Name: _____ Class; ____ Date: _____

Paper Olympics

Learner outcomes:

- Demonstrate and describe methods to increase the strength of materials through changes in design

Key Terms:

Horizontal beam	Box Beam	Column
I-beam	l-Beam	Lamination
T-beam	Corrugations	Load

Background Information: Architects and designers are sometimes limited as to the materials they can use, but they still need to design the sturdiest structure possible.

Investigative Question: How can you use your knowledge of shape and strength to turn flimsy paper index cards into load-bearing columns, beams and flat panels?

Materials:

Scissors	5 index cards	Flat plywood (20cm x
Assorted masses	Glue	20 cm)
Force meter	String	

Procedure:

Preparation

1. Use one index card to build a column that is the height of the card.
2. Cut and fold a second card into a strong beam that will span a 15 cm gap.
3. Use the last three cards to make a strong flat panel, larger than 10 x 12 cm. The panel must have at least three layers that are glued together and must be at least 1 cm thick.
4. Let the glue harden overnight.

Investigation

5. Stand the column upright on the floor or a desk, placing the plywood on top of the column. Place masses on the board, distributing them evenly until the column fails. Record the maximum amount of weight held by the column (in Newtons).

6. Place the beam across a 15 cm gap between 2 desks and put a loop of string around the middle. Attach the string to a force meter or plastic bucket. Pull down on the force meter or add masse4s to the bucket until the beam breaks, twists or bends. Record the largest force the beam can support.
7. Stand the flat panel on a desk or the floor. Lay the piece of plywood on top of the panel and add masses to the panel until it collapses. Record the maximum weight held by the panel.

Observations:

Analysis:

1. Based on your results, suggest ways in which you could improve the design of each of your structures. Draw sketches of your improved design and explain the reasons for your changes.

Conclusion: Summarize what properties make a load bearing structure strong.

Extension:

A) Work in groups of 3 to build a series of load bearing structures out of index cards that will support the weight of a student.