PROJECT TWO: MILESTONE 2 – COVER PAGE

Team Number: TUES-19

Please list full names and MacID's of all *present* Team Members

Full Name:	MacID:
Abeka Selliah	selliaha
Zhuohua Hu	huz80
Kyle McMaster	mcmask2
Sana Khan	khans288

MILESTONE 2 (STAGE 1) – REFINED CONCEPT SKETCHES (MODELLING SUB-TEAM)

Team Number: TUES-19

You should have already completed this task individually prior to Design Studio 8.

1. Copy-and-paste each sub-team member's refined sketch on the following pages (1 sketch per page)
   → Be sure to indicate each team member's Name and MacID

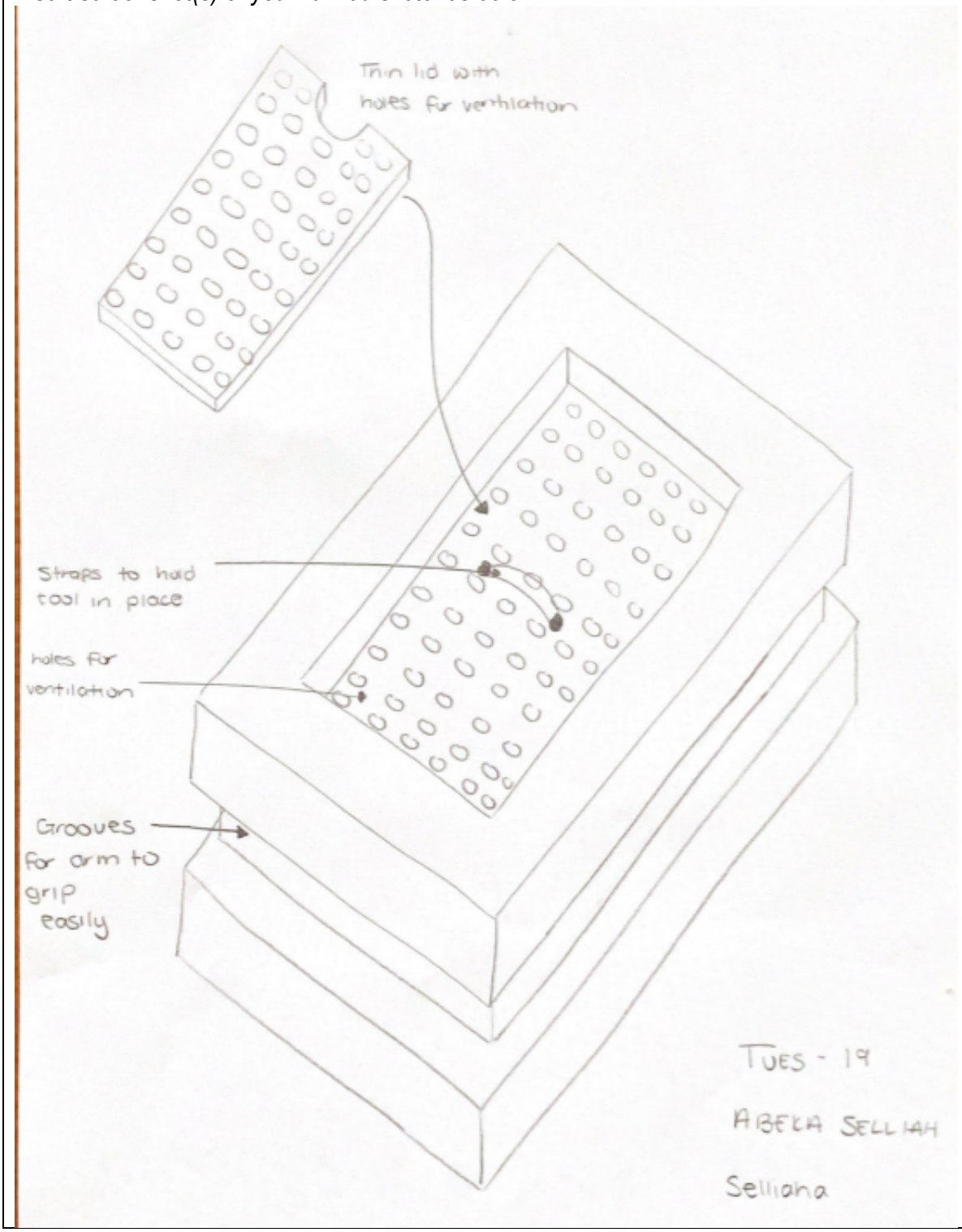
We are asking that you submit your work on both worksheets. It does seem redundant, but there are valid reasons for this:

