

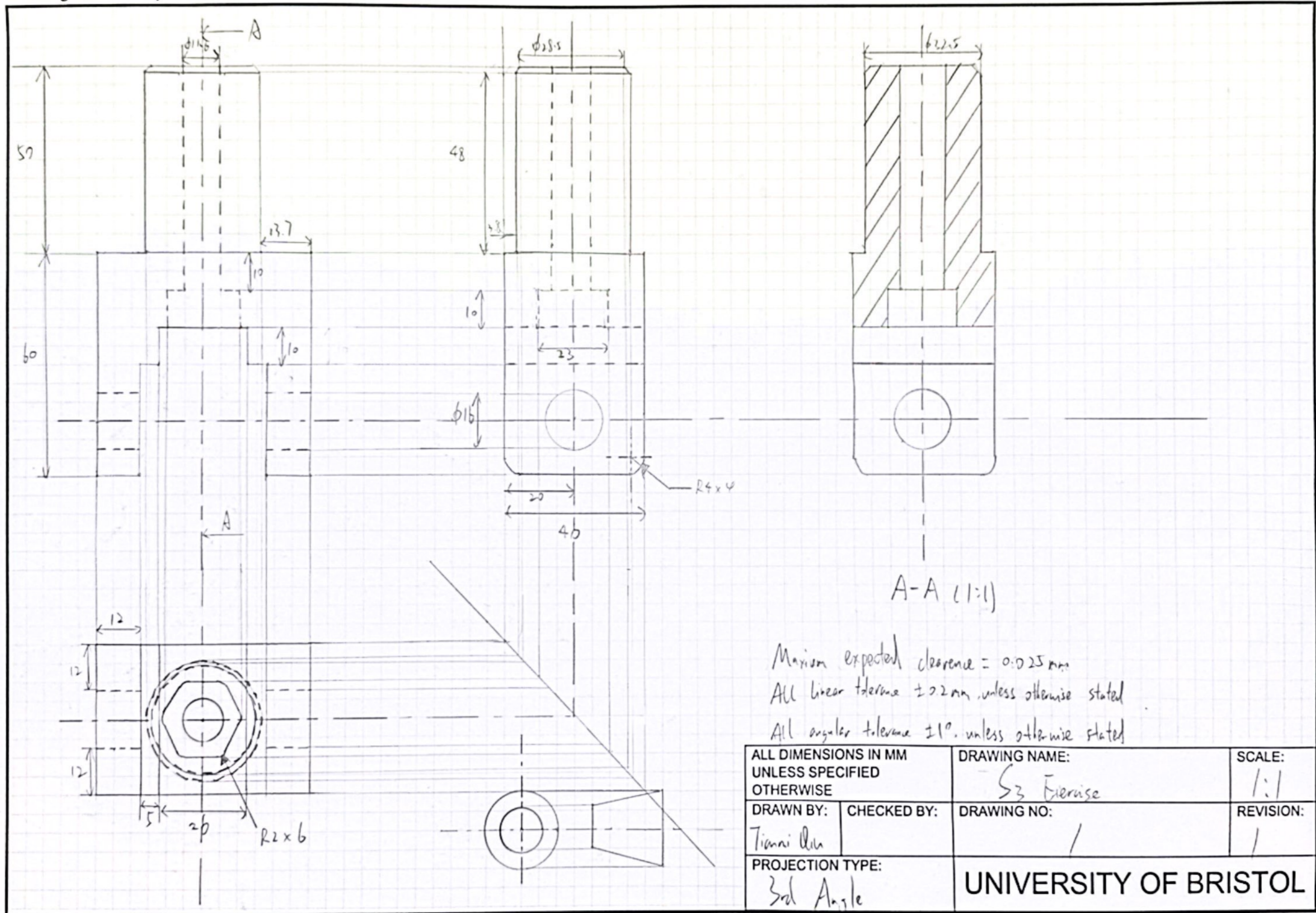
<b>Student Name</b>	<b>Tianrui Qiu</b>	<b>Date</b>	<b>6/12/2024</b>
<b>Student Number</b>	<b>2773678</b>	<b>Checked</b>	<b>Me</b>
<b>ILO</b>	<b>Requirement</b>	<b>Evidence</b>	
1. Communication 1 – Be able to produce basic engineering drawings (hand drawn and/or CAD)	Annex with orthographic and isometric hand drawing and CAD drawings.	See annex A for orthographic and isometric hand drawings (2 side of A3) and annex B for CAD drawings (2 side of A3)	
2. Communication 2 – Be able to explain engineering ideas through words (written and/or verbal)	State that oral presentation was given (will be checked against register) plus annex with artifact study	Gave oral presentation on 5/12/2025	
		See annex C for artifact study (1 side of A3)	
3. Working safely – Undertake workshop training and take responsibility for evidencing compliance.	Annex with signed off lab induction form	See annex D for signed off lab induction form (1 side of A4)	
4. Design Context 1 – Have an awareness of the UN Sustainable Development Goals and Planetary Boundaries.	No more than 50 words explain which Sustainable Development Goals were addressed in your artefact study and Global Challenges project and which planetary boundaries were considered. Include groups Global challenges project posters	The MGU-H design targets SDG 13 by saving heat energy, respecting the Climate Change boundary. Our group poster on bus routes supports SDG 11 and SDG 3 by reducing air pollution. Both projects aim to lower CO2 emissions and ensure human activities stay within safe Planetary Boundaries	
		See annex E for Global challenges project posters (4 sides of A3)	
5. Design Context 2 – Be able to describe the local and global context of a project and include this in a design or design review.	No more than 50 words explain the local and global context considered for the Global challenges project	Locally, the project context focuses on reducing town traffic and creating jobs for mechanics to maintain buses. Globally, we considered the environmental impact by lowering the carbon footprint. We also looked at the economic connections of importing vehicles from other countries.	
6. Design Process 1 – Participate in a conceptual design project and communicate the outcome.	No more than 50 words explaining the design process used on the Global Challenges project plus annex to show Introductory Design Project	We followed a Thought Process to identify issues like long-distance travel and fuel needs. We then moved to implementation, sketching a vehicle featuring solar panels for energy, tracks for rocky terrain, and robotic arms. The final concept addresses survival needs through detailed functional annotations.	
		See annex F for Introductory design project (1 side of A3)	
7. Design Process 2 – Work with a team to produce a design solution.	No more than 50 words explain your main contributions to the group project plus annex with examples of your input.	I kept the team organized using our group chat to ensure we finished on time. I helped draft the initial ideas, wrote half of the solution poster, and was responsible for presenting the final part of our project.	

