



TA201A

Design Project

T1G4: Final Turn Presentation

Sept 21, 2021



Project Info

Title: **Dog and Dog Wheelchair**

Instructor: **Dr. Shashank Shekhar**

Tutor: **Dr. Kantesh Balani**

Lab Incharge: **Mr. Anil Kumar Verma & Mr. IP Singh**

TAs: **Mr. Arijit Samaddar & Ms. Shalini Kushwaha**

Duration: **6 Weeks**



Team

200174 ANUSHKA PANDA

200533 KUMAR SAURAV

200841 SAIRAM NAYAK KUNSOTH

201097 VATSALYA ROY

200433 HARSHIT RAJ

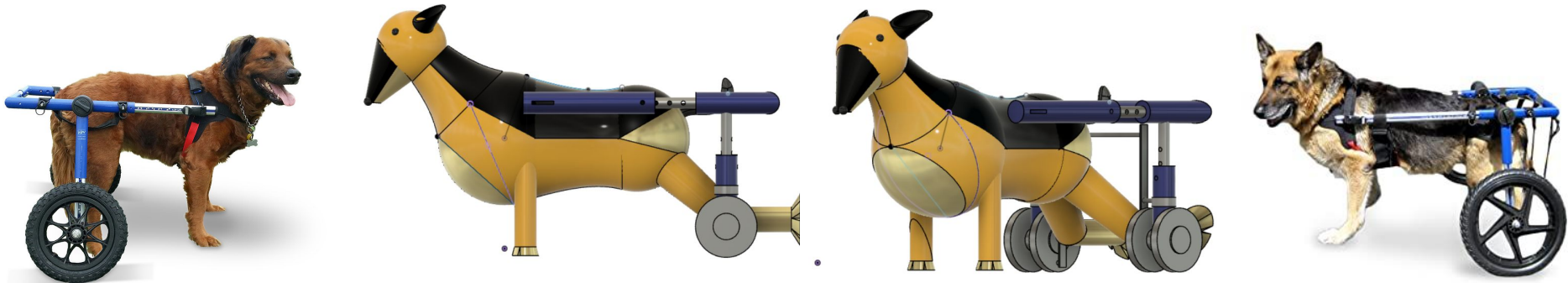
200783 RICK GHOSH

200895 SATYAM KUMAR ROY

201140 YASH DAHIYA

Dog and Dog wheelchair

The idea is to create a mechanical dog whose hind leg is physically challenged. To support the same dog a wheelchair is added to the model and the tail of the above mentioned dog would wag when wheelchair moves.

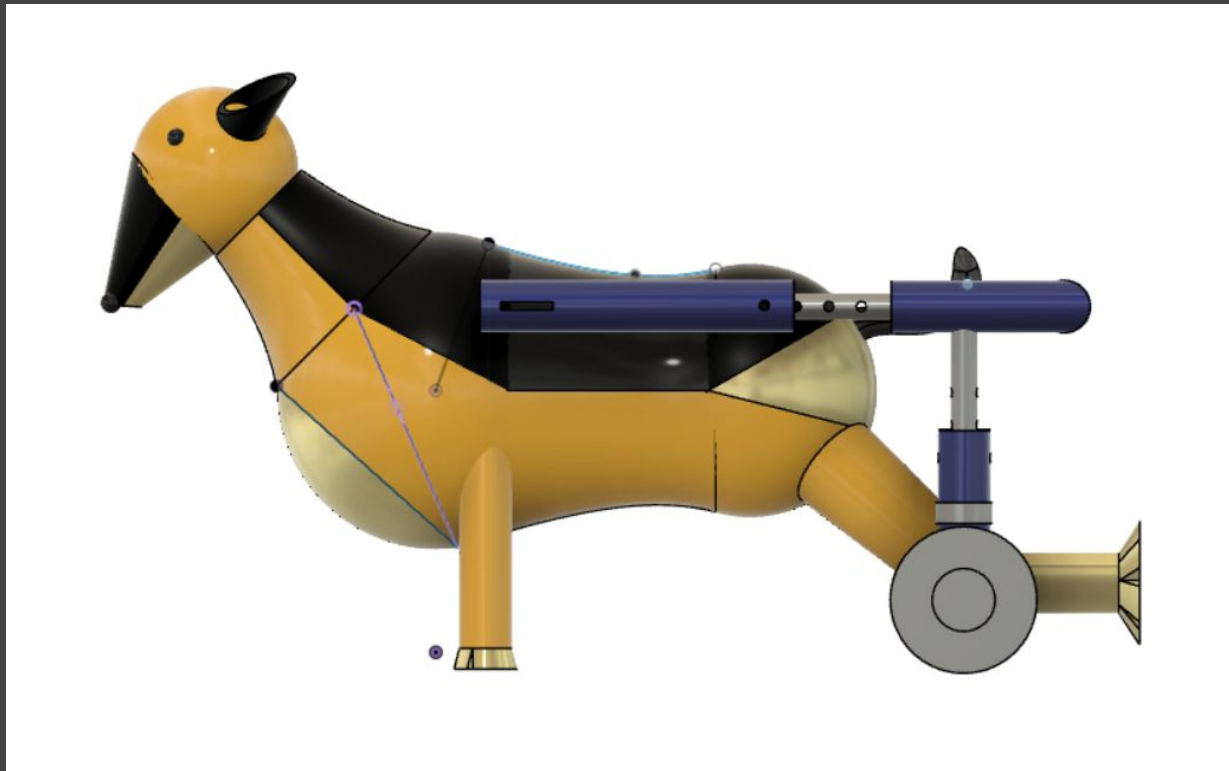




Main Features

- 1 Mechanical dog
- 2 Wheelchair
- 3 Wagging tail (Moving part)
- 4 Length of wheelchair is adjustable.

