Grade 9 Integrated Technologies

Trebuchet Evaluation (Revised Nov 15, 2010) Mr. Brunato, Mr. Bell

All sections are to be done by each student. You may work with a partner to create your trebuchet, however, you have to decide among yourselves which design you will build.

Thinking Part 1

Solutions: Rough Sketches

- Come up with 3 possible and unique designs for your project.
- Draw comprehensive 3 view sketches (top, front and right view) for each of the designs.

Level One	Level Two	Level Three	Level Four
10 11	**12 13**	**14 15**	**16 18 20**
Sketches are difficult to understand	Sketches are somewhat comprehensive	Sketches are considerably comprehensive	Sketches are comprehensive**
Limited variety of ideas are shown among the drawings	Some variety of ideas are shown among the drawings	Considerable variety of ideas are shown among the drawings	Variety of ideas are shown among the drawings
Designs are limited in their level of completeness	Designs are somewhat complete	Designs are considerably complete	3 designs are complete with three views each; views line up
Strong structure and good mechanics shown in the sketches in a limited way	Sketches somewhat shows strong structure and good mechanics	Sketches considerably shows strong structure and good mechanics	Sketches exemplify strong structure and good mechanics

**Label the thumbnails where necessary to make them understood.

Best Solutions: Rationale for Best Design

The trebuchet is a very good design challenge because it requires one to make many adjustments through trial and error. From the design point of view the trebuchet has two different areas of consideration that depends on each other" structure and mechanics. It has to be structurally strong to support a moving counter balanced throw arm; and it has to have well coordinated mechanics in order to successfully throw the projectile. On a separate sheet of paper entitled, "Trebuchet Best Solutions", write a rationale for your design choice.

- Write the subtitle, "Structure"
- Justify why your chosen design is the strongest structurally. Compare it with your other designs. Include truss design in your discussion. Write a **minimum** of one paragraph

- Write the subtitle, "Mechanics"
- Which design do you suppose is the most stable when it fires? In other words, which structure is least likely to move around when it fires? Compare it with your other designs when discussing. Write a **minimum** of one paragraph.

Level One	Level Two	Level Three	Level Four
10 11	**12 13**	**14 15**	**16 18 20**
Sentences are limited in their proper structure and grammar	Sentences are somewhat well structured and grammatically correct	Sentences are considerably well structured and grammatically correct	Sentences are well structured and grammatically correct
Paragraph have limited structure	Paragraphs are somewhat well structured	Paragraphs are considerably well structured	All paragraphs are well structured
Rationale is limited in its justification	Rationale is somewhat well justified	Rationale is considerably well justified	Rationale is well justified

Thinking Part 2

Record of Adjustments Chart

- You will be testing your trebuchet many times. Keep a record of all adjustments that you made to get it meet all or most of the design challenges. The purpose is to show how you solved problems to meet the design process. Writing in understandable points, describe your observations in the chart provided.
- Specifically record what you adjusted (sling, prong, weight) and how it affected the trajectory.
- Please note that your first firing will not have any adjustments.

Level One	Level Two	Level Three	Level Four
10 11	**12 13**	**14 15**	**16 18 20**
Description is limited in its detail	Description is somewhat thorough	Description is considerably thorough	Description is thorough
Limited evidence of problem solving	Some evidence of problem solving	Considerable evidence of problem solving	Evidence of problem solving is supported
Understanding of points is limited	Points are somewhat easy to understand	Points are considerably easy to understand	Points are easily understood
Some firings are accounted for and notarized by the teacher	Many firings are accounted for and notarized by the teacher	Most firings are accounted for and notarized by the teacher	All firings are accounted for and notarized by the teacher

Communication

Having tested your trebuchet, write a report on the process of investigating, creating, testing and modifying your design. The content of the report is the answer to a series of questions.

- Answer the questions on the report handout sheet.
- Use the report handout for your rough work to organize your thoughts.
- Rewrite the questions and your answers in paragraph form on a separate sheet of paper.
- Write a minimum of one paragraph to answer each question.