		See annex G for evidence of my work on the group projects (1 side of A3)
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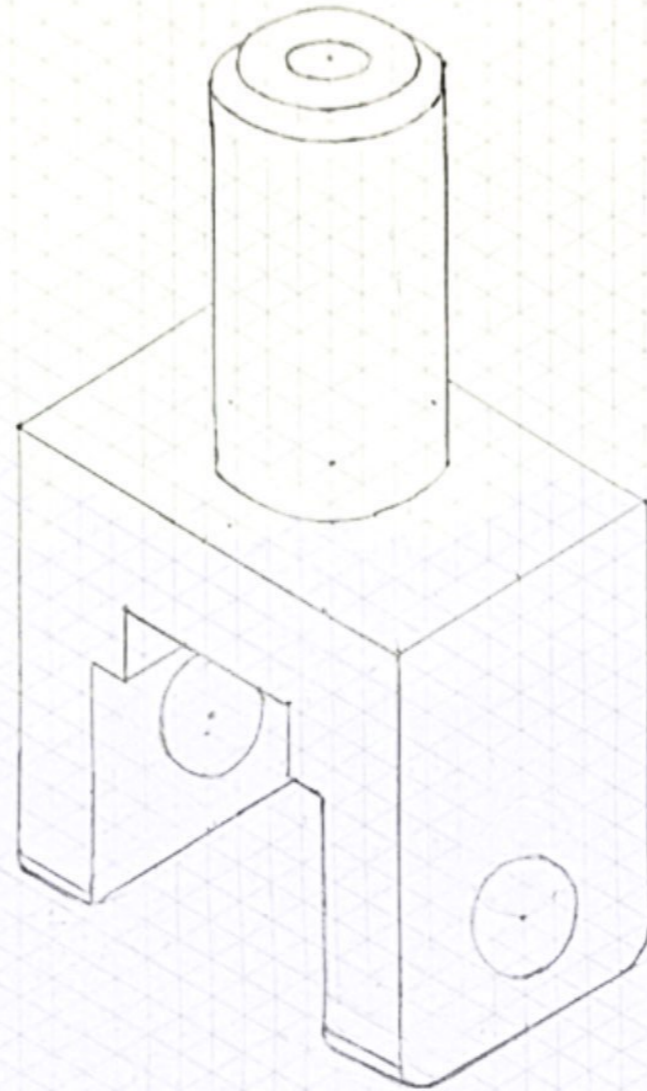
**Annex A – Orthographic and isometric hand drawings**

(2 sides of A3, as submitted in week 6)

Drawing border template



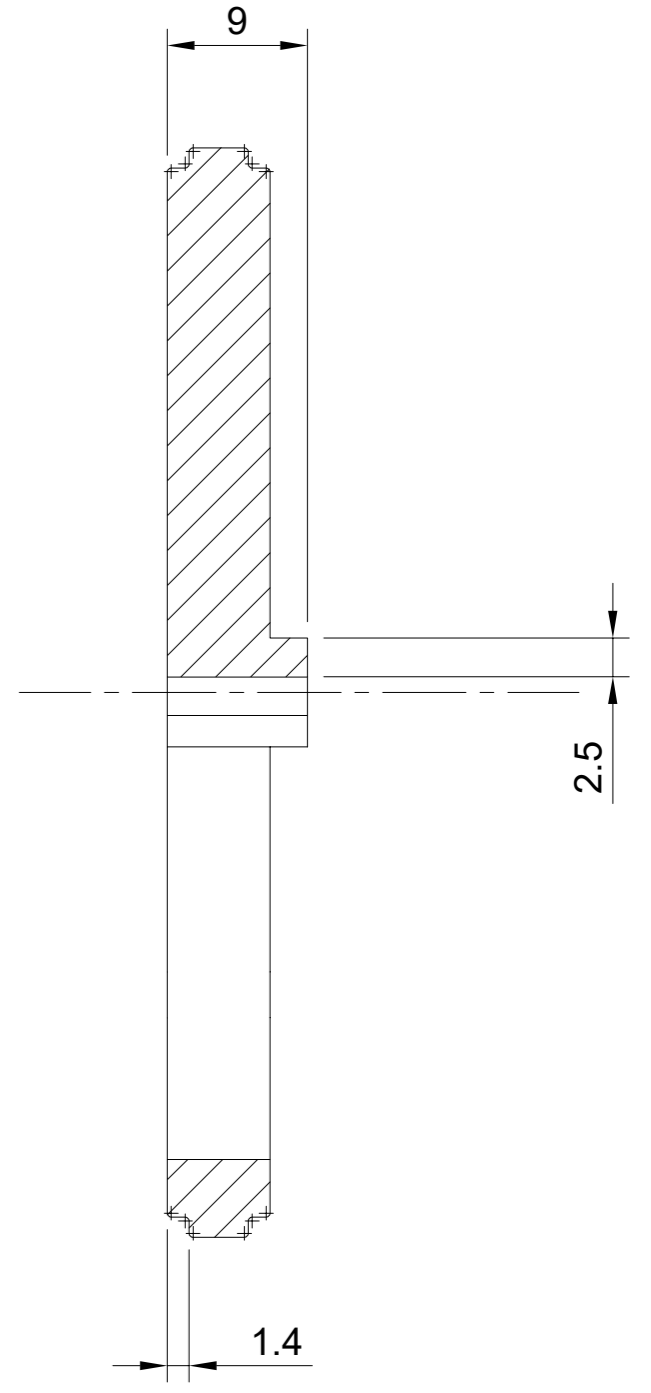
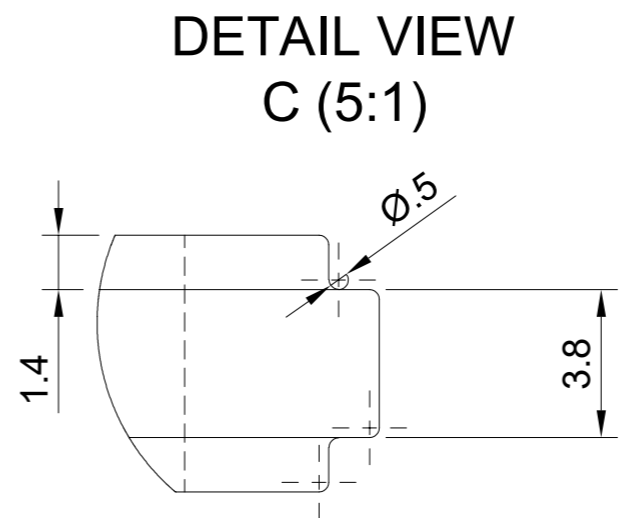
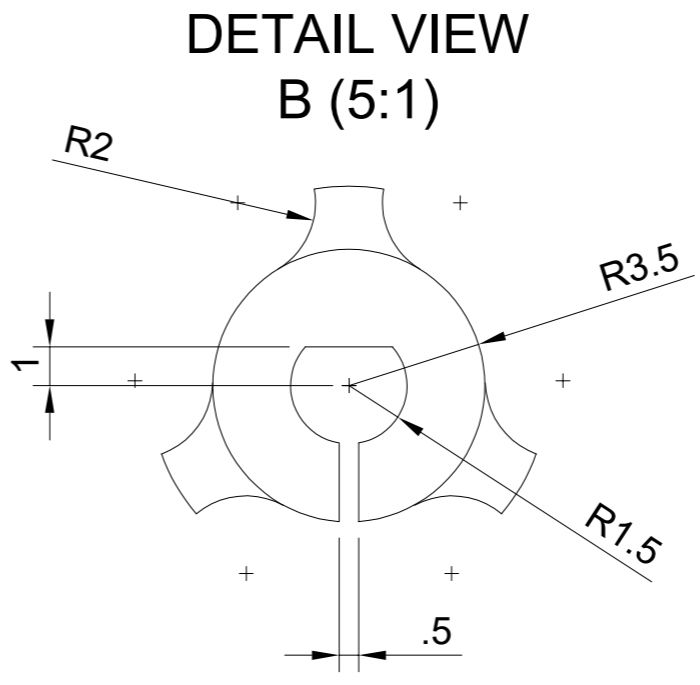
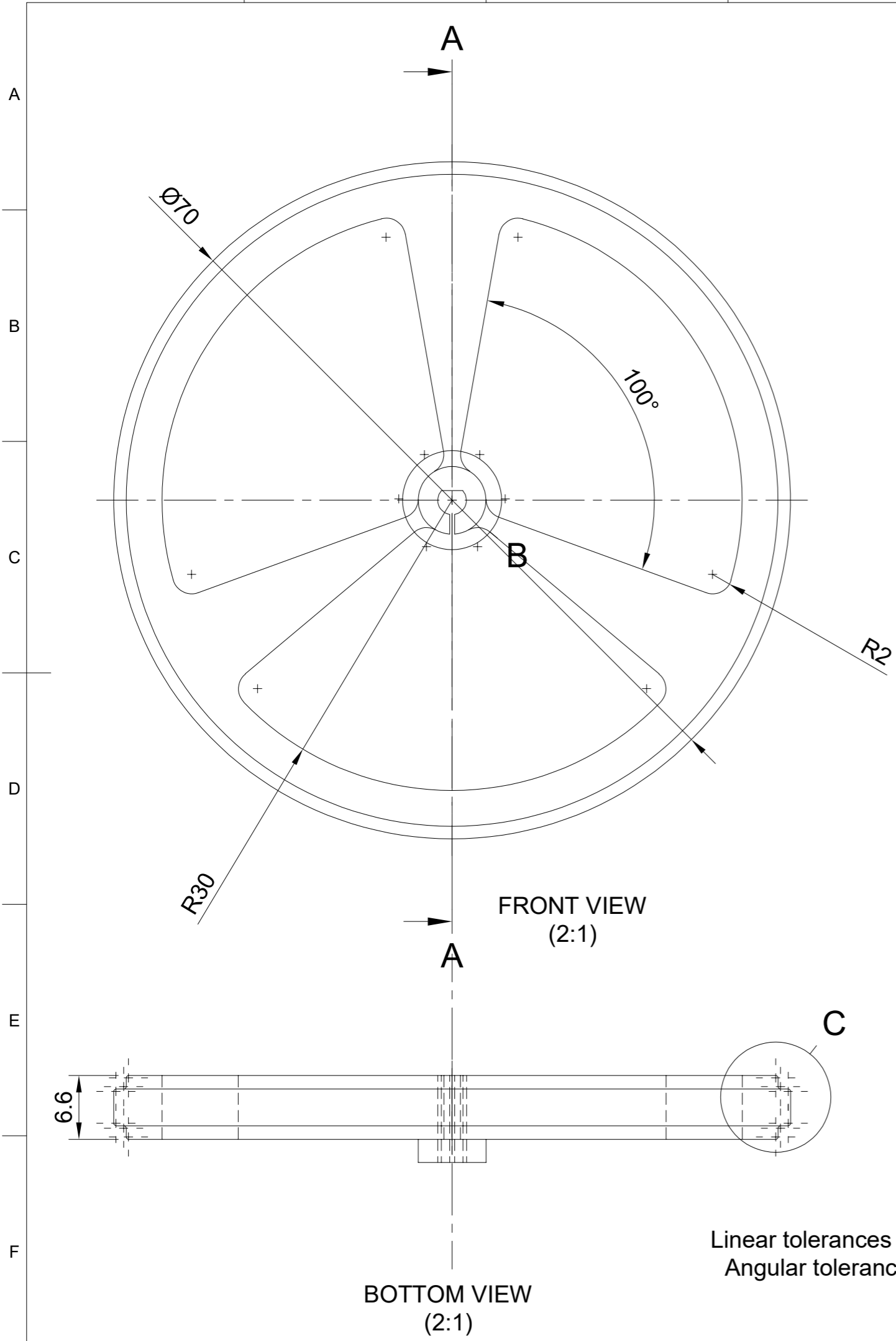
Drawing border template