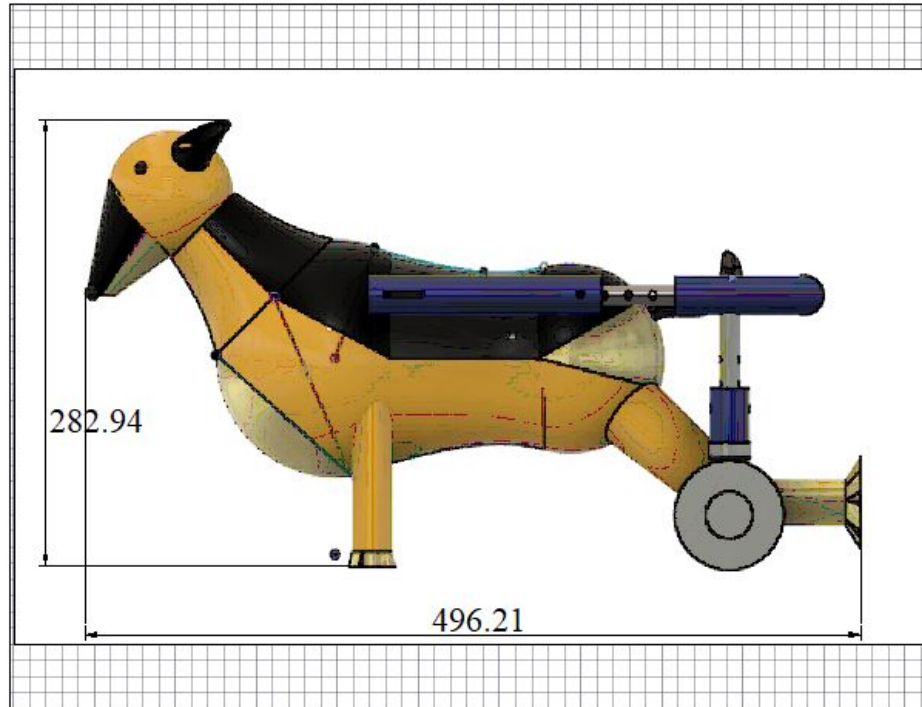
Side View



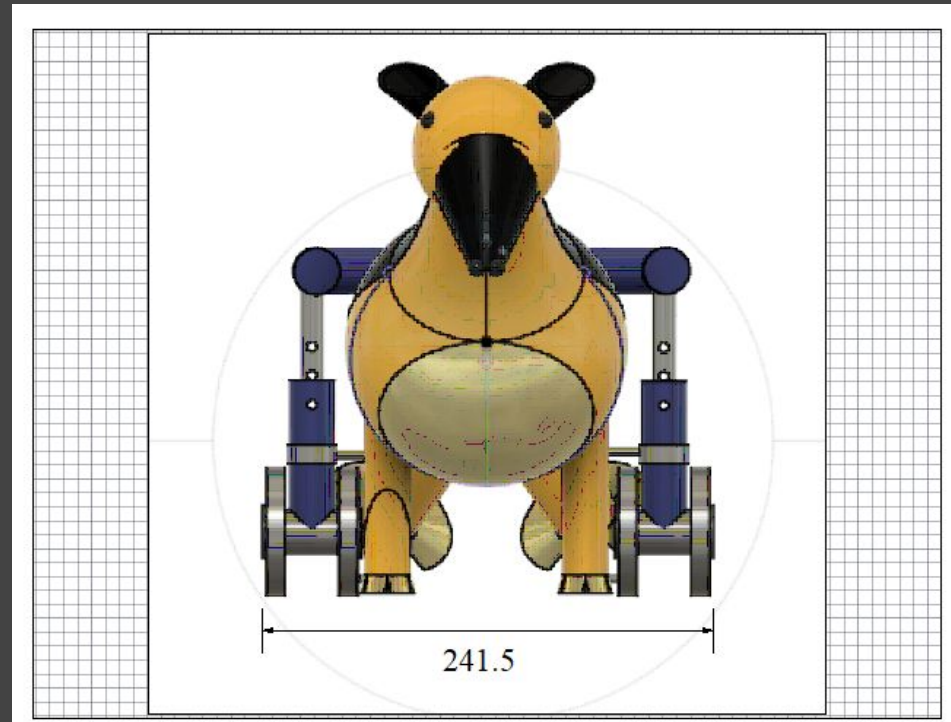
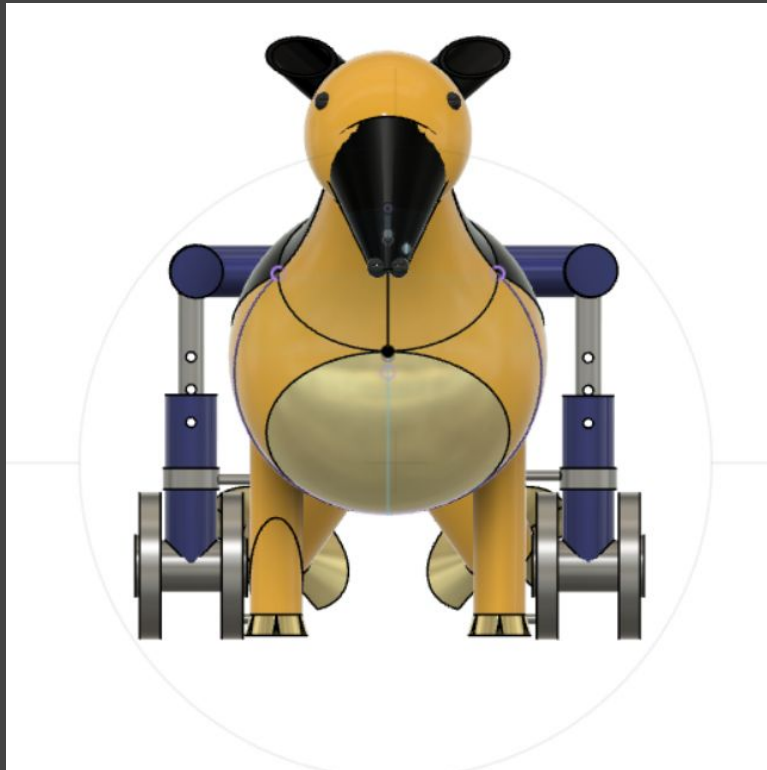
Side View



