

Building a DIY Catapult for DOE (Design of Experiments)

Plans and Instructions by Matthew Barsalou

Parts list:

2 Pieces of wood: 40 cm x 4 cm x 2 cm

2 Pieces of wood: 24 cm x 4 cm x 2 cm

8 Pieces of wood: 20 cm x 4 cm x 2 cm

1 Piece of wood: 45 cm x 2 cm x 2 cm

18 eye screws

4 screw hooks

16 Flathead wood screws: 5.0 mm x 60 mm

1 Rubber band: 60 mm diameter

1 Rubber band: 100 mm diameter

1 Rubber band: 130 mm diameter

1 plastic cup: small

1 bag of rice: 25 g

1 bag of rice: 37.5 g

1 bag of rice: 50 g

4 metal rods: 3 mm diameter by 25 cm long



Assembly

Step 1: Cut two pieces of wood to 40 cm x 4 cm x 2 cm to use as the base (part A).

Step 2: Cut two pieces of wood to 24 cm x 4 cm x 2 cm (part B) to connect the supports (parts C and D).

Step 3: Cut eight pieces of wood to 20 cm x 4 cm x 2 cm. The supports (parts C and D) will require 4 pieces; the reinforcement for the supports (part E) will require two pieces and the connectors (parts F and G) will use two pieces.

Step 4: Take two of the 20 cm x 4 cm x 2 cm pieces and cut a 45° angle on each end to fit the support reinforcements (part 4) to the supports (Parts C and D) and base (Part A).

Step 5: Attach the connectors (parts F and G) to the base (part A) using wood screws. NOTE: Predrill the screw holes and countersink if necessary.

Step 6: Attach the supports (parts C and D) to the base (part A) using wood screws.

Step 7: Attach the support reinforcement (part E) to the support (part D) and the base (part A) using wood screws.

Step 8: Attach the support connector (part B) to the supports (parts C and D) using wood screws.

Step 9: Assemble the opposite side by repeating steps 5 through 8 for the opposite side.

Step 10: Drill a hole on each side of the base (part A) for the pivot arm rod. The holes should be slightly larger than the 3 mm metal rod.

Step 11: Drill a hole in the catapult arm for the metal rod.

Step 12: Attach hook for rubber band, screw eyes for rubber band guides, hook screws for arm stoppers and hook screws for starting points to the frame.

Step 13: Attach the hooks for the rubber bands to the catapult arm.

Step 14: Attach the cup to the catapult arm using a wood screw.

Step 15: Attach the catapults arm to the catapult body by first inserting the metal rod into the hole in the base and then pushing it through the hole in the catapult arm. Then push the metal rod all the way through till it comes out of the base on the opposite side. Bend the metal rod on both ends to ensure that it does not fall out of the catapult.

Step 16: Bend the remaining three metal rods into an L shape to use for setting the catapult levels.

Step 17: Find the optimal catapult setting using DOE.

