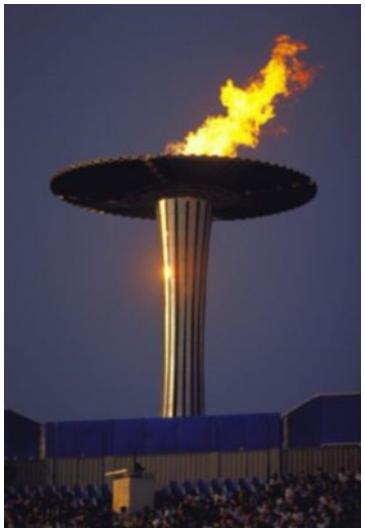
THE 2014 TAME DIVISIONAL MATH AND SCIENCE COMPETITIONS

OLYMPIC TOWER: AN ENGINEERING DESIGN CHALLENGE



Using the principles of physics and engineering, design and build a prototype tower to hold the Olympic flame high above the stadium. The tower must be tall enough to be visible outside the stadium walls and strong enough to hold the heavy Olympic torch and the fuel to keep the flame burning for two weeks.

OVERVIEW

The goal of this competition is to build the tallest and strongest structure that can support a container at least eight inches off of the ground while an increasing amount of weight is added. Points will be awarded based on the height of the tower and the amount of weight it can hold. Bonus points will be assigned for creative and innovative solutions.

BRAINSTORM AND DESIGN

- Think about how you might design a structure that is able to support a large amount of weight. For example, a single sheet of paper is flimsy. How can it be manipulated in such a way as to overcome this weakness?
- What considerations must be made to produce a structure that is both tall and stable?
- How will you incorporate the container into the structure in such a way that maximizes both its height and its ability to support weight?

MATERIALS

Material	Quantity
Printer paper	5 sheets
Construction paper	1 sheet
Drinking straws	2
Index card	1
Masking tape	11 inches
Small plastic cup or other container (may not be cut or otherwise modified)	1

NOTES

- A 6 inch ruler is printed at the bottom of each page of this packet. You may use the markings to determine the height of your structure.
- The structure must be at least 8 inches tall, and taller structures earn more points! Check out the scoring sheet to see how many bonus points you can earn.
- A tower that can hold more weight gets more points.
- Creativity points make a difference! Think of cool designs, decorate your structure, impress those judges!
- Design a tower that is tall and strong to earn the most points!

1 Inch	2 Inches	3 Inches	4 Inches	5 Inches	6 Inches

INSTRUCTIONS

READ ALL INSTRUCTIONS AND RULES BEFORE YOU BEGIN

1) Be sure to fill out the Project Documentation form completely.
2) Decide on a TEAM NAME and write it in the space provided.
3) Fill in the names of all team members.
4) Discuss and assign team roles. Each team member must participate (if your team contains fewer than the standard group size, some of the members will serve in more than one role).

- PROJECT MANAGER
  - Serves as the team's representative and notifies judges when project is complete and ready for final judging
  - Responsible for verifying that all documentation is complete and all requirements are met
- DESIGN ENGINEER
  - Manages the time restrictions to ensure the team completes each project phase on schedule
  - Requests judge's signature when team is ready to have design approved
- STRUCTURAL ENGINEER
  - Leads the team in developing and documenting the optimal design
  - Completes the Design Drawing and Design Log
- TEST ENGINEER
  - Serves as the team's representative during the testing process
  - Is the only team member allowed to interact with tower during judging
- MATERIALS ENGINEER
  - Ensures that only materials listed in the Material List are used in the project
  - Leads the building phase of the competition and see that materials are not lost or misplaced

Your team will have 45 minutes to design, construct and test a structure out of the available materials.

DESIGN CONSTRAINTS

- The container to hold the weights may not be modified in any way.
- The base of the container must be a minimum of 8 inches off the ground.
- No parts of the tower can be attached (via tape, adhesive, etc.) to the floor, walls or any external structure. The tower must be able to stand on its own throughout the duration of judging.
- ONLY the supplies specified in the Materials List may be utilized as part of the tower.

JUDGING

- Judges will measure the height of the tower from the table/floor to the lowest point of the container.
- The Test Engineer will add weights to the inside of the container, one at a time.
  - During judging, the Test Engineer may NOT touch any part of the tower.
- Weights will continue to be added until the integrity of the tower has been compromised.
- The tower has been compromised if the container falls off the tower, any weights fall out of the container or the height of the tower is reduced by an inch or more.
- The number of weights in the container just before the tower collapsed will be counted as the maximum capacity of the tower and recorded on the scoring sheet.

1 Inch	2 Inches	3 Inches	4 Inches	5 Inches	6 Inches

PROJECT DOCUMENTATION

Team name: _____ Team number: _____

ENGINEERING TEAM

Role	First Name	Last Name	School
Project Manager			
Design Engineer			
Structural Engineer			
Test Engineer			
Materials Engineer			

DESIGN LOG

Describe what happened when you tested your project the first time:

_____

_____

_____

_____

What changes did you make to address any design challenges?

_____

_____

_____

_____

Describe what happened when you retested your project:

_____

_____

_____

_____

1 Inch	2 Inches	3 Inches	4 Inches	5 Inches	6 Inches

DESIGN DRAWING(S) AND NOTES

Use this area to sketch your design. You must have a judge review and approve the plan before you start building the tower.

_____

Judge's name – please print

1 Inch	2 Inches	3 Inches	4 Inches	5 Inches	6 Inches

SCORING SHEET

Team Name: _____ Team Number: _____

METRIC	Count
Height of tower (measure to the lowest point of the container and the nearest quarter inch)	
Number of weights supported	
On a scale of 1 to 7, 7 being the best, score the project's overall aesthetics (creativity, innovation)	

Additional Height Points

Less than 12 inches	0
From 12 and 15.75 inches	10
From 16 and 19.75 inches	20
From 20 and 23.75 inches	30
From 24 and 27.75 inches	40
Above 28 inches	60

Judge's Notes:

_____ Judge's name – please print

_____ Judge's name – please print

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