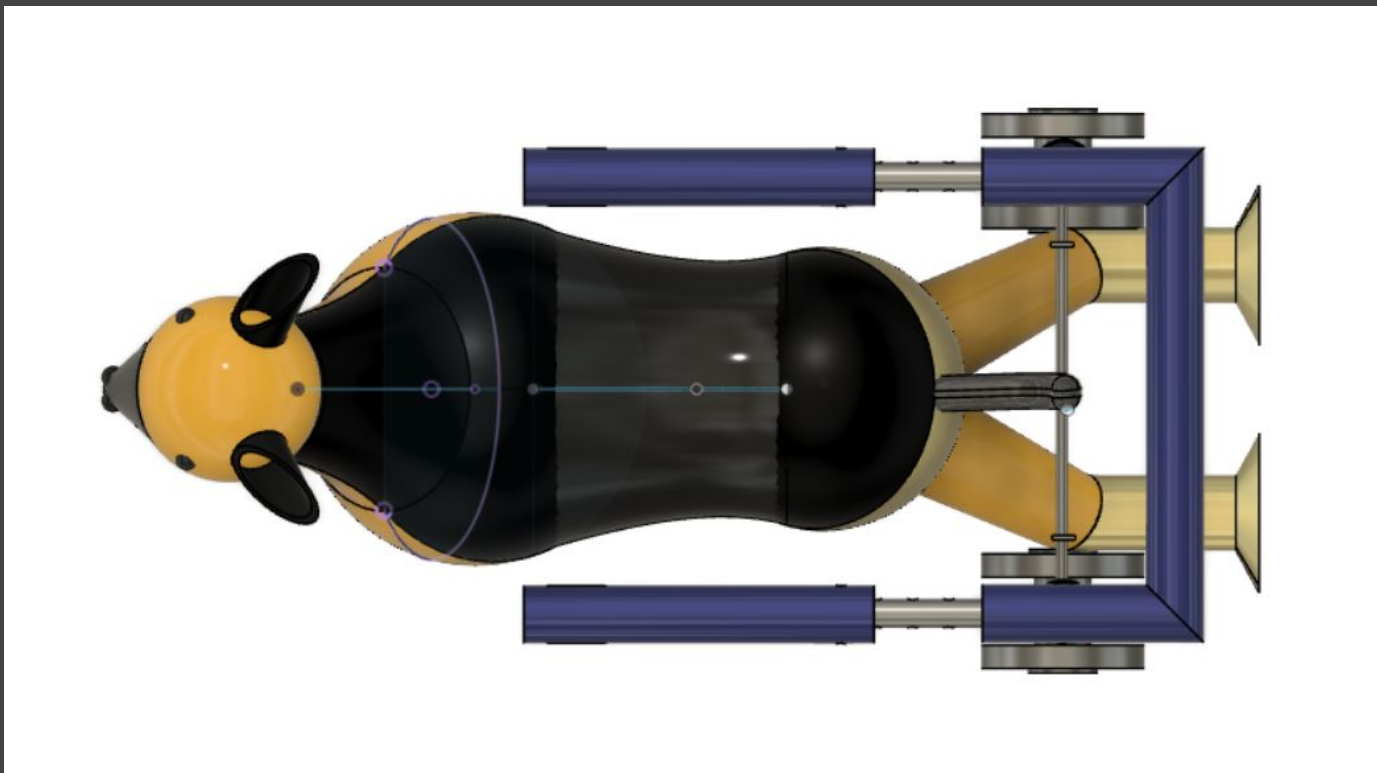
Throughout ppt All dimension in mm



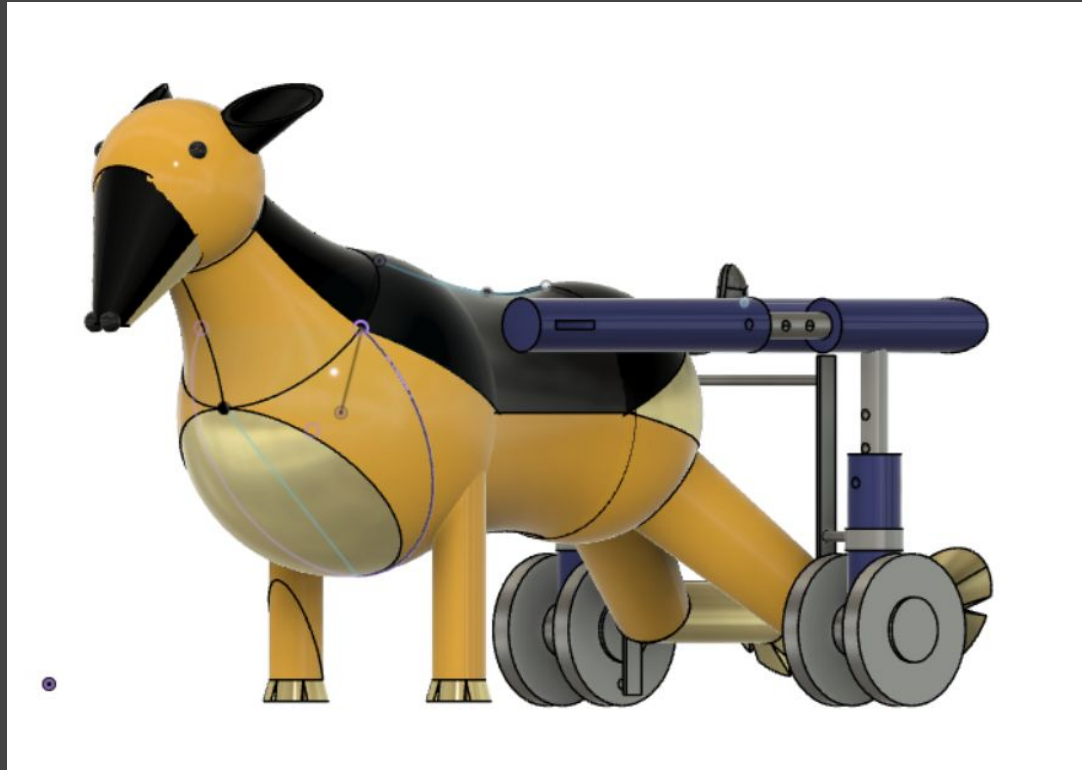
Front View



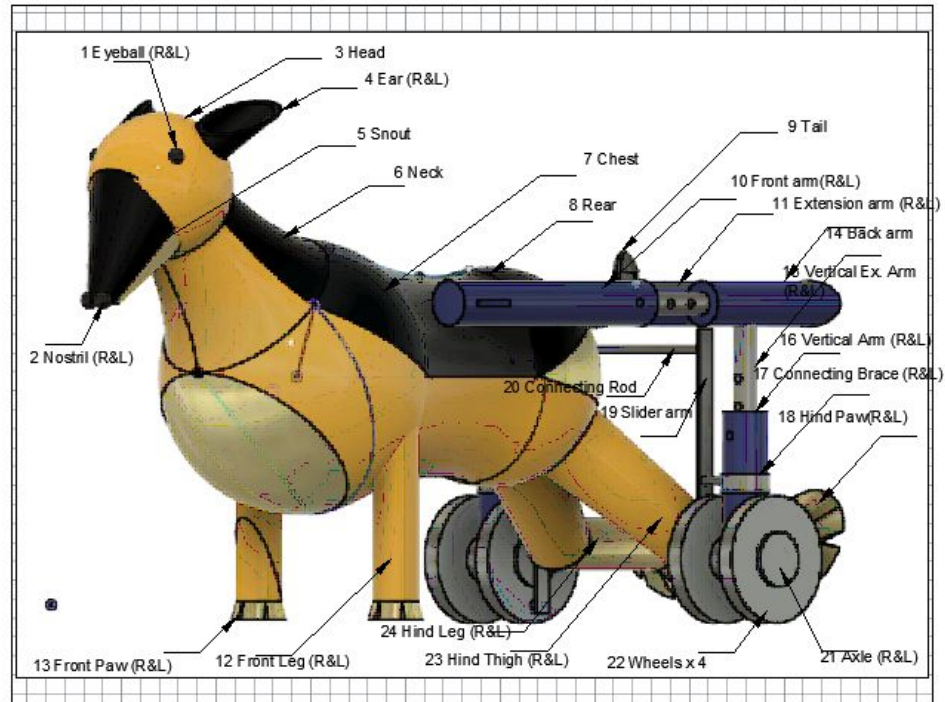
Top View



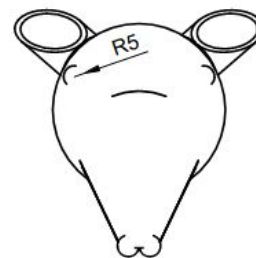
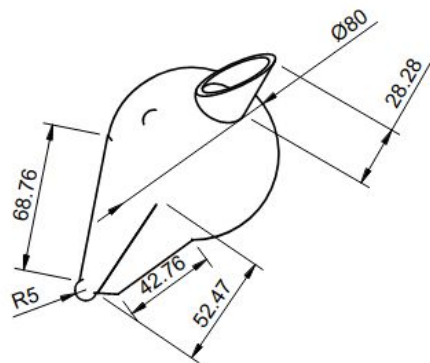
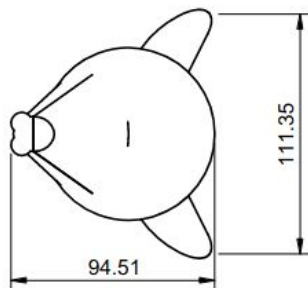
Isometric View



Isometric View



Face of Dog



Face of Dog

Component 1-5

Ears x 2 [P4 Ear]

Height: 40.1mm
Inner Diameter: 21mm

Material: Mild Steel Sheet (0.5 mm)

Manufacturing Process: Sheet forming and cutting

Joining Process: Metal Brazing

Total Mass: 10.83 g
Cost: INR 0.45



Sphere: [P3 Head]

Diameter: 80 mm
Material: Aluminium

Mass: 0.724 kg
Cost: INR 152

Manufacturing Process: Casting

Open Cone: [P5 Snout]

Length: 60 mm,
Circumference : 150 mm Angle: 144*,
Height: 75 mm

Material: Mild Steel Sheet (0.5 mm)

Manufacturing Process: Sheet forming and cutting

Joining Process: Metal Brazing

Mass: 300 g Cost: INR 12.6



Face of Dog

Eyeballs x 2: [P1]

Sphere Diameter: 10 mm

Total Mass: 2.8 g

Cost: INR 0.6

Material: Alumunium

Manufacturing Process: Casting

Joining Process: Brazing

Nostrils x 2: [P2]

Sphere Diameter: 10 mm

Total Mass: 2.8 g

Cost: INR 0.6

Material: Alumunium

Manufacturing Process: Casting

Joining Process: Brazing





Face of Dog

Ears x 2 [P4]

Height: 40.1mm

Inner Diameter: 21mm

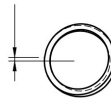
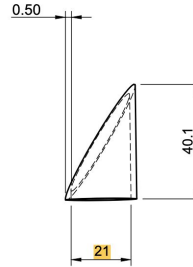
Material: Mild Steel Sheet (0.5 mm)

Manufacturing Process: Sheet forming
and cutting

Joining Process: Metal Brazing

Total Mass: 10.83 g

Cost: INR 0.45



Neck of Dog

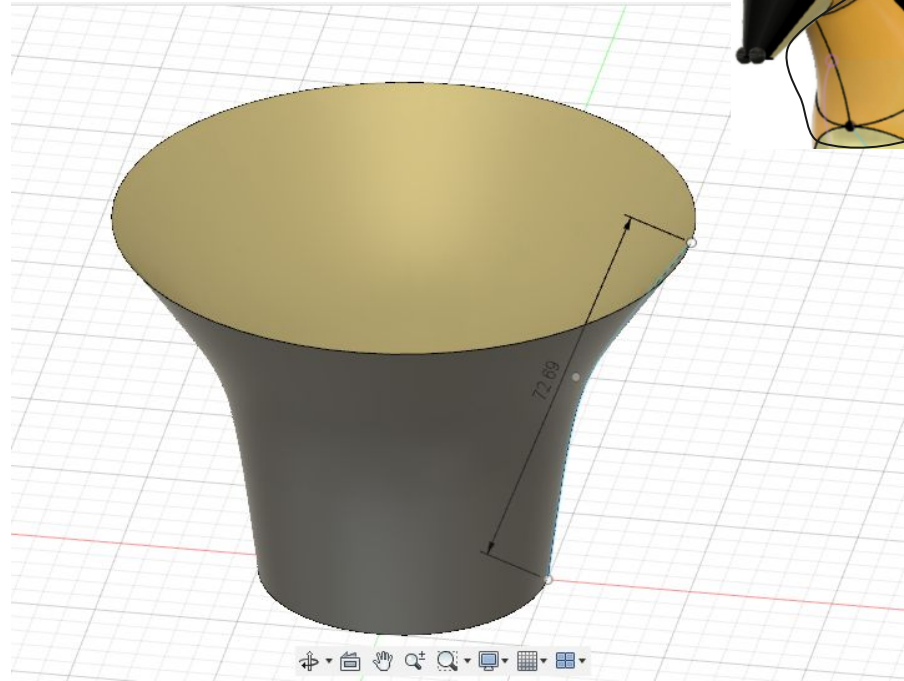
Curved Frustum: [P6 Neck]

Material: Mild steel sheet(1mm)

Manufacturing Process: sheet metal forming

Mass = 123 g

Cost = INR 24



Neck of Dog

Hemisphere(phi 151.5, thickness 5): [P7 Chest]