- Each team member needs to submit their refined concept sketches with the **Milestone Two Individual Worksheets** document so that it can be ***graded***
- Compiling your individual work into this **Milestone Two Team Worksheets** document allows you to readily access your team member's work
  - This will be especially helpful when completing ***Stage 3*** of the milestone

Team Number: TUES-19

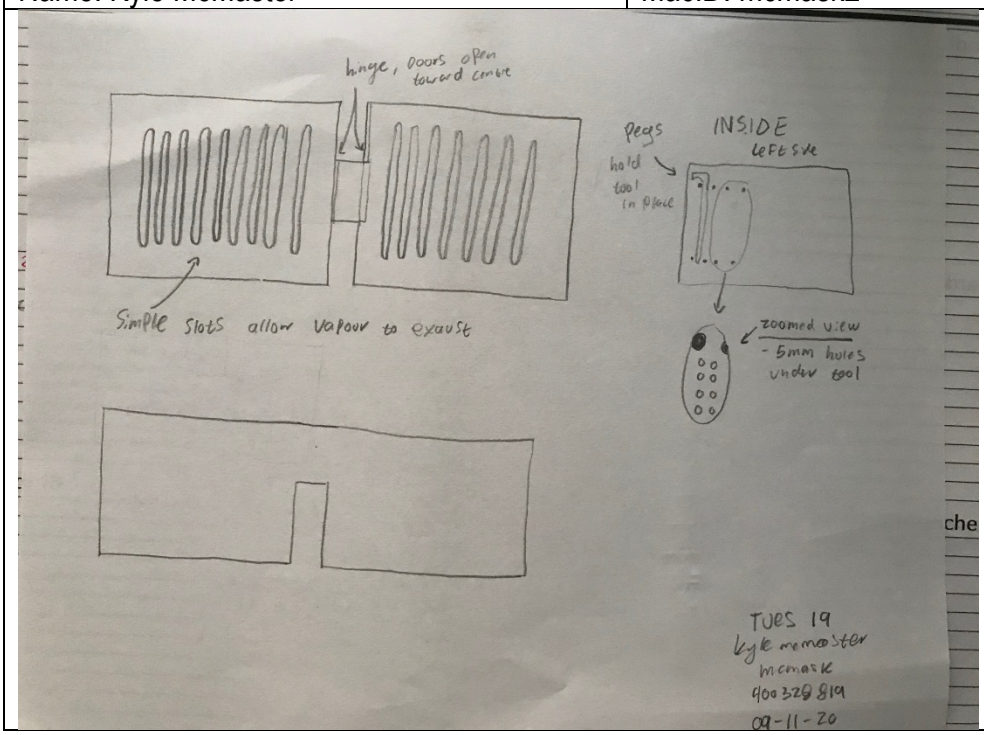
Name: Abeka Selliah	MacID: selliaha

Insert screenshot(s) of your refined sketches below



Team Number: TUES-19

Name: Kyle McMaster	MacID: mcmask2



*If you are in a sub-team of 3, please copy and paste the above on a new page

MILESTONE 2 (STAGE 2) – COMPUTER PROGRAM WORKFLOW (COMPUTATION SUB-TEAM)

Team Number: TUES-19

You should have already completed this task individually prior to Design Studio 8.