ALL DIMENSIONS IN MM UNLESS SPECIFIED OTHERWISE		DRAWING NAME: <i>Mars Raer Jakt</i>	SCALE: <i>1:1</i>
DRAWN BY: <i>Tiara Uli</i>	CHECKED BY:	DRAWING NO: <i>1</i>	REVISION: <i>1</i>
PROJECTION TYPE: <i>Isometric</i>		UNIVERSITY OF BRISTOL	

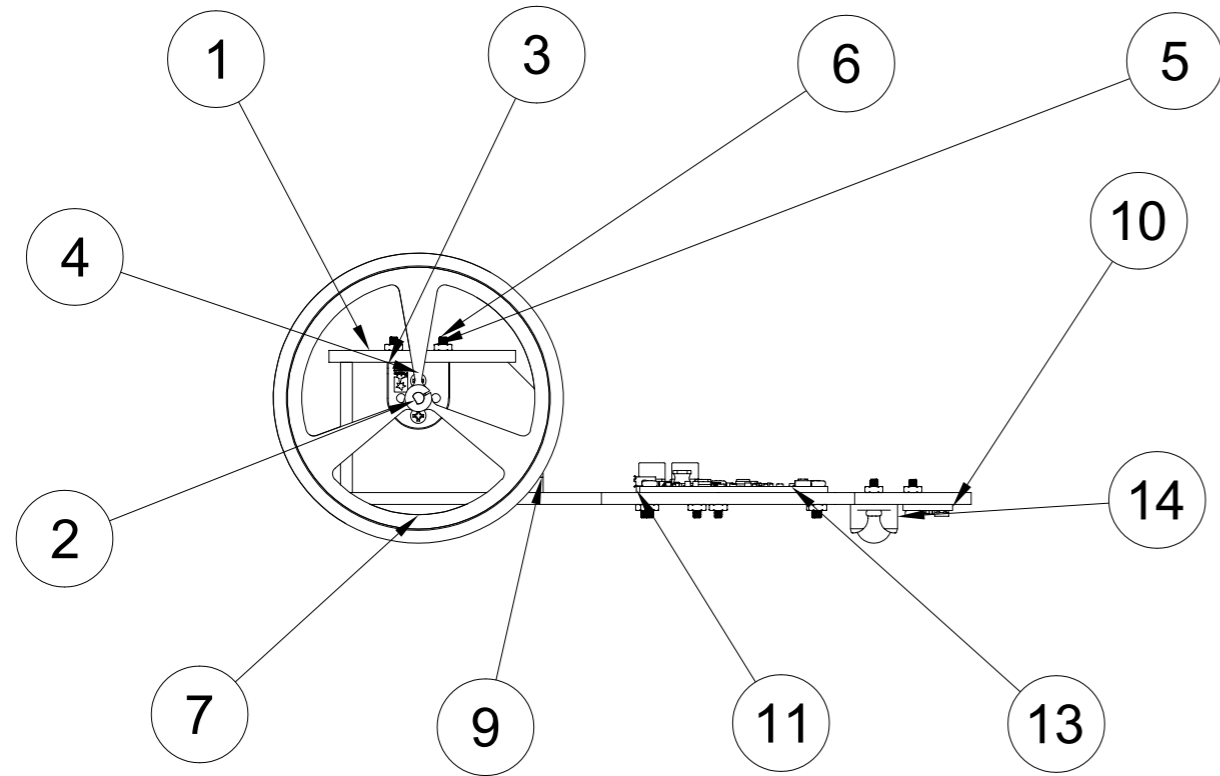
**Annex B – CAD drawings**

(2 sides of A3)