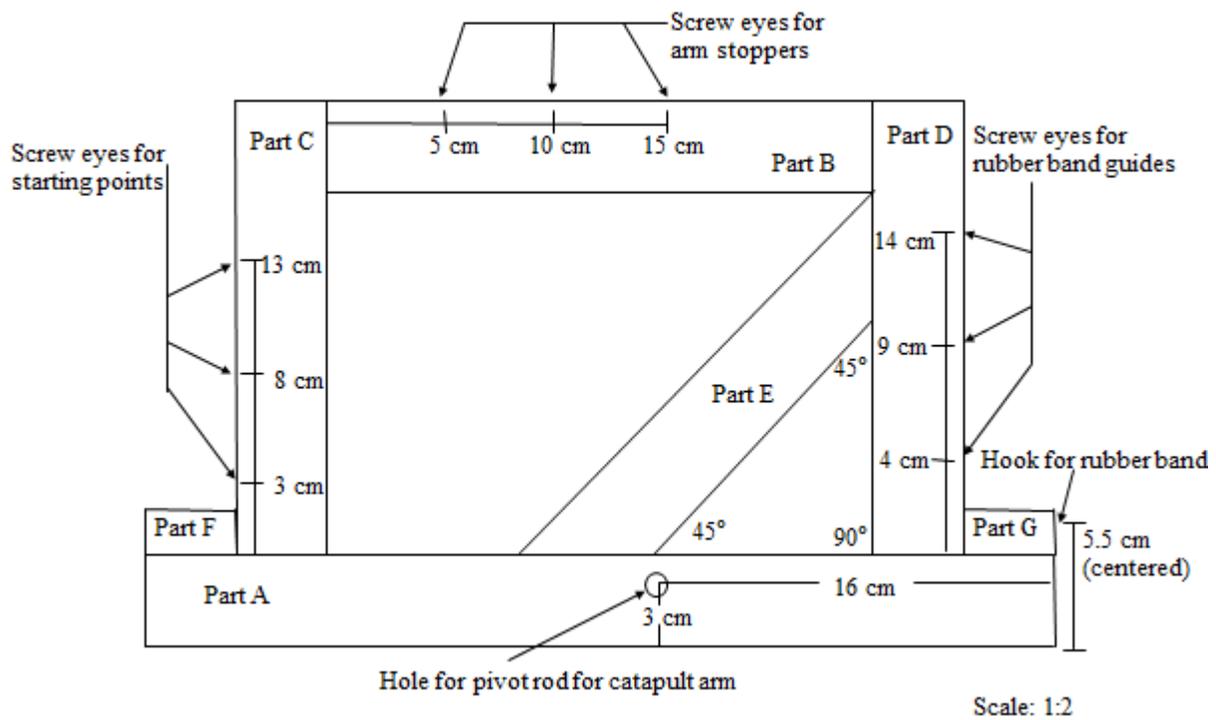


Figure 1: Right side view of catapult without catapult arm

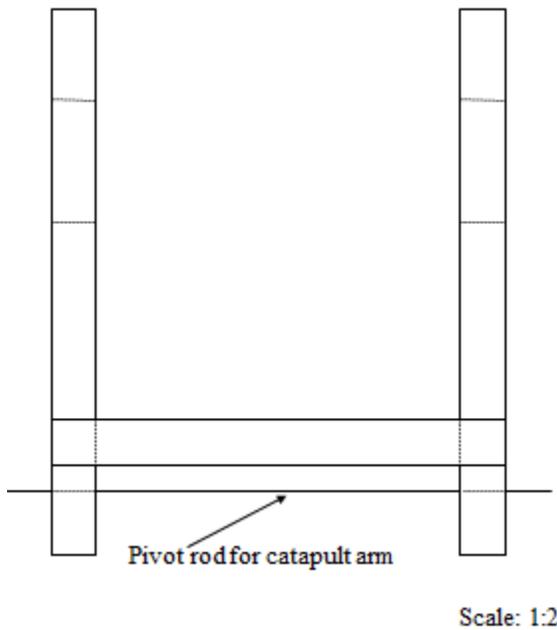
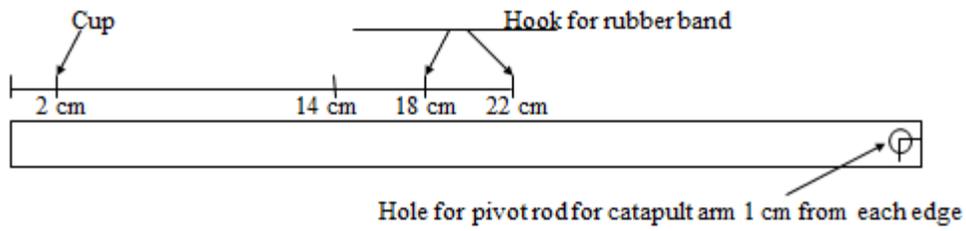


Figure 2: Front view of catapult body without catapult arm



Scale: 1:2

Figure 3: Right side view of catapult arm