

BRIDGES PROJECT RUBRIC

CATEGORY	4	3	2	1
Portfolio	Our portfolio to the town council provides clear and convincing evidence for our choice of design, accurate and detailed blueprints of our model bridge, and other supporting documentation including a concept web, graph, chart, and photo.	Our portfolio to the town council provides evidence for our choice of design, accurate blueprints of our model bridge, and some supporting documentation such as a concept web, graphs, charts, and photos.	Our portfolio to the town council provides minimal evidence for our choice of design, blueprints of our model bridge with errors, and one other supporting document: either, a concept web, graph, chart, or photo.	Our portfolio to the town council does not provide evidence for our choice of design, accurate blueprints of our model bridge, or supporting documentation.
Content	Our presentation and portfolio cover all aspects of the bridge design in depth with details and examples. Our subject knowledge is excellent.	Our presentation and portfolio cover all aspects of the bridge design with details and examples. Our subject knowledge appears to be good.	Our presentation and portfolio cover all aspects of the bridge design but there are 1-2 factual errors.	The content in our presentation and portfolio is minimal OR there are several factual errors.
Research	I gather significant information from an extensive variety of sources and assess the reliability of all my sources. I sort and classify my information into meaningful categories, and I revise my categories as I collect more information.	I choose relevant information from a variety of reliable sources. I sort and classify my information, and revise my categories as I collect more information.	I choose general information from a variety of sources and my sources are not consistently reliable. I sort and classify my information with some consistency.	I choose insufficient information from a few sources. Most of my sources are not reliable. I do not sort or classify my information in a useful way.
Understanding (Individual)	I effectively demonstrate a thorough understanding of the importance of geometry in the modern world by providing an insightful explanation with many detailed examples drawn from my work in the unit.	I accurately provide details about the importance of geometry in the modern world.	I provide a few examples about the importance of geometry in the modern world.	I demonstrate severe misconceptions about the importance of geometry in the modern world.

Using a Rubric

To Self- and Peer Assess

Focus on difference of descriptors

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- “clear and convincing evidence” → “evidence” → “minimal evidence” → “does not provide evidence”



Sample Student Presentation

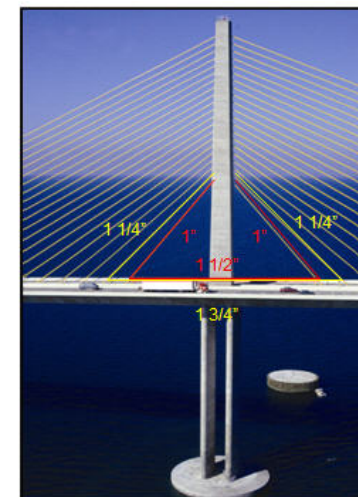
Let's Look at Combinations of Side Lengths

• The **red triangle** has two sides of 1" and one side of 1 1/2". If you use what we learned about triangles,

$$a + b > c; 1 + 1 > 1 \frac{1}{2}.$$

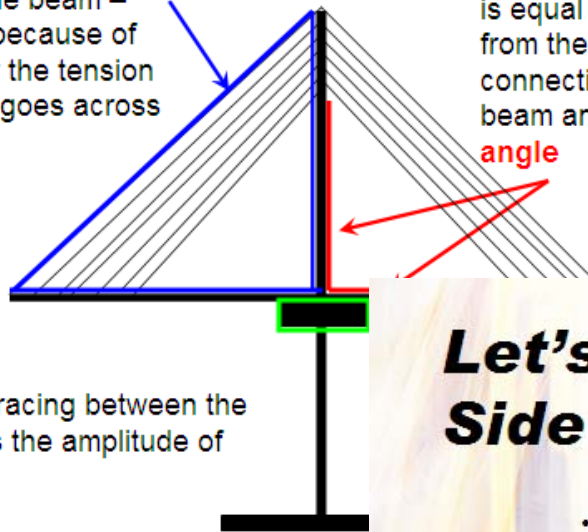
• The **yellow triangle** has two sides of 1 1/4" and one side of 1 3/4". So, $1 \frac{1}{4} + 1 \frac{1}{4} > 1 \frac{3}{4}$

• Both triangles are very close to an equilateral triangle with all sides being equal. This is the strongest triangle.