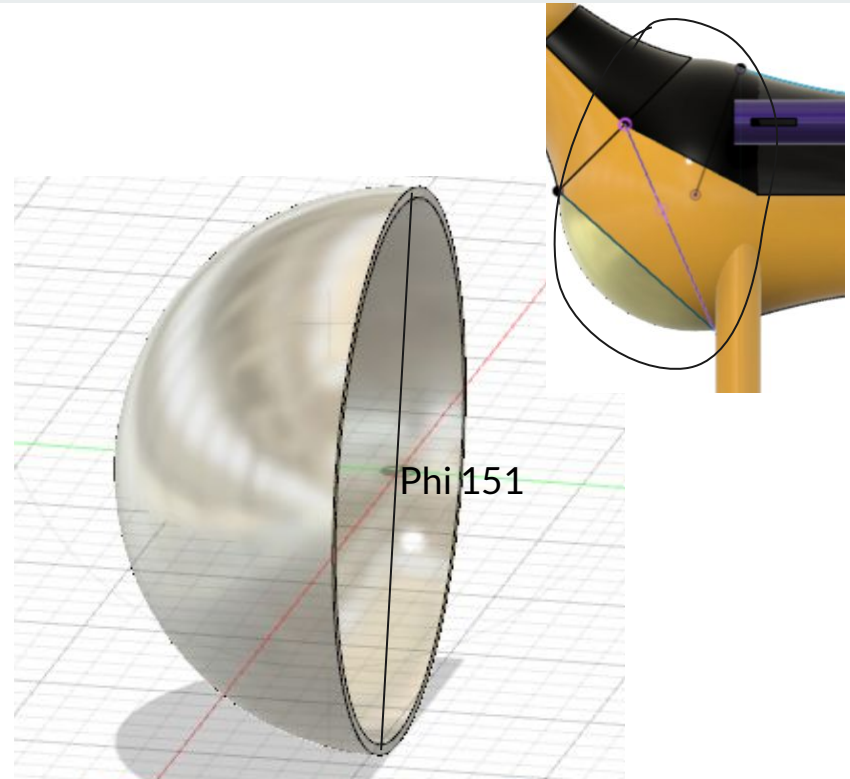
Material: Aluminium

Manufacturing Process: Sand mould casting

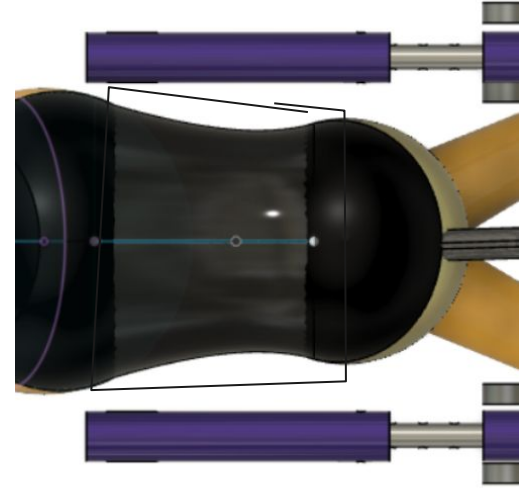
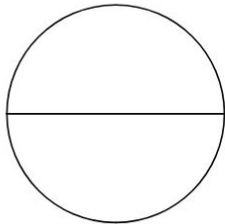
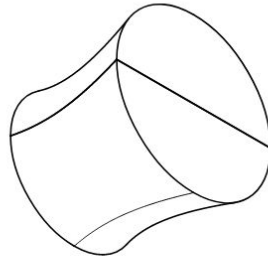
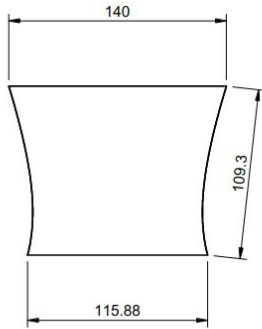
Mass: 281

Assuming rate = Rs. 191/kg

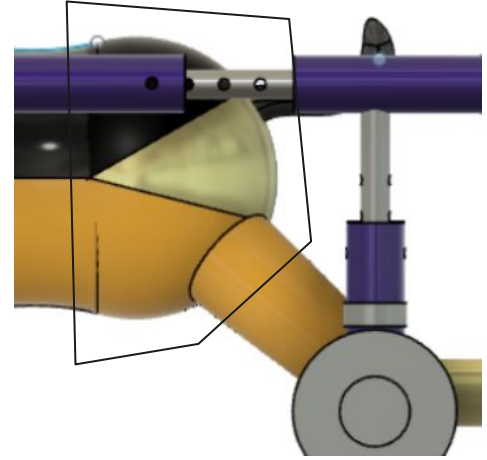
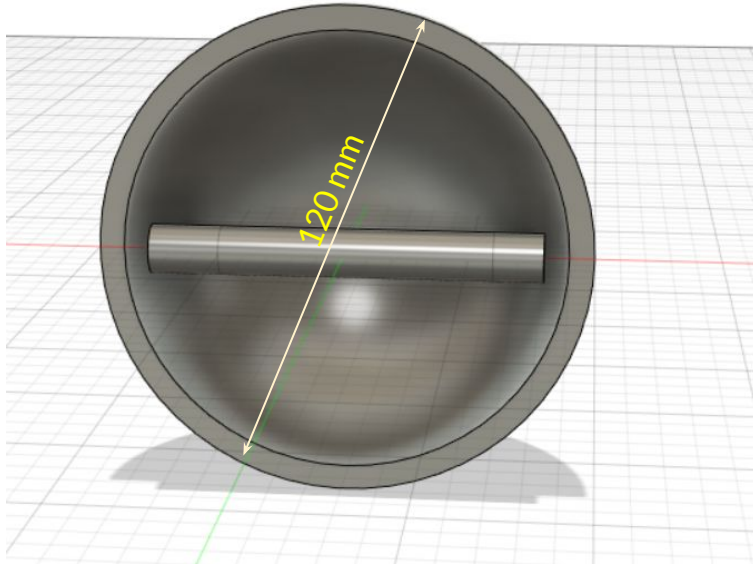
Cost: 61 rupees



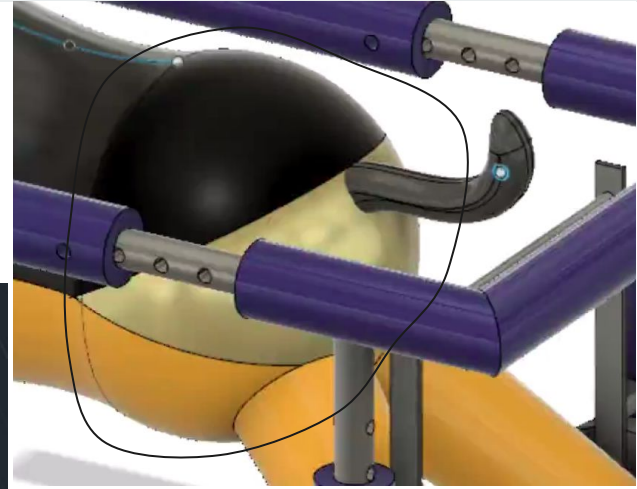
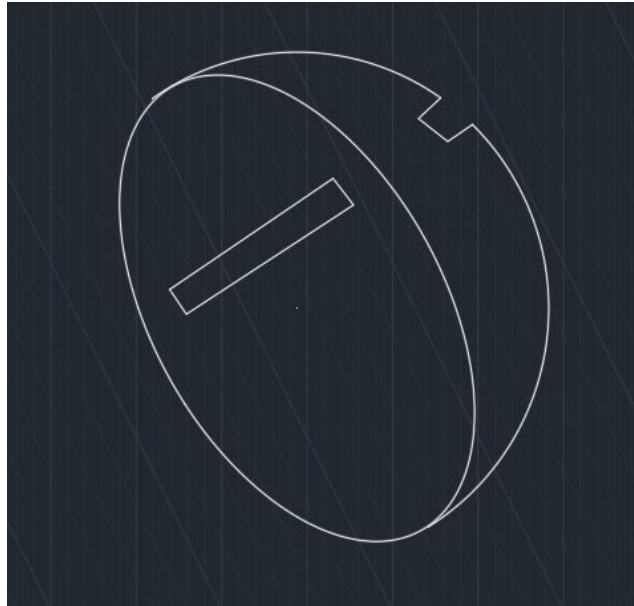
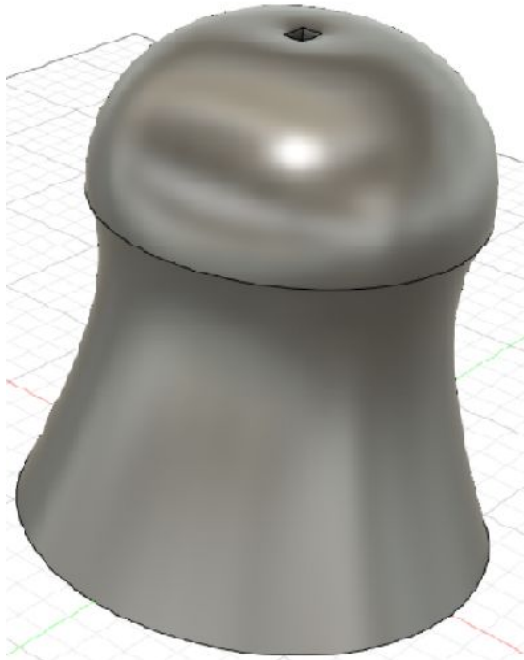
Torso and rear [P7-8]



Torso and rear [P7-8]



Torso and rear [P7-8]



Torso and rear



Frustum: [P7-8]

Material- Mild steel sheet(1 mm)

Manufacturing process- Sheet metal forming

Large diameter- 150 mm

Slant height- 150.75 mm

Small diameter- 120 mm

Mass- 0.510 kg

Cost- Rs 26 (Rs 50 per kg)

Lower body: [P8]

Hemisphere:

Material- Aluminium(3 mm)

Manufacturing process- Sheet metal forming

Diameter- 120 mm

Mass- 0.183 kg

Cost- Rs 39 (Rs 210 per kg)

Rod:

Material- Mild steel round rod(10mm)

Length- 115mm

Mass- 0.0722 kg

Cost- Rs 3.61 (Rs 50 per kg)

Hind leg

Frusturn: [P23]

