

# Shuttle Arm 2015

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**Objective** To construct the lightest arm possible that will lift a **100 gram** mass vertically to a platform 30 cm above a table.

**Helpful Hint:** 100 grams of mass is approximately equivalent to 18 Quarters OR 20 Nickels OR 44 Dimes OR 40 post-1982 Pennies.

## **Construction**

1a) Grades 5-9--The arm may only be made from 8 1/2 x 11 white copy paper (20 lb. weight) and masking tape.

1b) Grades 10-12--The arm may only be made from 8 1/2 x 11 white copy paper (20 lb. weight). No tape, glue or adhesive.

2) Grades 5-12--The materials (paper and masking tape) may be cut or folded but they may not be altered in any other way. ( No chemicals, burning or soaking.)

## **Competition**

1) The device may be held by one or two contestants during the trial. The contestants must remain in contact with the floor at all times and behind one end of the table. The device must not be supported by the table or platform while the **100 gram** mass is being lifted.

2) A **100 gram** standard cylindrical brass weight with (large paper clip) hook on top will be placed on a lab table at a distance from the end of the table determined by the contestant. (**Minimum distance = 50 cm**)

3) The contestants must use the arm to lift the weight from its position on the table onto a platform (30 cm tall) next to the weight without reaching over the table. The platform is a 14 cm x 10 cm horizontal surface. (The weight must remain on the platform after being placed there.)

4) The contestants must position themselves so that no part of their bodies breaks the vertical plane of the end of the table.

*-The intent of this event is to build a device which will lift the weight onto the platform from the greatest horizontal distance away.*

## **Judging**

1) Two one-minute trials will be allowed. A different arm may be used for the second trial. The best trial will be counted.

2) Score = distance(cm) x distance(cm) / mass(gm)

(Score = distance squared divided by mass)

distance = distance from the brass weight and platform to the end of the table

mass = mass of the entire arm

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