Report

Level One	Level Two	Level Three	Level Four
10 11	**12 13**	**14 15**	**16 18 20**
Analysis is limited	Analysis is somewhat thorough	Analysis is considerably thorough	Analysis is thorough and addresses the design challenge
Paragraph structure is limited	Paragraph structure is somewhat proper	Paragraph structure is considerably proper	Proper paragraph structure used
Sentences are limited in their proper structure and grammar	Sentences are somewhat well structured and grammatically correct	Sentences are considerably well structured and grammatically correct	Sentences are well structured and grammatically correct

Application Part 1

Orthographic Drawing of Trebuchet

Level One	Level Two	Level Three	Level Four
10 11	**12 13**	**14 15**	**16 18 20**
Each view reflects the other two views in a limited way	Each view somewhat reflects the other two views	Each view considerably reflects the other two views	Each view reflects the other two views
All three views do not line up well	All three views somewhat line up	All three views considerably line up	All three views line up correctly
Limited use of proper drafting conventions	Proper drafting conventions somewhat used	Proper drafting conventions considerably used	Proper drafting conventions used
Limited use of dimensions	Dimensions somewhat accounted for	Most dimensions accounted for	All dimensions are accounted for
Dimensions are limited in their accuracy	Dimensions are somewhat accurate	Dimensions are considerably accurate	All dimensions are accurate according to the established scale
Lines are limited in their neatness	Lines are somewhat neat; pencil and ruler used	Lines are considerably neat; pencil and ruler used	All lines are neatly drawn using a pencil and a ruler

Application Part 2 - The Working Trebuchet

Safety and Work Standards

Level One	Level Two	Level Three	Level Four
5	**6**	**7**	**8 9 10**
Safe procedures employed in a limited way; Safe work environment is maintained in a limited way	Safe procedures somewhat employed; Safe work environment somewhat maintained	Safe procedures considerably employed; Safe work environment considerably maintained	Safe procedures consistently employed; Safe work environment maintained
Limited clean up procedures	Clean up procedures somewhat employed	Clean up procedures considerably employed	Clean up procedures employed
Use of class time is limited in focus; distracting to peers	Use of class time is somewhat focused	Use of class time is considerably focused	Use of class time is focused
Safe procedures for launches is limited; risks posed to self, others or property	Safe procedures for launches are somewhat employed	Safe procedures for launches are considerably employed	Safe procedures for launches are employed

Aesthetics

Level One	Level Two	Level Three	Level Four
5	**6**	**7**	**8 9 10**
Appearance has limited aesthetic appeal	Aesthetic appearance is somewhat pleasing	Aesthetic appearance is considerably pleasing	Aesthetic appearance is pleasing

Craftsmanship of the Structure

Level One	Level Two	Level Three	Level Four
10 11	**12 13**	**14 15**	**16 18 20**
Wood has limited clean cuts; Joinery has limited tight fits; Neatness of the cutout cardboard base is limited; Security of glued cardboard base is limited; Excessive amounts of glue	Wood is cut somewhat clean; Joinery fits somewhat tight; Cardboard base is somewhat neatly cut; Cardboard base is glued on somewhat secure; Glue is considerably excessive	Wood is cut considerably clean; Joinery fits considerably tight; Cardboard base is considerably neatly cut; Cardboard base is glued on considerably secure; Glue is somewhat excessive	Wood is cleanly cut; Joinery is tightly fitting with no gaps; Cardboard base is neatly cut; Cardboard base is securely glued on; No excessive amounts of glue

Craftsmanship of the Sling

Level One	Level Two	Level Three	Level Four
5	6	7	8 9 10
Cut of material is limited; Stitching is very uneven; Stitching is loose	Material is cut somewhat clean; Stitching is somewhat even; Stitching is somewhat tight	Material is cut considerably clean; Stitching is considerably even; Stitching is considerably tight	Material is cleanly cut, no frayed edges; Stitching is even; Stitching is tight
Sting is not well secured; knots are loose	String is somewhat well secured to the throwing arm and material; knots somewhat tight	String is considerably well secured to the throwing arm and material; knots considerably tight	String is well secured to the throwing arm and material; knots tightly tied

Functionality (Working Mechanics)

Level One	Level Two	Level Three	Level Four
10 11	12 13	14 15	16 18 20
Trebuchet pitches over	Trebuchet moves a lot throughout the launch	Trebuchet is moves quite a bit throughout the launch	Trebuchet is stable; movement of structure is minimal throughout the entire launch
Pivot of arm is limited	Arm pivots with considerable lateral movement	Arm pivots with some lateral movement	Arm freely pivots with no lateral movement
Release of arm is limited in its consistency	Trigger releases arm somewhat adequate and consistent	Trigger releases arm considerably adequate and consistent	Trigger mechanism releases the arm adequately and consistently
Release of projectile is limited	Release of projectile is somewhat consistent	Release of projectile is considerably consistent	Sling consistently releases the projectile
Projectile releases in a straight line seldom	Projectile releases in a straight line some of the time	Projectile releases in a straight line most of the time	Projectile consistently releases in a straight line

Accuracy and Consistently

Level One	Level Two	Level Three	Level Four
10 11	12 13	14 15	16 18 20
Projectile lands far away from target distance	Projectile lands somewhat close to target distance consistently	Projectile lands close to target distance consistently	Projectile consistently hits target distance