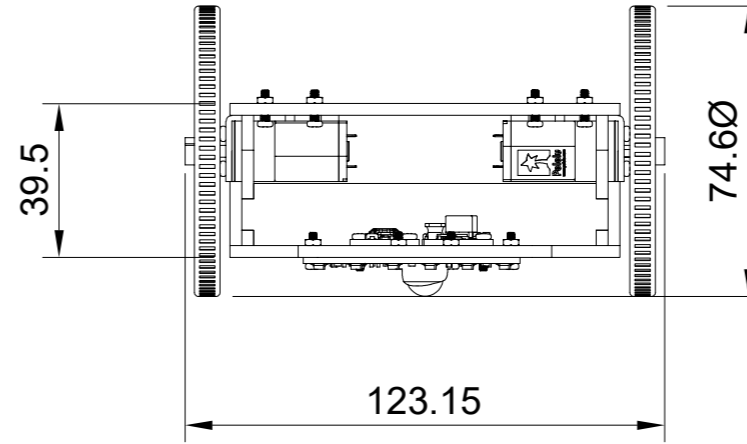


Linear tolerances  $\pm 0.01\text{mm}$   
 Angular tolerances  $\pm 0.1^\circ$

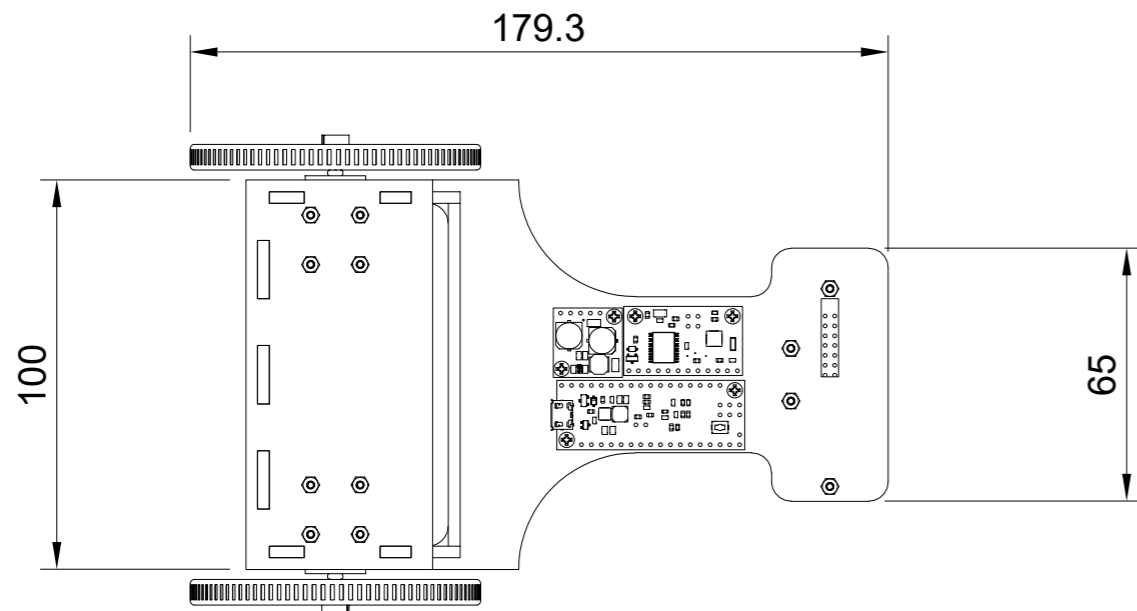
Dept.	Technical reference	Created by <b>Tianrui Qiu</b>	2025/11/28		Approved by
		Document type		Document status	
		Title <b>WHEEL HUB</b>		DWG No. <b>1</b>	SIZE <b>A3</b>
		Rev.	Date of issue		Sheet <b>1/1</b>



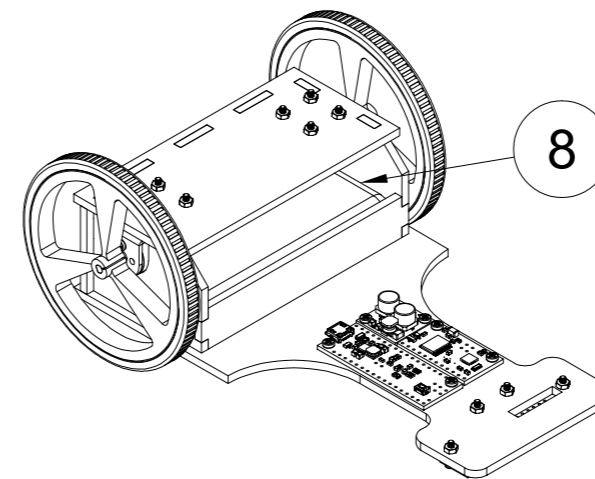
FRONT VIEW  
(1:2)



RIGHT VIEW  
(1:2)



TOP VIEW  
(1:2)



ISOMETRIC VIEW  
SCALE (1:2)

Parts List		
Item	Qty	Part Name
1	1	Robot base
2	2	GEAR MOTOR
3	2	GEAR MOTOR BRACKET
4	4	M2 X 4 PAN HEAD SCREW
5	18	M2 HEX NUT
6	18	M2 X 8 PAN HEAD SCREW
7	2	WHEEL
8	1	BATTERY PACK
9	1	Battery Cover
10	1	REFLECTANCE SENSOR ARRAY
11	1	STEP DOWN VOLTAGE REGULATOR
12	1	PROGRAMMABLE MODULE
13	1	DUAL SERIAL MOTOR CONTROLLER
14	1	BALL CASTER

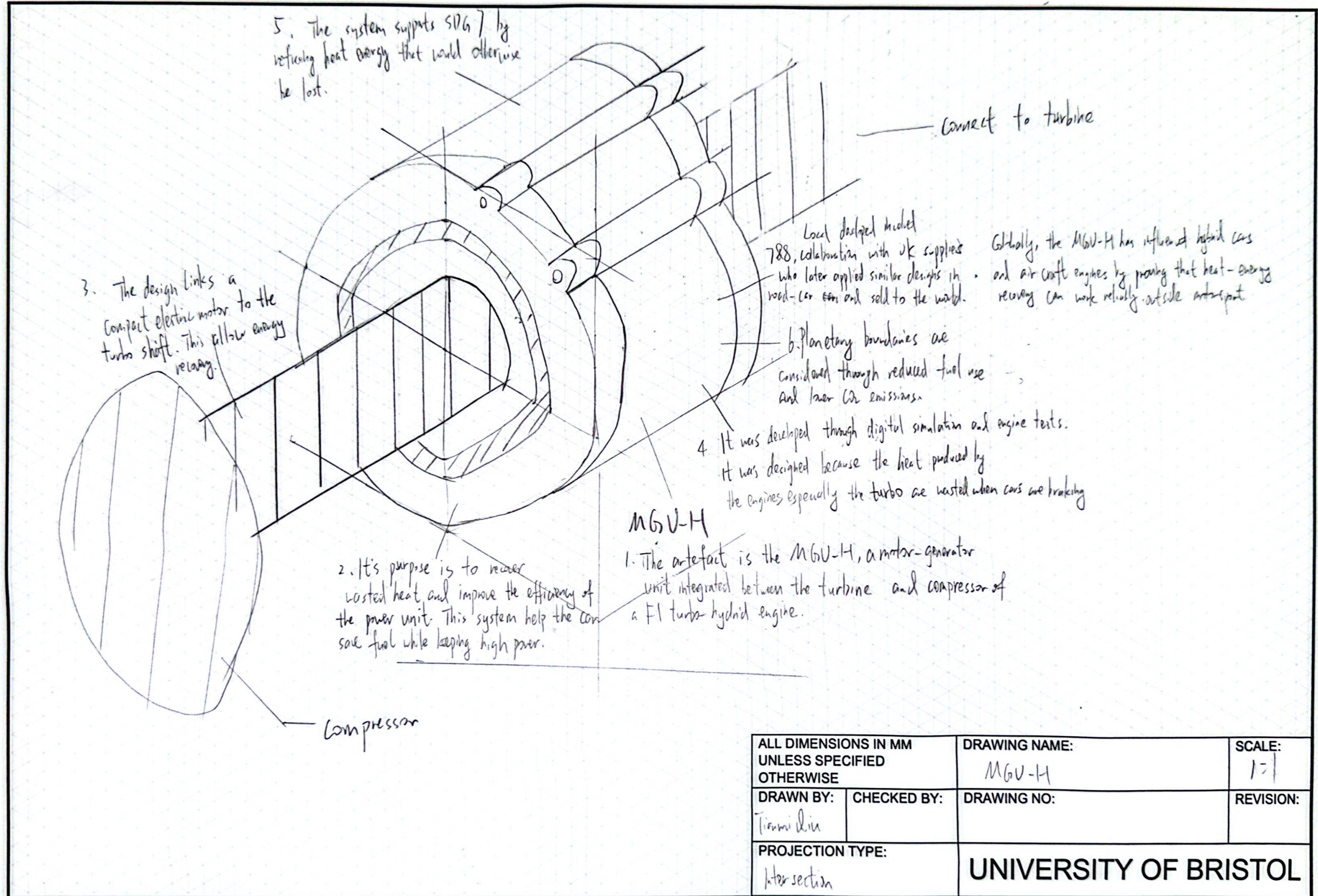
Linear tolerances  $\pm 0.01\text{mm}$   
Angular tolerances  $\pm 0.1^\circ$

