblical worldview to the design and operation of bridges.

Evaluation Rubric

Your team's design will be evaluated in 3 categories (design, testing, and presentation). Please see the descriptions below for further details regarding each rubric category.

Design Evaluation Categories	Further Details
Craftsmanship	Random materials were not thrown together—team used organization and attention to detail with quality of construction.
Proficiency	Design demonstrated a knowledge of bridge architecture and function.
Creativity and innovation	Design showed originality and ingenuity in integrating a composite material.

Bridge Testing Categories	Further Details
Functionality	Bridge supported weight during the stress table test and would function as an actual bridge.
Efficiency	Bridge demonstrated strength for mass.
Structurally sound	Bridge withheld during the testing with little damage to the structure and demonstrated stability even after failure.

Presentation Categories	Further Details
Described design process with adequate detail, including introduction, methodology, and conclusion	Details of the design process were clearly laid out and had a logical flow.
Communication and team collaboration clear and concise	Team demonstrated that they worked together and their presentation was well thought out and organized.
Demonstrated knowledge of bridge construction	Team clearly indicated how they thought out and applied real-world scenarios to their design and an understanding of natural laws and applied forces.
Application of biblical worldview to the design task	Team showed the importance of standing on the authority of God's Word and appropriately applied biblical principles to bridge construction and operation.

Explore STEM Challenge Judging Rubric

Team Name: _____

Bridge Mass: _____ Composite Mass: _____

Load Mass: _____ Efficiency: _____

Overall Score: ____/50

Judges will place a mark in the box that best describes each category.

Design Evaluation Categories	Poor (1)	Average (2)	Good (3)	Very Good (4)	Excellent (5)	Total
Craftmanship						
Proficiency						
Creativity and innovation						
						/15

Bridge Testing Categories	Poor (1)	Average (2)	Good (3)	Very Good (4)	Excellent (5)	Total
Functionality						
Efficiency						
Structurally sound						
						/15

Presentation Categories	Poor (1)	Average (2)	Good (3)	Very Good (4)	Excellent (5)	Total
Described design process with adequate detail, including introduction, methodology, and conclusion						
Communication and team collaboration clear and concise						
Demonstrated knowledge of bridge construction						
Application of biblical worldview to the design task						
						/20

Awards

Presentations that do not include a clear, biblical worldview connection will not be eligible for prizes. See the website for a current list of prizes.
GetAnswers.org/stem

SCAN FOR PRIZES

Resources

Incorporating a Biblical Worldview

To ensure that you have access to resources that can help you incorporate a biblical worldview into your presentation, here are links to articles that may assist you in showing how your project connects to God's Word and the foundation of natural laws and science.

- Biomimicry: AnswersInGenesis.org/technology/biomimicry/
- God's living girders: AnswersInGenesis.org/human-body/bones/
- The nature of science: AnswersInGenesis.org/what-is-science/
- Ark engineering: AnswersInGenesis.org/noahs-ark/could-wooden-ark-survive-flood/

Sources for Materials

Balsa sticks can be purchased at local craft and hobby stores or at many online stores. Below are links to online retailers you may use, but minimum orders are required:

NationalBalsa.com/products/181824

BalsaTron.com/products/1-8-x-1-8-x-36-balsa-stick?variant=48108744605978

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