Material: Aluminium

Manufacturing Process: sand mould casting

Slant height: 105.43 mm

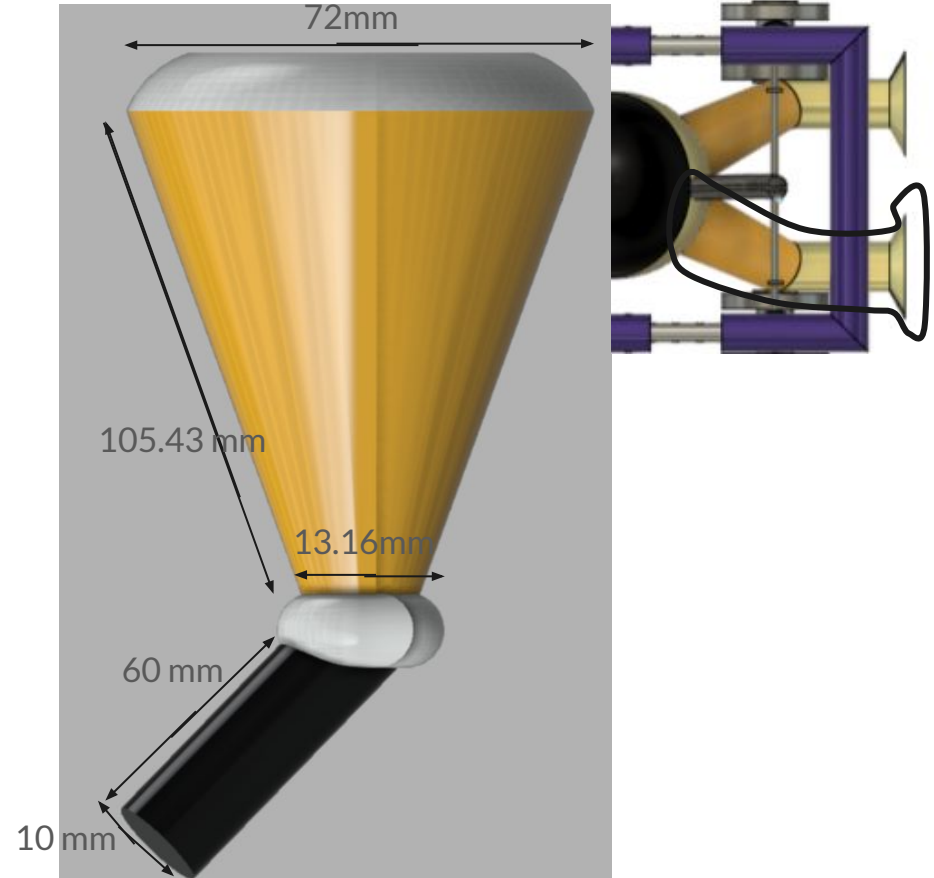
Larger diameter: 72mm

Smaller diameter: 13.16mm

Sheet metal metal working (shearing and bending)

Mass: 47 g

Cost: 10 rupees





Hind leg

Rod: [P24]

Material: Steel rod

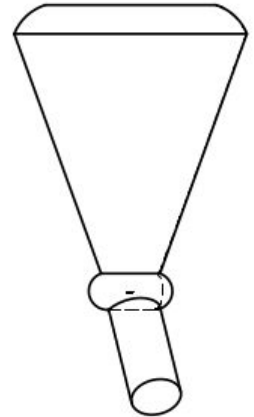
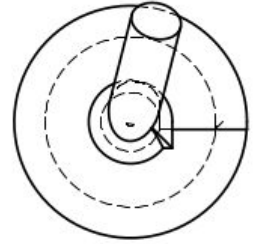
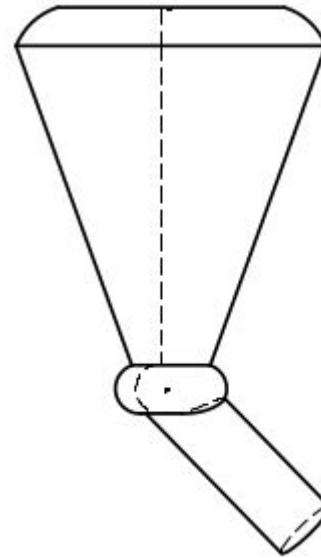
Manufacturing Process: cutting

Length: 60 mm

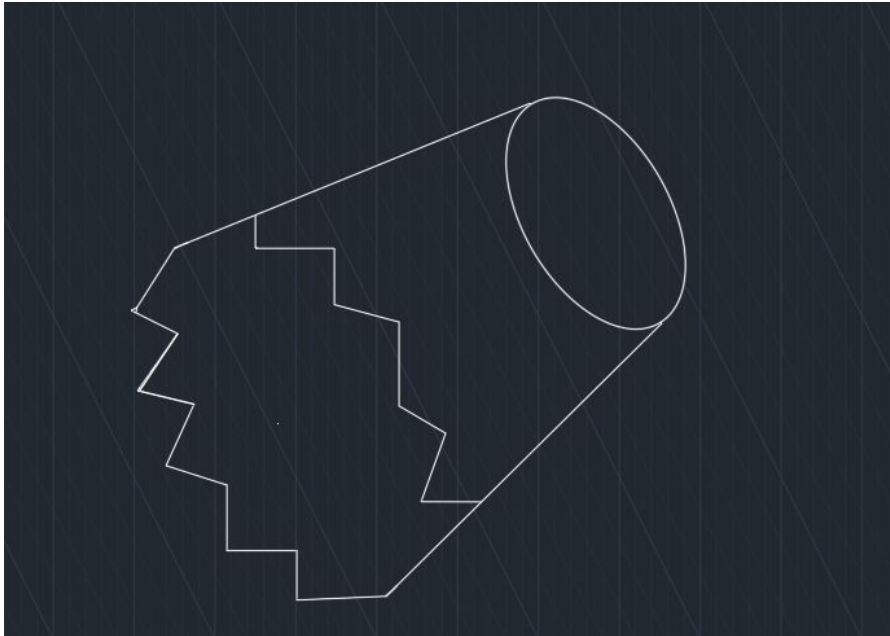
Diameter: 10 mm

Mass: 46 g

Cost = 8 rupees



Paws



Paws [P13 & P18]

Frustum:

Material- Mild steel sheet(1 mm)

Manufacturing process- Sheet metal forming

Height- 10 mm

15° taper

Small diameter- 25 mm

Wedges at 60°

Cut by planes at angle 30° to the center of wedges

Mass- 0.007 kg

Cost- Rs 0.365 (Rs 50 per kg)

Tail [Pg]

Materials required Aluminium item

Process involved

- Casting to get desired shape
- Hinging the tail with the rod in the

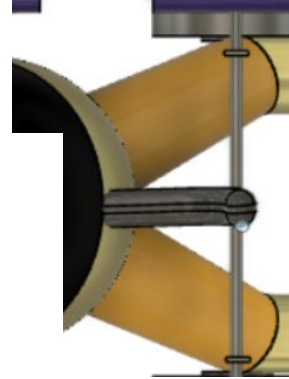
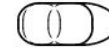
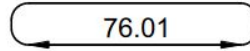
rear

Cost analysis

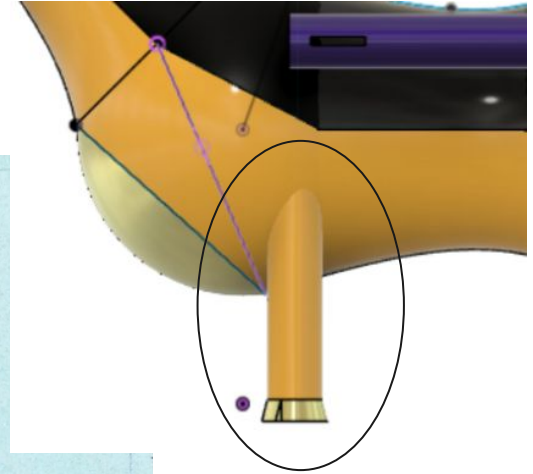
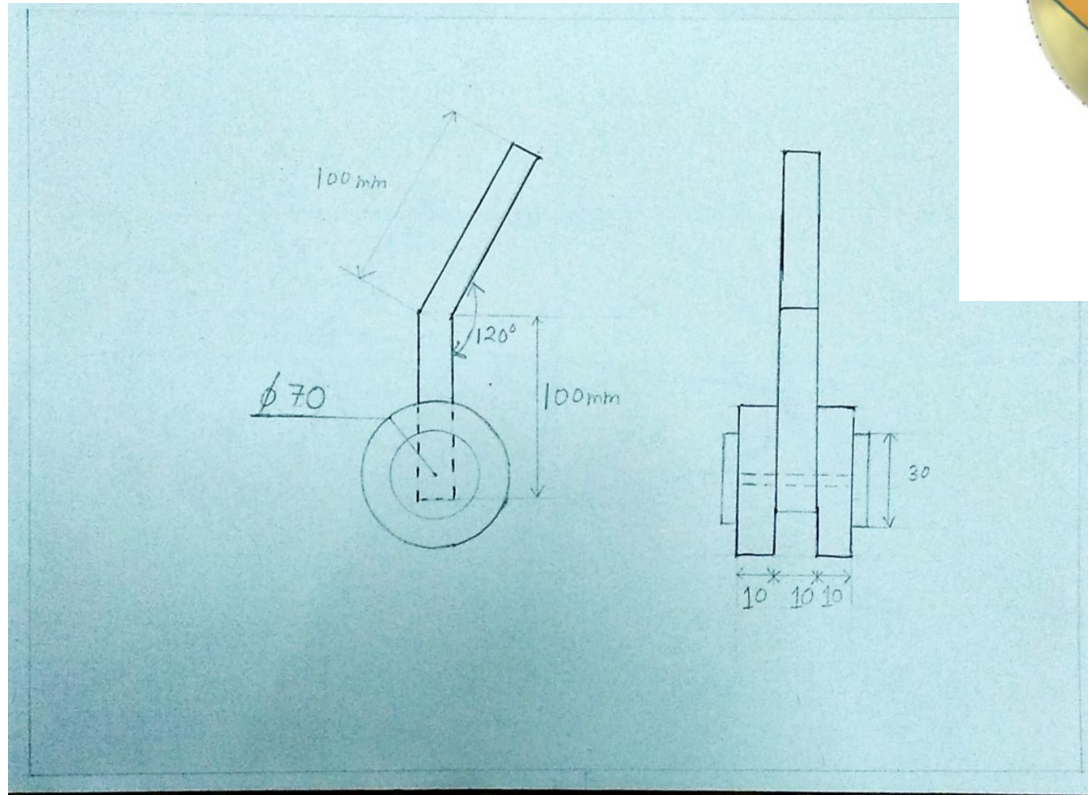
Volume of tail = 21cm^3

Mass = 56.7 g

Cost = 12 rupees



Front legs [P12]





Front legs

07

Materials used-

1. Two cylindrical Aluminium Rods (length 100mm, diameter 10mm).
2. Two cylindrical Aluminium wheels (diameter 70mm, width 10mm).
3. An aluminium axle (in the form of cylindrical rod of length 30mm)
4. Two thin cylinders (of width 5mm) and diameter 30mm.