Let's Look at Shapes

Triangles are one of the shapes used by the attachment of the cables and the beam – this shape is used because of its ability to transfer the tension as the moving load goes across the bridge



Triangulated bracing between the cables reduces the amplitude of oscillations

- “clear and convincing evidence”

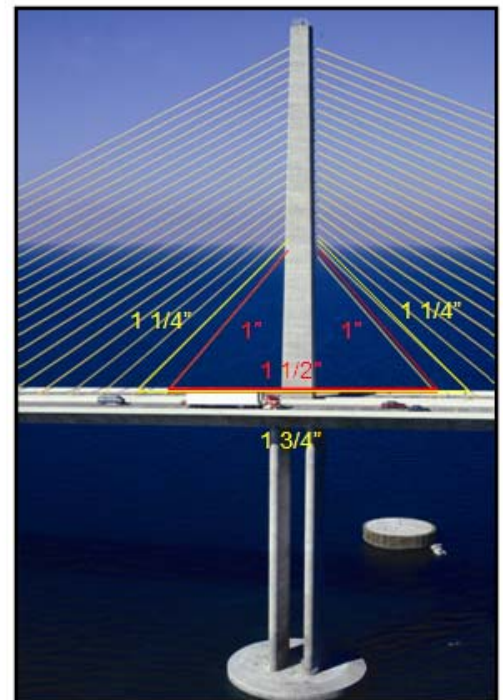
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- The **yellow triangle** has two sides of 1 1/4" and one side of 1 3/4". So, $1 \frac{1}{4} + 1 \frac{1}{4} > 1 \frac{3}{4}$

- Both triangles are very close to an equilateral triangle with all sides being equal. This is the strongest triangle.



- “supporting documentation including a concept web, graphs, charts, and photos”

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Important research descriptor words:

- Significant
- Extensive
- Reliable
- Sorted and classified
- Meaningful categories

vs.

Research descriptor words

identifying shortcomings:

- Not consistent
- Not reliable
- Insufficient
- Few sources
- Not sorted/classified

References

Basic Information

- **Bridge from Fact Monster**
www.factmonster.com/ce6/sci/A0808901.html
We got basic information about bridges.
- **Basic Bridge Types from Matsuo Bridge**
www.matsuo-bridge.co.jp/english/bridges/index.shtm
We found information about different bridge types
- **Super Bridge from PBS NOVA Online**
www.pbs.org/wgbh/nova/bridge
We learned about the four major types of bridges..

Bridge Design

- **Bridge Basics: A Spotter's Guide to Bridge Design**
<http://pghbridges.com/basics.htm>
We researched diagrams and descriptions of a wide variety of kinds of bridges.
- **Knowhere: Bridges**
<http://www.polymorf.net/engineer23.htm>
We learned about the stability and structure of different bridges.
- **Building Big: All About Bridges**
www.pbs.org/wgbh/buildingbig/bridge/index.html
We explored forces, loads, materials, and shapes of bridges.
- **PBS "Build a Bridge" Game**
<http://www.pbs.org/wgbh/nova/bridge/build.html>
We used the simulation to practice building a bridge.
- **Understanding: Cable Stay Bridge Design**
<http://videos.howstuffworks.com/tlc/28818-understanding-cable-stay-bridge-design-video.htm>
This video was helpful to understand cable stay bridge design.

Photos, Graphs, and Charts

- **Brantacan: Cable-Stayed Bridges**
http://www.brantacan.co.uk/cable_stayed.htm
- **Figg Engineering Group**
<http://www.figgbridge.com>

Your Turn

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- Use the Research trait descriptors to assess the references used by another team
- Discuss with your team your reasons

References

- Bridges
<http://en.wikipedia.org/wiki/Bridge>
- Which Bridge Design is Stronger? By Eric J.
<http://www.selah.k12.wa.us/SOAR/SciProj2000/ErikJ.html>
- Bridge Basics
<http://www.pqhbridges.com/basics.htm>
- How Bridges Work
<http://www.howstuffworks.com/bridge.htm>
- Polymorf Clipart Gallery
<http://www.polymorf.net/clipart.htm>
- Freefoto.com
<http://www.freefoto.com/index.jsp>

Truss Bridge



- A truss bridge is a bridge composed of connected elements (typically straight) which may be stressed from tension, compression, or sometimes both in response to dynamic loads. Truss bridges are one of the oldest types of modern bridges. The basic types of truss bridges shown in this article have simple designs which could be easily analyzed by nineteenth and early twentieth century engineers. A truss bridge is economical to construct owing to its efficient use of materials.

Your Turn

Reasons to Use a truss bridge

- Using your rubric, discuss the problems you see in this sample
 - **USE the terms from the rubric.** Such as:
 - Accurate
 - Convincing
 - Detailed
 - Subject knowledge
 - Relevant
- Its design has been used for a long time and has been very effective
 - It can span really long distances
 - It has lots of geometric shapes
 - It's economical to build
 - The central vertical member stabilizes the upper compression member, preventing it from buckling. If the top member is sufficiently stiff then this vertical element may be eliminated.
 - If the lower chord (a horizontal member of a truss) is sufficiently resistant to bending and shear, the outer vertical elements may be eliminated, but with additional strength added to other members in compensation. The ability to distribute the forces in various ways has led to a large variety of truss bridge types.