Dept.	Technical reference	Created by <b>Tianrui Qiu</b>	2025/11/28		Approved by	
			Document type		Document status	
			Title <b>FULL ROBOT</b>		DWG No. <b>1</b>	SIZE <b>A3</b>
			Rev.	Date of issue	Sheet <b>1/1</b>	

**Annex C – Artefact study**

(1 side of A3, as submitted in week 8)

Drawing border template



ALL DIMENSIONS IN MM UNLESS SPECIFIED OTHERWISE		DRAWING NAME: MGU-H	SCALE: 1:1
DRAWN BY: Trammi Dina	CHECKED BY:	DRAWING NO:	REVISION:
PROJECTION TYPE: Inter section		UNIVERSITY OF BRISTOL	

**Annex D – signed off lab induction form**

(1 side of A4, as submitted in week 4)

# CADE10001 Introduction to Design Practice

## Lab induction signoff sheet

Student Name	Tianni Qin	Student Number	2773678
Lab A – Drill Training	QUEENS BLDG L.050 LAB	Date	30/09/2025
Lab B - Soldering	QUEENS BLDG 0.09 ELEC MAIN LAB	Date	
<b>Drill Training</b>			
The student is dressed appropriately		Instructor Initials JG	
The student has brought the right equipment		Instructor Initials JG	
The student has correctly and safely drilled and tapped three number holes		Instructor Initials JG	
The student has behaved appropriately for a lab environment		Instructor Initials JG	
The student has completed their drill training		Instructor Signs JG	
Date 20/9/25		Instructor Dates JG	
<b>Solder Training</b>			
The student is dressed appropriately		Instructor Initials CK	
The student has brought the right equipment		Instructor Initials CK	
The student has correctly soldered the two number specimens		Instructor Initials CK	
The student has behaved appropriately for a lab environment		Instructor Initials CK	
The student has completed their solder training		Instructor Signs CK	
Date		Instructor Dates 7/10/25	
<b>Final Induction Signoff</b>			
The student signs here to confirm that:  - They have completed the induction training, - They will abide by the laboratory procedures and requirements during future use of laboratories at the University.		Student Signs  Tianni Qin	
Date		Student Dates 7/10/2025	

Your induction will occur over two sessions. Please note which sessions you need to attend at the top of the form.

The inductions can start in either lab – so please ensure you go to the correct one.

This form will be available at the start of your induction from both labs. Once you have completed the first induction you will need to hold onto your form for the second. If you lose your form between sessions you will need to redo the session.

We would strongly suggest taking a copy of the form after the first session in case you lose it.

Once all signatures have been included, please take a scan of this and upload on Blackboard under assignments.

You can either scan this form using a scanning app that you can download to your phone, or most university printers, which you can log in to with your UCard, allow scanning and will email you the form. **We recommend you use the university printers rather than your phone to do the scanning as the resulting quality is much better. If we cannot read your scans, then they will not be accepted as evidence you have completed the labs.**

Once you have taken a personal copy (which is your responsibility to manage) please add the signed form to the folder. The signed form is not proof that you have completed the lab, but will be used to check that you haven't falsified the document.

Please upload the form to Blackboard by the end of week 4 under the "lab induction" formative assessment as a PDF.

Please use the following file name: Lab Induction [student number].pdf

[failure to correctly name the file may lead to the file being misplaced and you being asked to redo the induction]

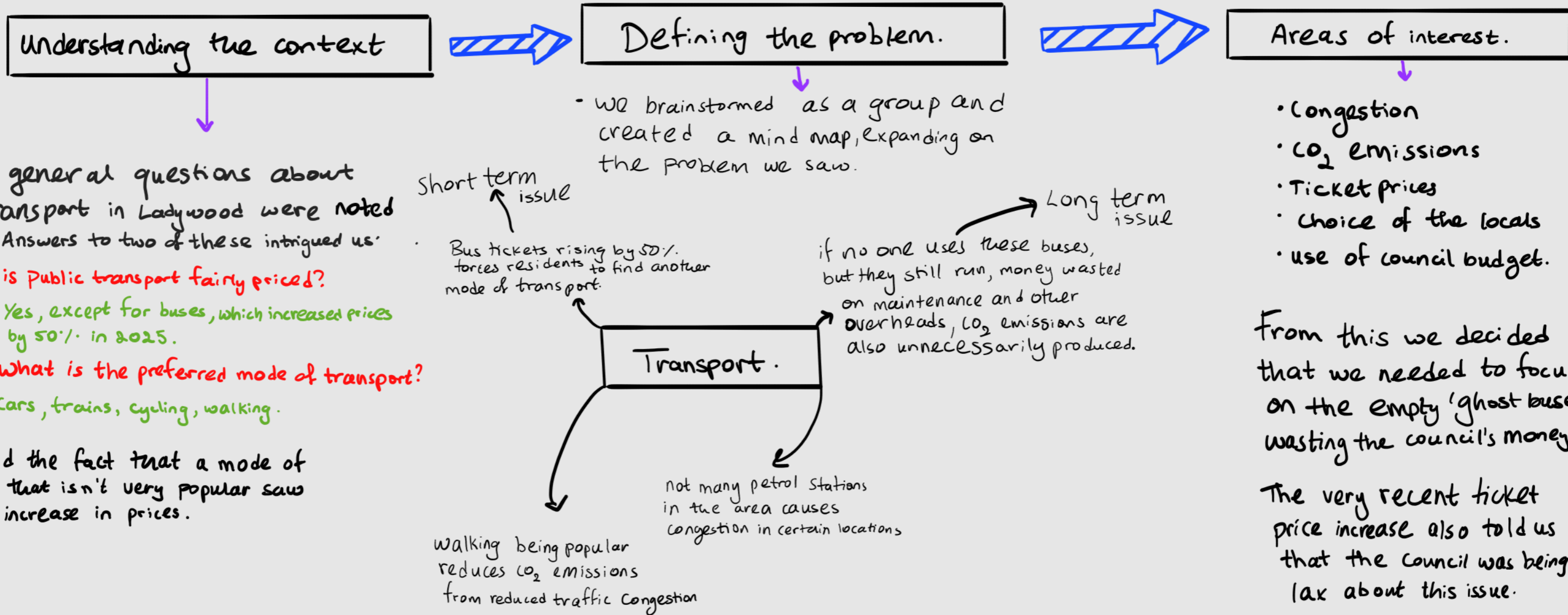
**Annex E – Global challenges design posters**

(4 sides of A3. Note all group members should use the same posters as evidence)

# Problem Space

Ticket prices for empty 'ghost buses' soar up by 50%, forcing residents to walk. Council remains lax as their precious budget gets wasted by buses.