Process used-

1. Welding –
To join legs with body of dog.
To join both the rods.
To join axle with thin cylinders.
2. Metal forming
3. Casting

Cost Analysis-

- a) **Rods**
Volume = 15.7cm^3
Weight = 42.39 g
Cost = 9.19
- b) **Wheels**
Volume = 76.93cm^3
Weight = 207.711 g
Cost = 45.07
- c) **Thin Cylinders**
Volume = 7.065cm^3
Weight = 19.07 g
Cost = 4.13
- d) **Axle**
Volume = $3.14 \times 0.505^2 \times 4\text{cm}^3 = 3.14\text{cm}^3$
Weight = 8.478 g
Cost = 1.83

Total Weight = 271 g (approx.)

Total cost = 62 Rs (approx.)

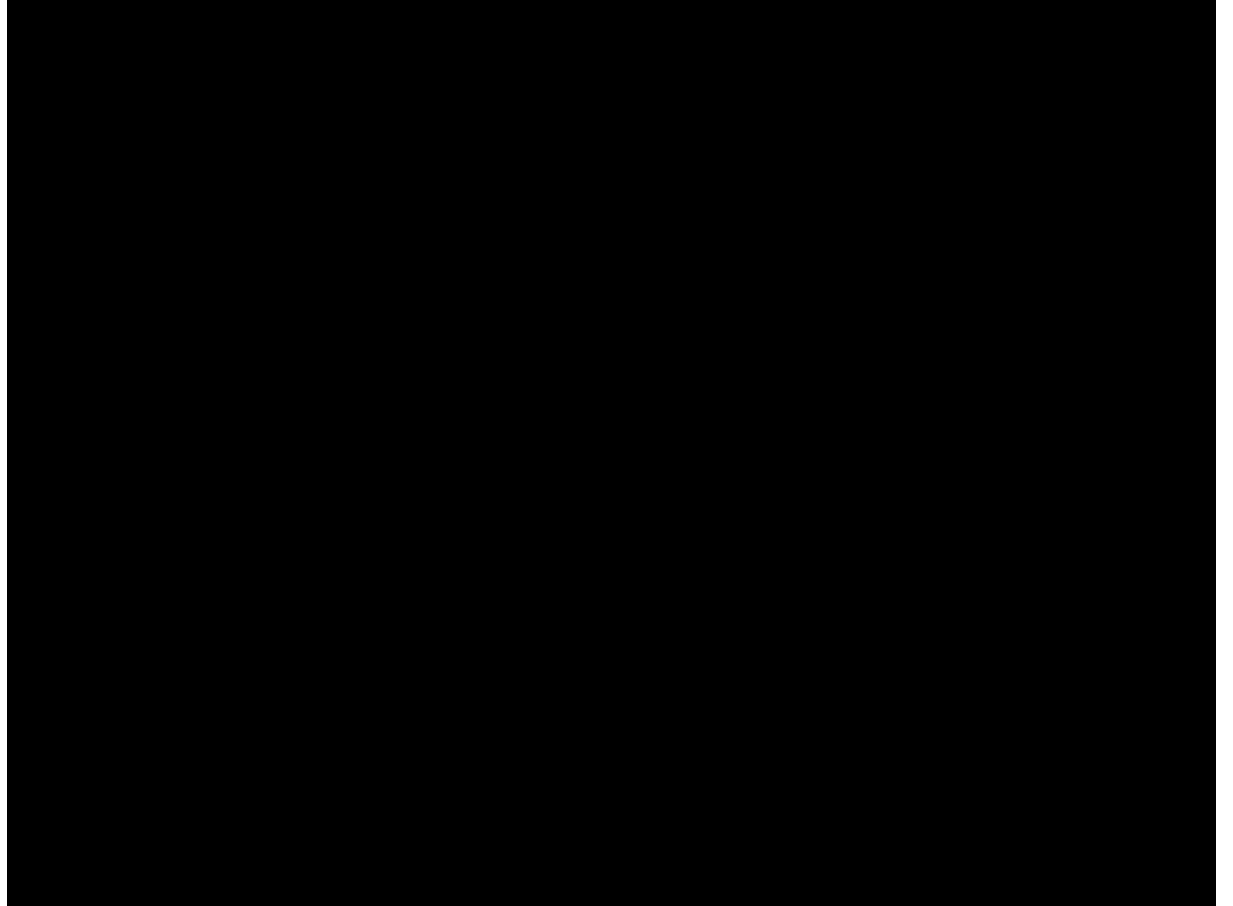


Tail wagging Mechanism

- 01 | A rivet to attach to the tail
- 02 | And an steel rod rod of maximum length 259 mm (approximate)
- 03 | Sheet metal shearing
- 04 | Cost accommodate with other parts



Tail wagging Mechanism





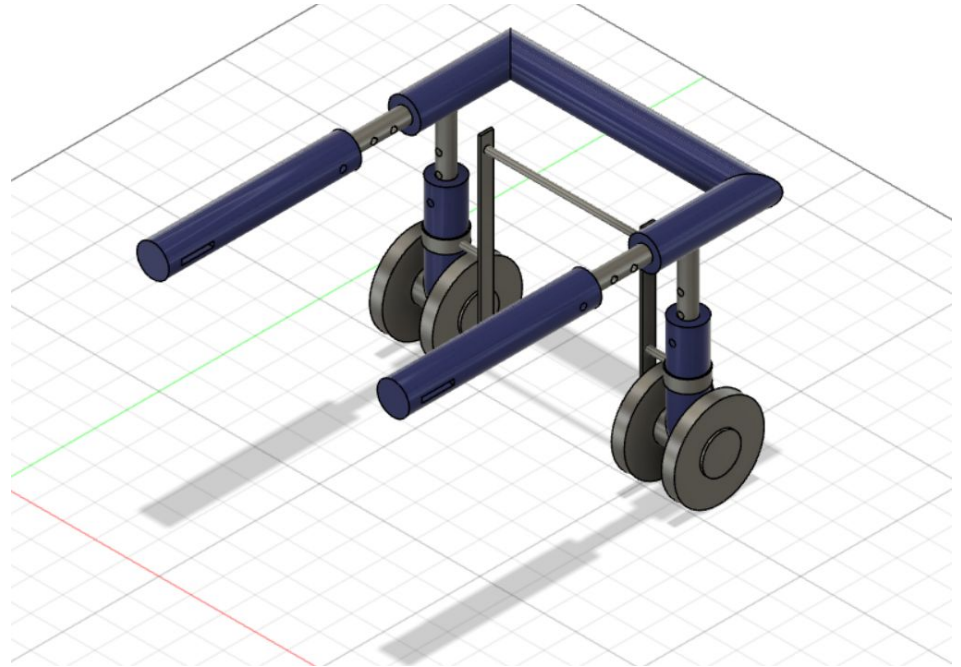
Wheel chair

Isometric

Flexible wheelchair

max width: 300 mm since its adjustable

height 212 mm (adjustable)



