

DREAM Design Challenge Rules and Materials List Strongest and Lightest Bridge!

Objective:

Build a bridge that can span a 0.6 m (23.6 inch) gap and support the most weight when loaded in the middle, while minimizing the weight of the bridge (and thus minimizing the materials).

Timeline:

Week 1	Kickoff and Surveys and Inventories
Week 2	Form Teams, Introduce Challenge, Introduce K'NEX and Plan
Week 3	Team Meeting - Brainstorm
Week 4	Mini-Lecture and Team Meeting - Design and Build
Week 5	Mini-Lecture and Team Meeting - Build and Test
Week 6	Mini-Lecture and Team Meeting - Test and Re-Design
Week 7	Mini-Lecture and Team Meeting - Test and Re-Design
Week 8	Practice Tearing Down and Reassembly
Week 9	<i>DREAM Day Project Demonstration at Rice University</i>

Eligibility:

In order to qualify to win prizes at the DREAM Day competition, ***you must be present for at least 6 of the sessions and attend DREAM Day*** itself. To track attendance, we will have a sign in sheet each day – please make sure to sign in so that we know you came!

Design Phase:

You will be provided with a box containing fixed set of K'NEX building pieces. ***Please write your team name on the top of the box*** so that you know which box is yours. You will need to have a working design by DREAM Day, when you will reassemble it from subcomponents that are easily transportable.

DREAM Day Project Demonstration:

On DREAM Day you will need to reassemble your bridge from subcomponents for testing. You will have 30 minutes to reassemble your bridge. If you spend more than 30 minutes in assembly, your bridge will be disqualified. After 30 minutes of reassembly, your bridge will be displayed, weighed and then tested.

Display and Weigh-in:

During this phase you will display your bridge and it will be weighed and judged for the Most Innovative Design prize. You will not be allowed to make any modifications to your device during the display phase.

Testing:

After all weighing and judging has been completed, each team's device will be tested. The bridge must span across a 0.6 m (23.6 inch) gap between two tables and not touch the ground. A bar with a basket below will be used to add mass (weight) to your structure. Mass will be added until the failure of your bridge, which will be determined by either collapse or deformation to the point that any part of your bridge or the weight basket touches the ground. The final mass supported will be recorded.

Bonuses:

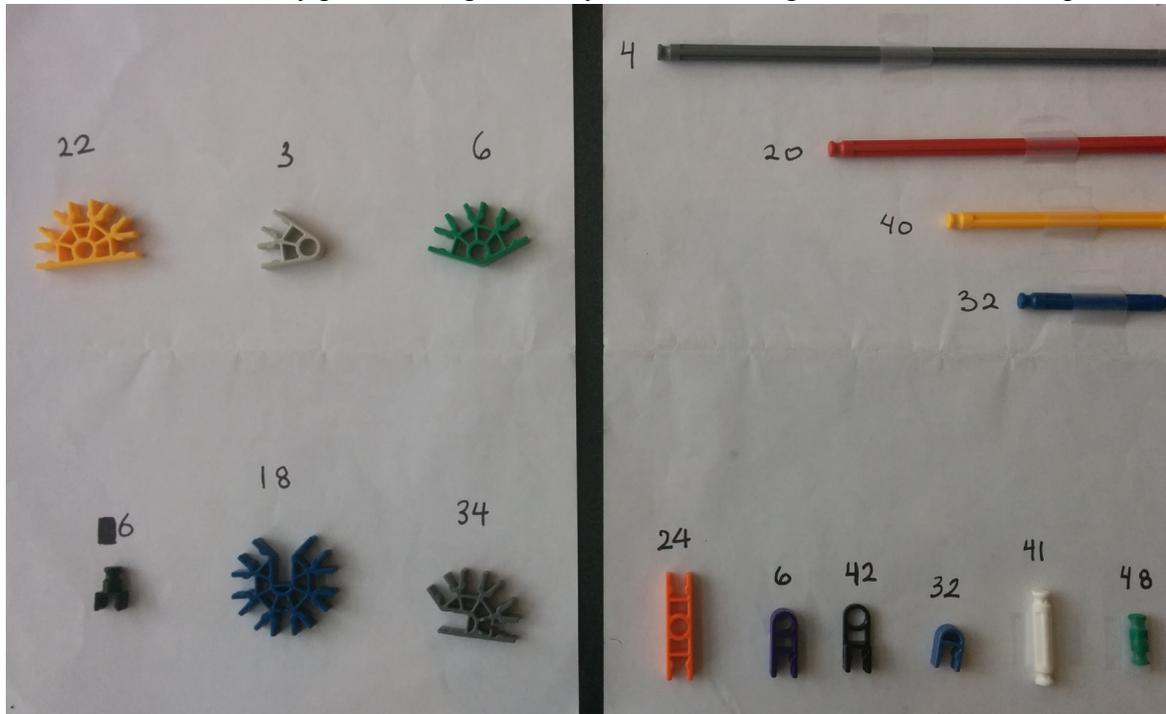
Your team can earn bonus points by

1. spanning a gap longer than 0.6 m
2. increasing the width of your bridge (which would allow more "traffic" to pass over it)
3. reassembling after failure for a torsion test - this will serve as a tie-breaker

The calculation of scores, including bonus points, are described in the Scoring Section.

Materials List:

You will be provided a set of K'NEX parts shown in the figure. No other materials can be used (no glue, no tape, etc). The use of more of any parts than specifically listed in the figure will result in disqualification.



Scoring

Your overall score will be determined as follows:

$$\text{Overall Score} = 0.1 \{ (\text{mass in kg supported by bridge at failure})^2 + \\ + 1/2 \times (\text{length of the gap spanned in cm} - 60 \text{ cm}) \times (\text{mass supported in kg}) + \\ + 1/4 \times (\text{width of the bridge in cm at narrowest part}) \times (\text{mass supported in kg}) + \\ + 1/8 \times (1 / \text{mass of the bridge in kg}) \times (\text{mass supported in kg}) \}$$

The Most Innovative Design will be awarded at the discretion of the panel of judges.

Note: All K'NEX components together total about 540 g. The minimum mass to span 0.6 m is about 16 g.

Rules and Limitations:

1. Your bridge must be free-standing. You will not be allowed to touch or hold it during the testing.
2. Your bridge must span at least 60 cm (23.6 inches) to be tested.
3. Your bridge will be considered to have failed when any part of the bridge or the weight basket touches the ground.
4. If a torsion test is required as a tie-breaker, you will have 15 minutes to reassemble your bridge to its ORIGINAL design. Any modification of the design from the original will result in disqualification.

Prizes:

Prizes will be awarded to the teams as follows:

- Grand Champion (highest overall score)
- Second Place (second highest overall score)
- Third Place (third highest overall score)
- Most Innovative Design (get creative!)

To make sure that you're eligible to win prizes on the final competition day, make sure that you show up to **at least six DREAM sessions and sign in every time.**

Questions:

If you have any questions, please ask any of the mentors for clarification.