How did we come to this conclusion?



From this we decided that we needed to focus on the empty 'ghost buses' wasting the council's money.

The very recent ticket price increase also told us that the Council was being lax about this issue.

# Less Frequent Buses in Ladywood

## ① Reduces Congestion

- Routes go through many narrow roads, so less buses will lead to less road blockages and a safer space for pedestrians and cyclists.

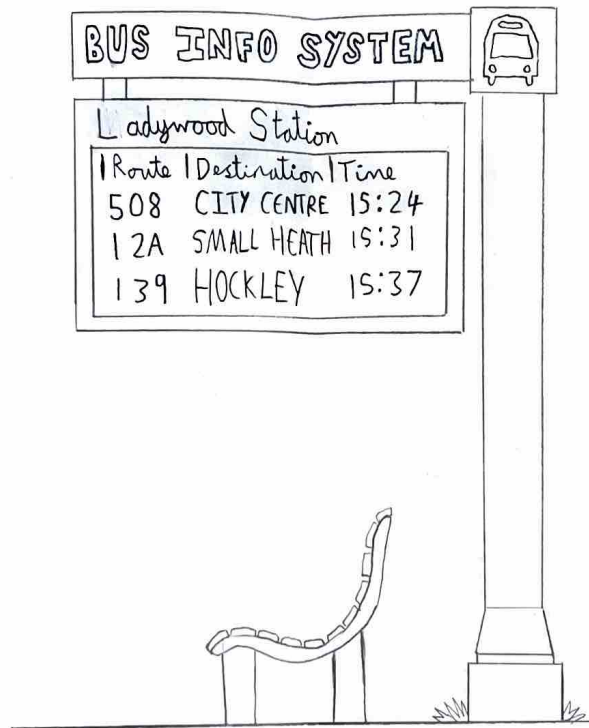
## ② Reduces noise and air pollution

- Less carbon emissions and quieter neighbourhoods.

## ③ More efficient use of resources

- Less frequent buses allows for drivers to be allocated more effectively. Also avoids understaffing as less staff are needed.

## ⑦ Constraint: Time intervals between buses can't be too long as it will lead to more inconvenience and maybe overcrowded buses.



## ④ Stops over crowding

- Reduces bus stop blockages, therefore, improves safety and accessibility for passengers.

## ⑤ Matches demand for the bus with supply of buses

- Less empty buses

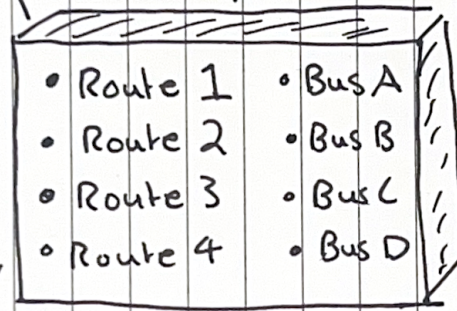
## ⑥ Reduces ghost buses

- Less confusion with bus arrival times, increasing passenger satisfaction for the service of the buses.

Solution: Decreasing Bus Routes and adding better stops on original routes.

① Reducing the number of bus routes can help lower ticket prices and congestion on roads. Furthermore, reduce CO<sub>2</sub> emissions and left over money can be re invested as there is fewer drivers.

② main constraint is all bus stops must still be accounted for. Alterations to routes that remain mean all bus stops still remain active



③ This reduces number of empty buses running meaning less drivers need to be payed and less maintenance on buses. ~~can be~~ This saves lots of council money so the 50% increase in ticket prices this year can be stopped and money can be re invested helping improve quality and efficiency of buses.

④ To increase efficiency a survey can be carried out to locate bus stops with the highest frequency of passengers. These can be placed on routes which run more frequently. Maximising the use of buses and making sure we minimise running of empty buses.

# Investing Money in Bus Quality in Ladywood

① Upgrade buses on the A457 to new electric models, reducing noises & air pollution near the large residential flats.

② Install better-lit, modern shelters at key stops, improving safety and comfort, especially after dark and during rainy days.

③ Add real-time info screens at community hubs, such as local libraries or community centers, showing live bus arrivals.

④ Implement real-time GPS tracking for all buses, providing accurate arrival times on an app to reduce ghost buses.

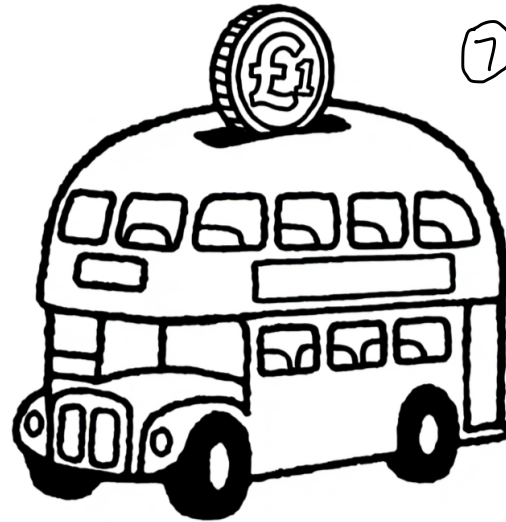
⑤ Improve accessibility on services connecting to key locations like City Hospital, with more space for wheelchairs and pushchairs.

⑥ Install easy-to-use racks on the front of every bus for 2-3 bikes to combine both modes of transport and solve the "last mile" problem.

⑦ Investment in marketing, providing activities like "try the new bus" and offer a week of free bus to let the public try new bus.

⑧ Make some advertisement with words to describe the advantage of bus compare to bike. Such as "Tired of the rain? Your warm, dry, and fast new bus is here" and "bring your bike on board and extend your range."

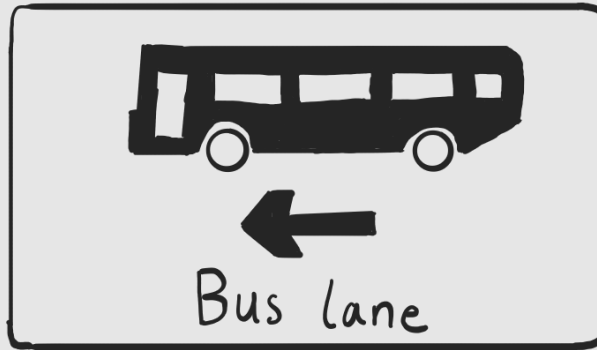
⑨ Simplify the system of buying the ticket, connect the system with other transportation like shared bike to make the payment process easier. Also, increase the payment methods to attract more users of bus.



## Solution: Increasing number of bus lanes

⊗ Due to the unreliability of buses, many 'ghost buses' are seen going around the city, carrying no one.

⊕ Increased reliability & efficiency of buses can lead to more people using it thus cutting down on CO<sub>2</sub> emissions that would come from using a taxi for example.



⊗ Too many bus lanes can really narrow down roads, causing inconveniences for normal traffic. This means that the amount of bus lanes that are added must have a limit.

⊗ Most residents of Ladywood prefer walking and cycling over taking the bus, as Ladywood is said to have walkable streets, and cyclist-friendly. Making buses more accessible and on-time can help people with disabilities, senior citizens, and in general people that cannot access other modes of transport.

⊗ Buses of Ladywood reported to be unreliable as they typically are not on time.

⊗ More lanes dedicated to buses will save time spent being stuck in daily traffic.

⊗ Funds saved from rescheduling of buses, and cutting down bus routes can facilitate the increase.

⊗ Bus lanes can occupy space that can be used for other modes of transport, such as Bicycles. This can greatly impact the carbon emissions, as residents are forced out of choosing carbon-neutral modes of transport.