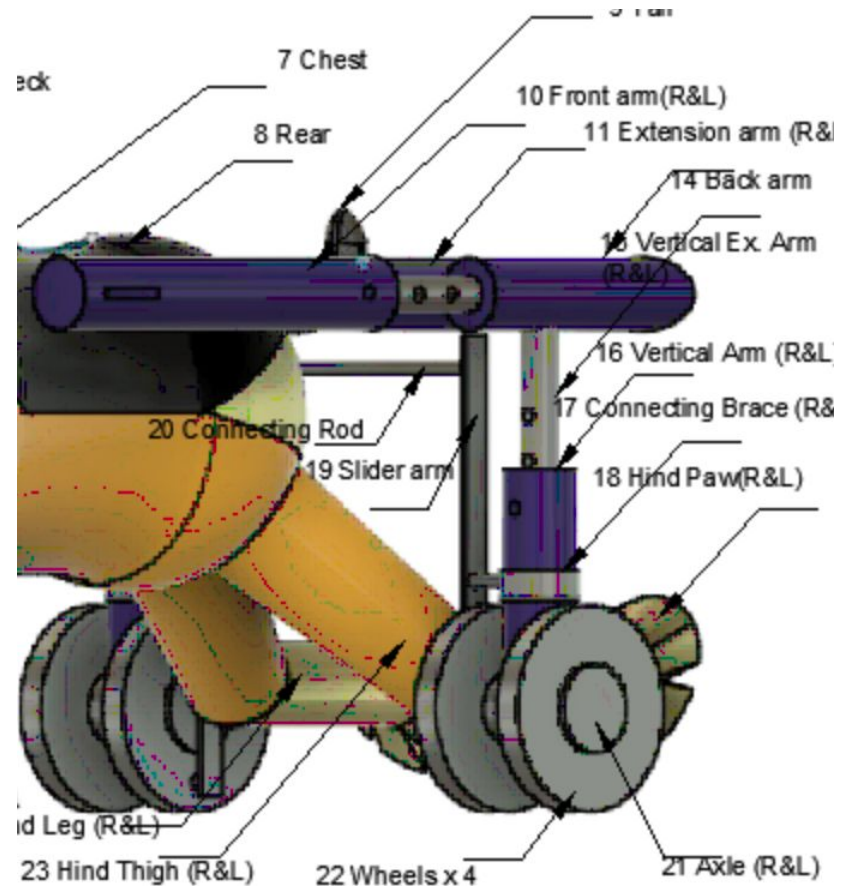
Wheel chair

Isometric

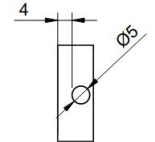
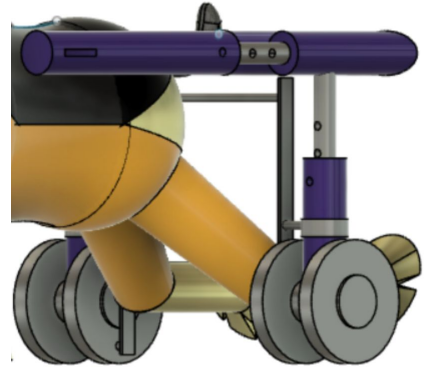
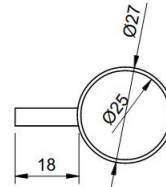
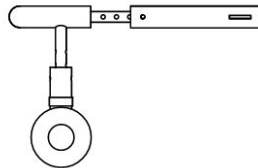
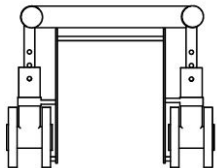
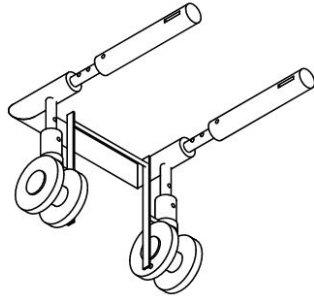
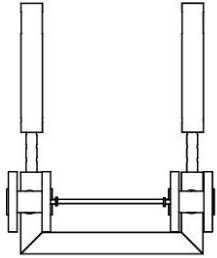
Flexible wheelchair

max width: 300 mm since its adjustable

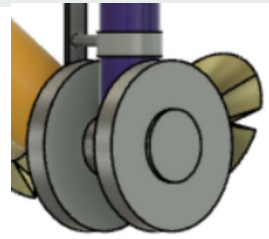
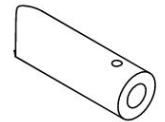
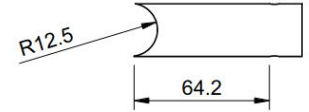
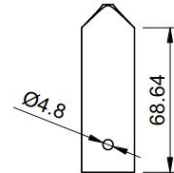
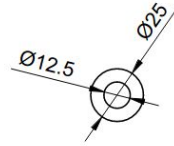
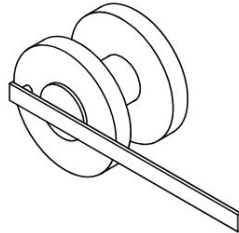
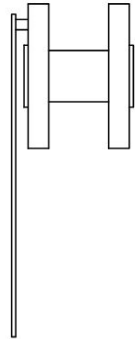
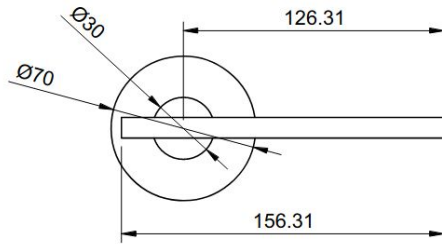
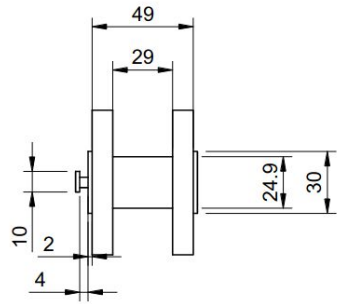
height 212 mm (adjustable)



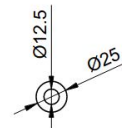
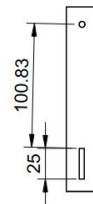
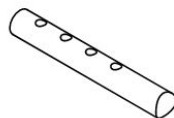
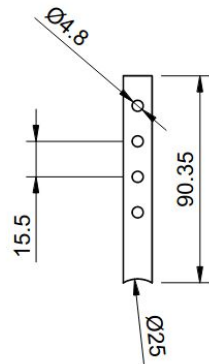
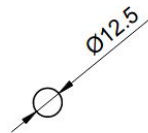
Wheel chair



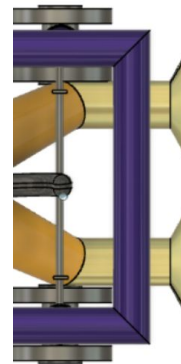
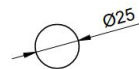
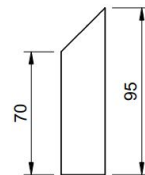
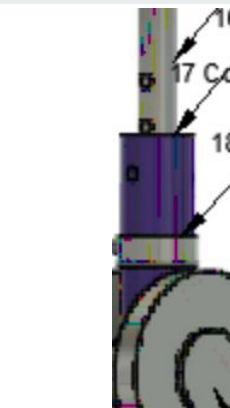
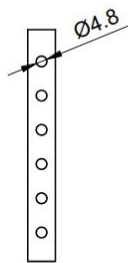
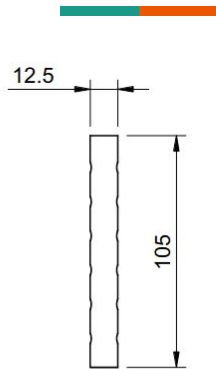
Wheel chair



Wheel chair



Wheel chair





Wheel chair

Processes :

Drilling to make holes in rods and pipes of 4.8 mm

Welding to join various rods

Forging to make rod of 12.5 mm out of 25 mm

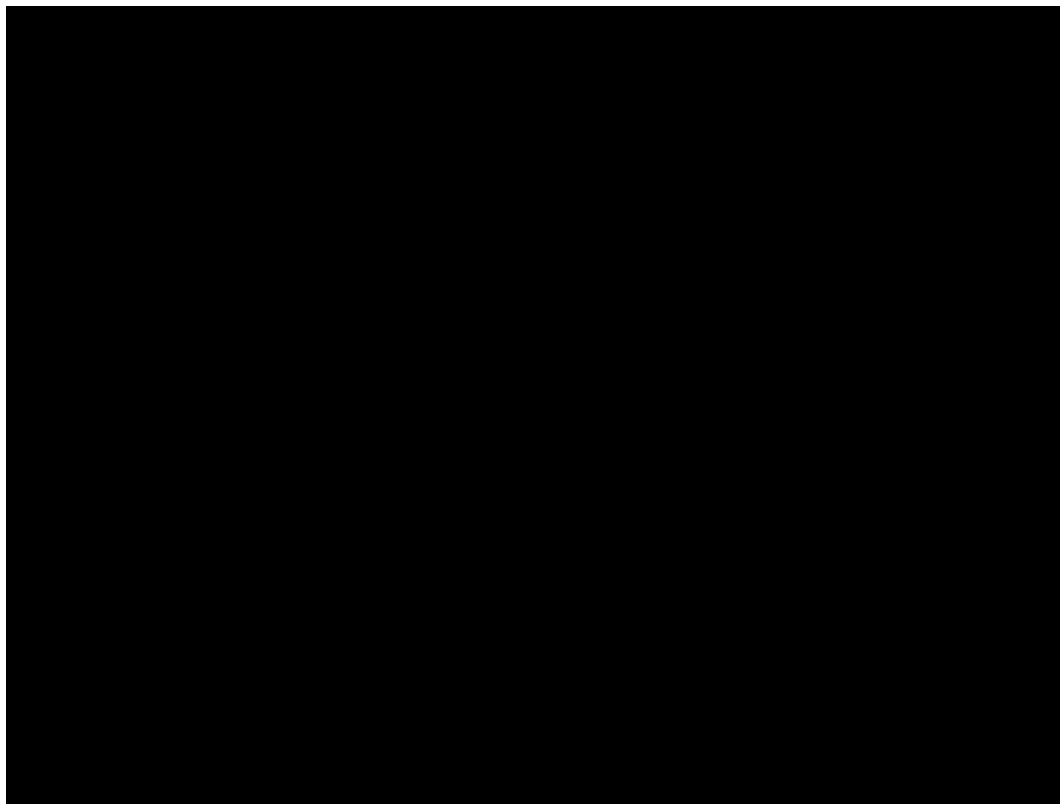
Parts:

