

## **Mechanical Engineering Competition for Arran School Children**

### **Design, Build and Test your Structure.**

You are invited to design, build and test your own support for a 3kg weight suspended from the end of your invention. You can do it on your own or in teams of up to three. The winning entry receives a prize of £500.

### **Eligibility**

The competition is open to all children at school on Arran up to the age of 16. Individuals or teams may enter the competition.

### **The task:**

Build a 1 metre long cantilever beam out of the following materials

Softwood (maximum dimension in any direction to be no greater than 400mm)

Any glue except superglue or other rapid setting cyanoacrylate type

Paper, - 80 gsm A4

10lb / 4.5kg breaking strain fishing line.

No other materials are permitted.

The beam shall support a minimum of 3 kilograms at 1 metre from the final anchorage of the cantilever.

The cantilever beam will be anchored by a single crossbeam measuring 125mm by 25mm by 800mm (with a 25mm square socket 25mm deep) to be clamped to a board supported on a table. The distance from the cantilever inner edge to the near edge of the crossbeam shall be 250 mm. The inner end of your cantilever is to fit into a socket 25mm square.

Preparation for the final assembly is permitted but pre-fabricated elements of the build shall be able to fit into a 500mm

square box of height no greater than 200mm prior to assembly at the venue.

You will have two hours for final assembly and preparation at the venue prior to judging.

You may research your solution however you should construct it yourself(ves) and you are to reach your design solution yourself(ves) and then build it yourself(ves). Each member of the team may take part in the presentation, but you are not all required to do so.

Adult assistance is not permitted other than at the research stage.

## **Judging**

There will be 3 judges, at least two of whom will be professional engineers or retired professional engineers. Judging decisions will be by majority and no discussion on judging decisions will be entered into.

The design and build will be judged on:

1. Your presentation which should last no more than 3 minutes. A weighting of up to 10% applies.
2. The success of the cantilever beam in supporting the load.
  - We will weigh your entry accurately.
  - The 3 kg load weight shall be divided by the weight of your entry thus giving a ratio defining the raw efficiency of the structure. The bigger this number the better!
  - The raw efficiency figure of the structure will be multiplied by a factor pertaining to the average age of the team of designers / constructors and that factor will be 1.05 for teams whose integer average age is no more than 12 and a factor of 1.1 for those whose integer average age is less than 9.

- A weighting of up to 5% will be applied taking into account the standard of build of the finished beam.
- Your presentation weighting will then be applied to reach the final result.

For example:

your structure weighs 55g giving a raw efficiency of 54.5.

Average age of your team is 11, giving a factor of 1.05 and the judges give you 4.5% for your standard of build.

Your presentation receives a weighting of 8%.

Start with your basic score of 54.5, add 8% for your presentation, multiply result by 1.05 for age weighting and add 4.5% for build quality, which gives a final result of 64.6. The highest result wins the competition.

Judging will take place at the Kildonan village hall commencing at 1400 on Saturday 19<sup>th</sup> March 2016. If there are sufficient entries a preliminary competition round will be held in order to produce 8 finalists. Details will be provided when necessary. There will be one prize of £500 to the winning person or team.

**Questions:**

Questions to Rory Cowan, October Cottage, Kildonan, Isle of Arran, KA27 8SE. 01770820603. [hrc@morayhouse.com](mailto:hrc@morayhouse.com)

**Entries:**

There is no entry fee. Register your entry with Steve Garraway in the Technical Department at the Arran High School where records will be securely retained.

26 November 2015