# Final solution!

A fair price allows individuals of all financial backgrounds to have access to the buses, providing an equal opportunity at access to facilities

Main constraint: Bus stops on inactive routes need to still be active. Provide alternative routes for these bus stops.

Examples:

- Town centre
- Hospitals
- Airports
- Train stations.

Reduces running costs, which in-turn allows ticket prices to be reduced or stay constant.

Provide routes to essential areas only.

## Reducing bus routes

### SDG's

- Well maintained and sanitary buses will contribute to the wellbeing of the residents.
- Reduced congestion on the roads leads to a more pleasant environment for drivers, cyclists and makes the town more walk-friendly, encouraging a healthier lifestyle and reducing their carbon foot print.

### Global context

- More ecologically sustainable materials for manufacture of buses imported from other countries, increasing economic growth for them.

### Local context

- Money saved from less buses running can be re-invested to maintain the buses and keep them running well and in good sanitary conditions, and increase workers' wages.
- This is a great job opportunity to give local mechanics and cleaning services, whilst providing satisfactory wages

### Planetary boundaries

- Reduced bus activity correlates to decrease in CO<sub>2</sub> emissions, reducing air pollution, increasing air quality.

**Annex F – Initial design project poster**

(1 side of A3, as submitted in week 5. Note all group members should use the same poster as evidence)

Thought Process  
Question/Issue  
Use of Journey  
(Distance/Length)

Solution/Implementation  
Long expeditions ∴ require  
Provisions such as food,  
fuel, sleeping arrangements

→ built in bed & bio, solar panels to generate energy to charge batteries  
large storage space needed for food for long journey

will provide energy for running vehicle & also energy for heating, lighting etc

Fuel/Power

Solar panels all over roof  
↳ energy stored in batteries

Plants to supply  
oxygen due to  
high carbon  
dioxide

Food can  
also be  
grown

glass enables  
sunlight

control  
panel

entrance  
into  
driving  
seat

• At the front for  
full visibility

• Allows communication

• Can be filled  
with oxygen so  
that space suit  
can be taken  
off

For long journeys, need somewhere to  
sleep.

toilet

Bed

shower:  
can use the  
recycled ice  
water

Can be  
used as  
storage space

Headlights

Arms at the  
front of the vehicle

engine at the  
front of the  
vehicle

Can remove  
debris that  
blocks path

tracks give  
grip/stability

on legs for  
rocky terrain

engine

Ice could be  
placed on top of  
the engine so that it  
melts when heat  
is generated

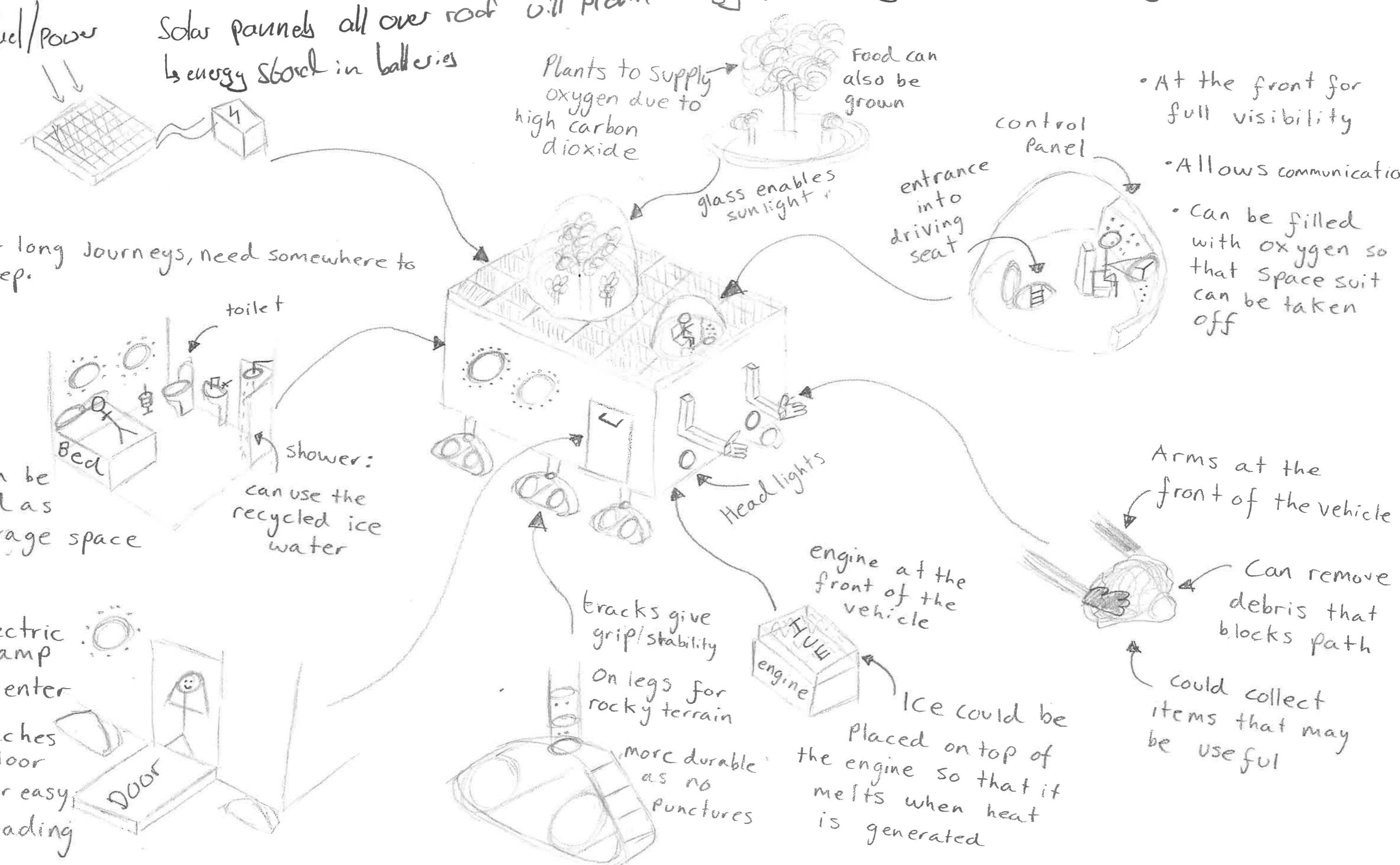
could collect  
items that may  
be useful