- 25 mm rod (x13)mild steel disk (70 mm dia , 10 mm thick)
- 5 mm rod
- 2mm thick mild steel sheet

Mass: 4573.945g

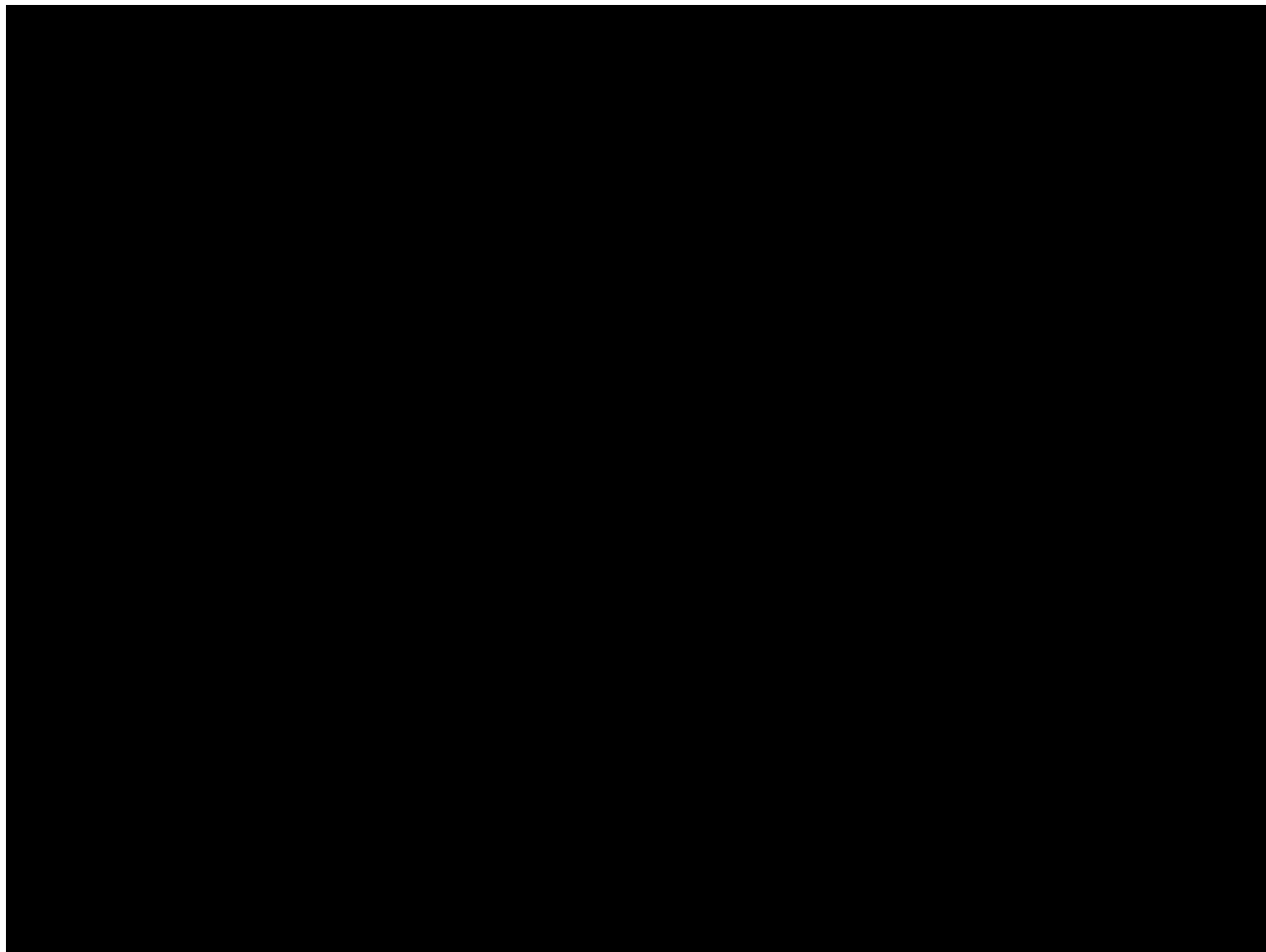
Cost: 228.65 Rs

Exploded View



*Only slide with Wheel cap

Assembly





Assembly

Assembly dimension:

283 mm Height

496 mm width [head to tail]

241 mm depth

Approximated Expected weight: 7 KG



Cost analysis

Sl	Part Name	Mass (grams)	Material Cost (INR)	Machining cost (INR)
01	Face of Dog	1041	167	43
02	Front Body	433	85	57
03	Rear body	693	65	58
04	Hind legs * 2	190	36	61
05	Paws * 4	30	5	99



Cost analysis

SI	Part Name	Mass (grams)	Material Cost (INR)	Machining cost (INR)
06	Tail	57	12	100 (approx)
07	Front leg	500	124	52
08	Tail wagging mechanism	--	--	35
09	Wheel Chair	4580	230	250
Total		6905	724	755



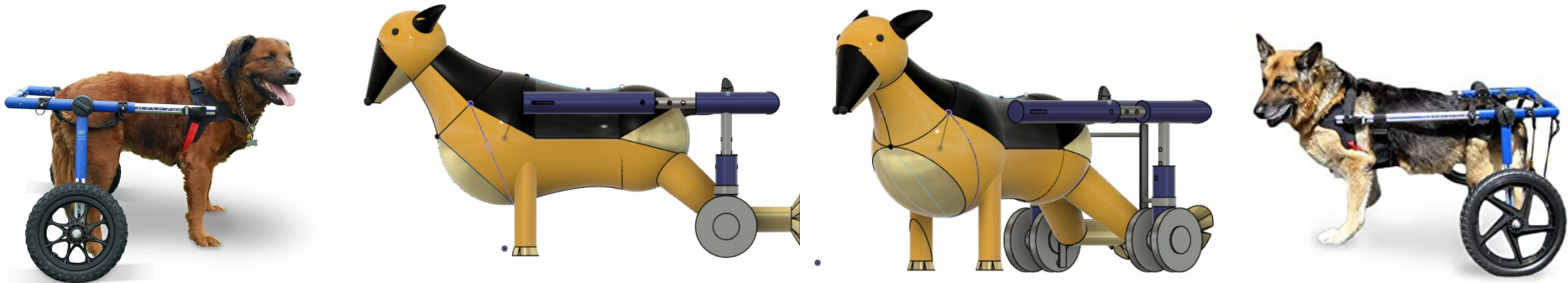
Master Cost analysis

SI	Bill Head	Cost (INR)
01	Dog+Wheelchair	1,500
02	Labour Cost : [20-40] man hours (max)	--
03	Finishing (smoothening, polishing etc)	250
04	Other expenses	250
Total		2,000

Impact on Environment/Society

Our wish was to, as future engineers, leverage human ingenuity in service of life as opposed to its destruction. This is but a small attempt to alleviate pain and improve the quality of life of our canine friends.

This would make our canine friends, dogs, very happy and make their life so much better and easy.



Work division

Name → Week ↓	200174 ANUSHKA PANDA	200533 KUMAR SAURAV	200841 SAIRAM NAYAK KUNSOTH	201097 VATSALYA ROY
Week 1	Every member contributed to ideas and 4 group idea was presented in Turn 2.			
Week 2	Detailing of Pendulum Clock [Deprecated]	Detailing of Dog + Wheelchair	Detailing of wind mill[Deprecated]	Detailing of Wind mill [Deprecated]
Week 3	Dog's neck and tail wagging mechanism	Overall Isometric and measurement of each part	Tail and internal tail parts	Front legs
Week 4	Front body and animation of wagging mechanism	Isometric, assembly and tail wagging mechanism	Tail of the dog and paws of the dog	Front legs of the dog
Week 5	Animations, video making and minor enhancement	Enhancement of aesthetics and Assembly	Working and isometric part of tail	Report and Manufacturing analysis

Each member were actively involved in discussion of ideas and potential problems and it's supposed solution.

Each member continuously worked on enhancing what they've done in previous weeks

Work division (Contd)

Name → Week ↓	200433 HARSHIT RAJ	200783 RICK GHOSH	200895 SATYAM KUMAR ROY	201140 YASH DAHIYA
Week 1	Every member contributed to ideas and 4 group idea was presented in Turn 2.			
Week 2	Detailing of Pendulum Clock [Deprecated]	Detailing of Dog + Wheelchair	Detailing of Dog + Wheelchair	Detailing of Wind mill [Deprecated]
Week 3	Hind legs, presentation and overall coordination	Distributed work, Worked on Dog's Head	Dog's body and tail wagging mechanism	Orthographic of wheelchair
Week 4	Hind legs, cost estimation, presentation, and coordination	Details and aesthetics on Dog's Head	Back half of the Dog's body and Paws	Details of wheelchair and Assembly
Week 5	Report, presentation and Manufacturing analysis	Report and Manufacturing, cost analysis	Report and Manufacturing analysis	Assembly, wheelchair and minor enhancements

Each member were actively involved in discussion of ideas and potential problems and it's supposed solution.

Each member continuously worked on enhancing what they've done in previous weeks



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Thank you