more durable  
as no  
punctures

electric  
ramp  
to enter

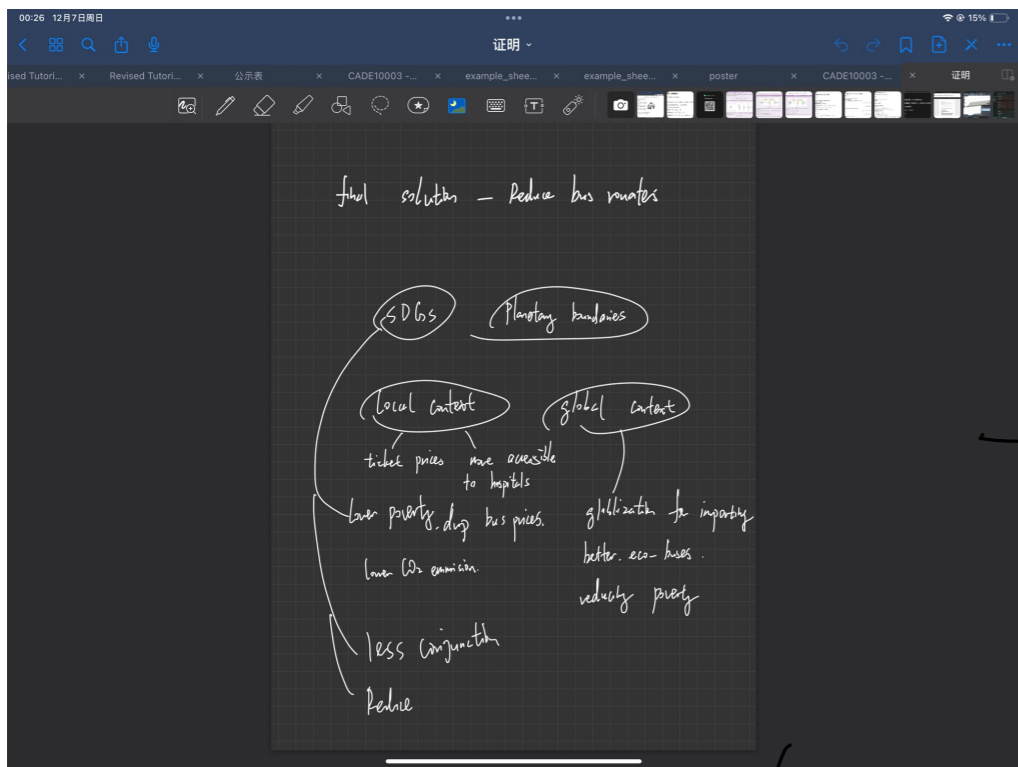
reaches  
floor  
for easy  
loading

Door

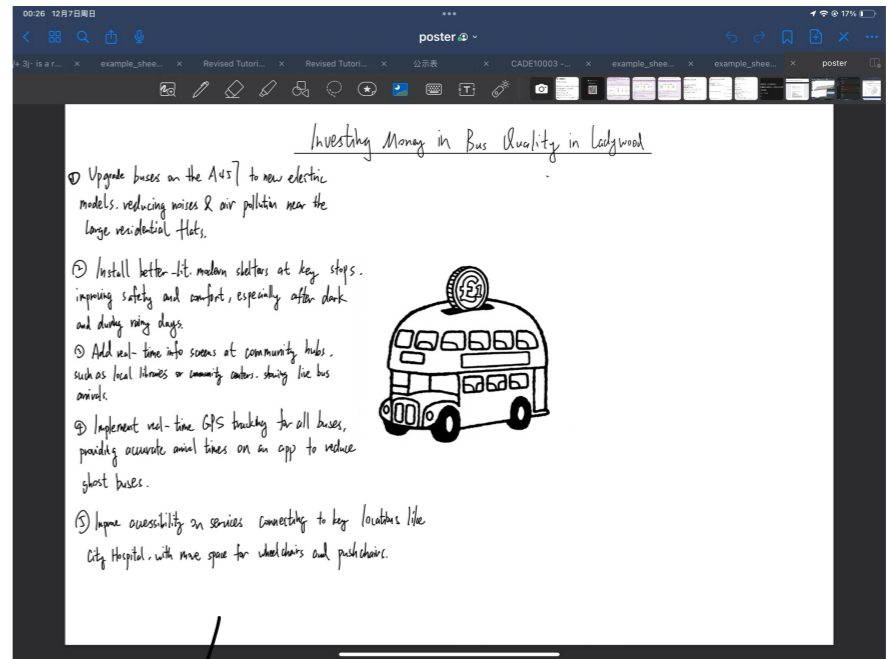


**Annex G – Evidence of individual input for group projects**

(1 side of A3. Can include sketches, drawings, tables, text, diagrams, and photos that capture your **individual** contribution to the group projects)

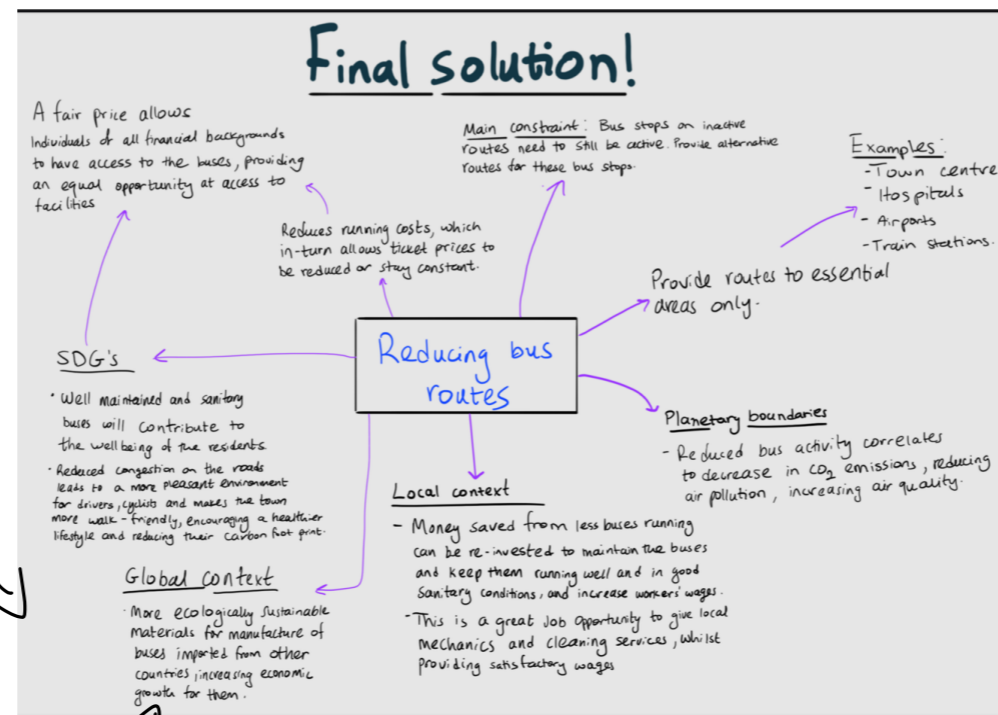


We discussed the final solution together and thought about the questions we have to answer there are some drafts while we are discussing.

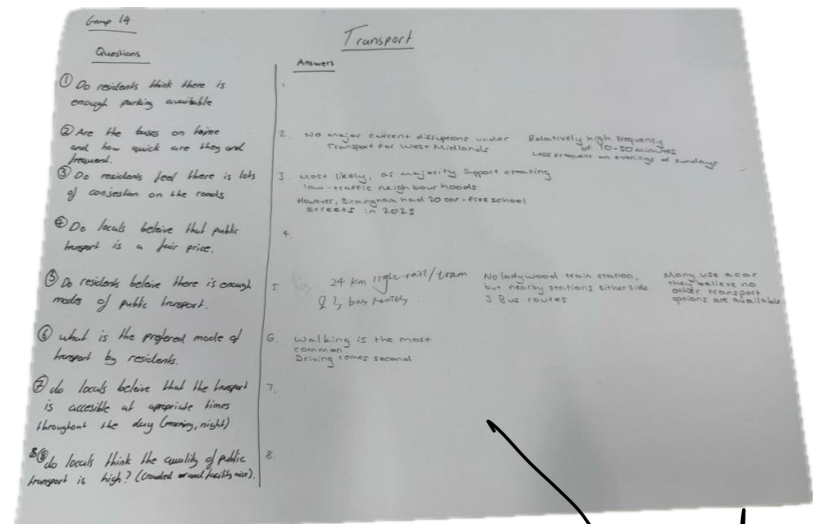


I wrote half of one of the solution posters. Apart from that I provided a lot of other points which were written on other posters by my teammates.

this draft was contribute to this part on the final solution poster.



I was responsible for the final part of our presentation which is quite stressful.



We discussed together and I wrote some questions on the poster above.

We built an groupchat and kept in touch with each other.

I shared some suggestion in the group chat and asked my teammates about their progress to make sure we completed on time.