1. Copy-and-paste each team member's storyboard or flowchart sketches on the following pages (1 team member per page)
   → Be sure to indicate each team member's Name and MacID

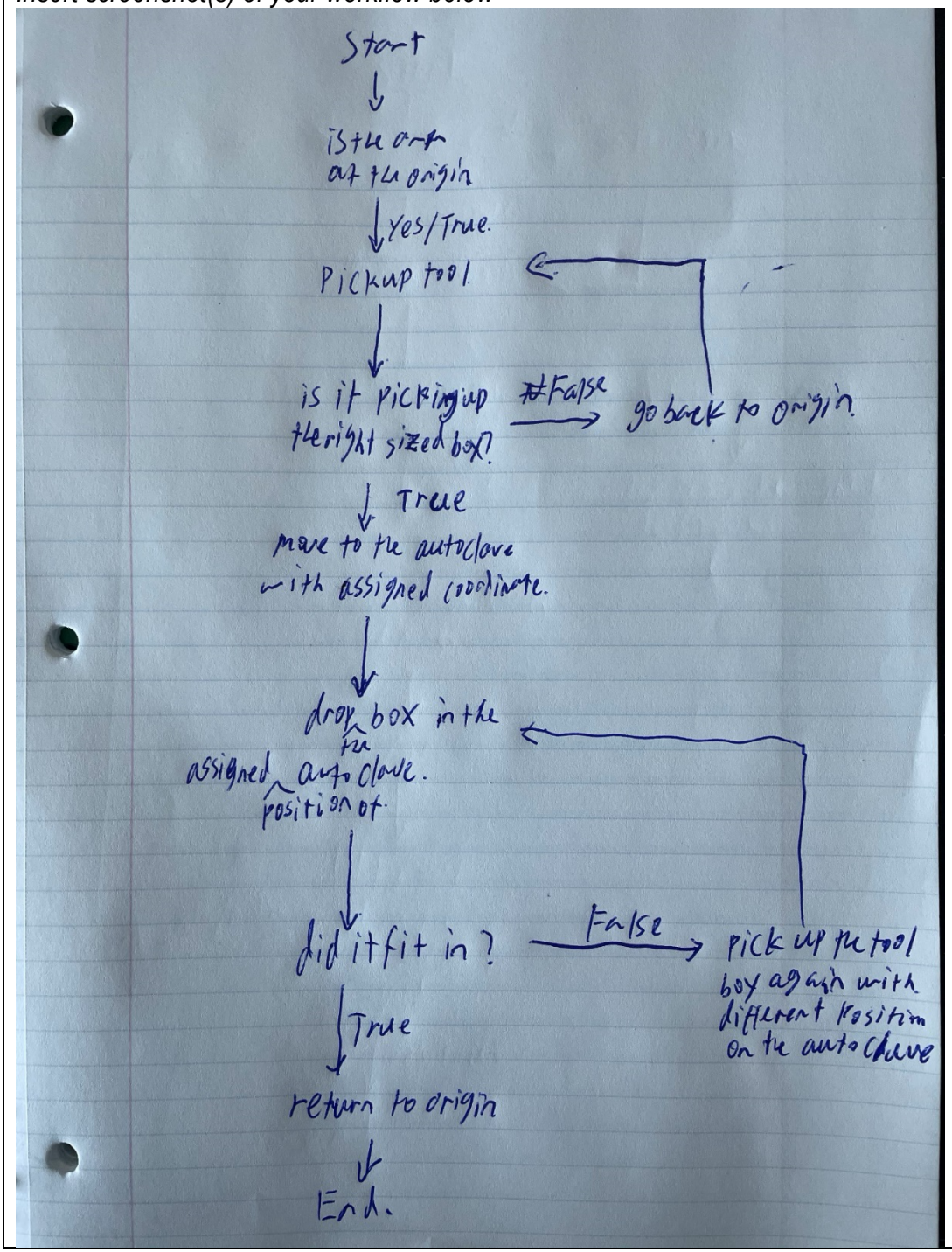
We are asking that you submit your work on both worksheets. It does seem redundant, but there are valid reasons for this:

- Each team member needs to submit their storyboard/flowchart with the **Milestone Two Individual Worksheets** document so that it can be ***graded***
- Compiling your individual work into this **Milestone Two Team Worksheets** document allows you to readily access your team member's work
  - This will be especially helpful when completing ***Stage 4*** of the milestone

Team Number: TUES-19

Name:Zhuohua Hu	MacID:huz80

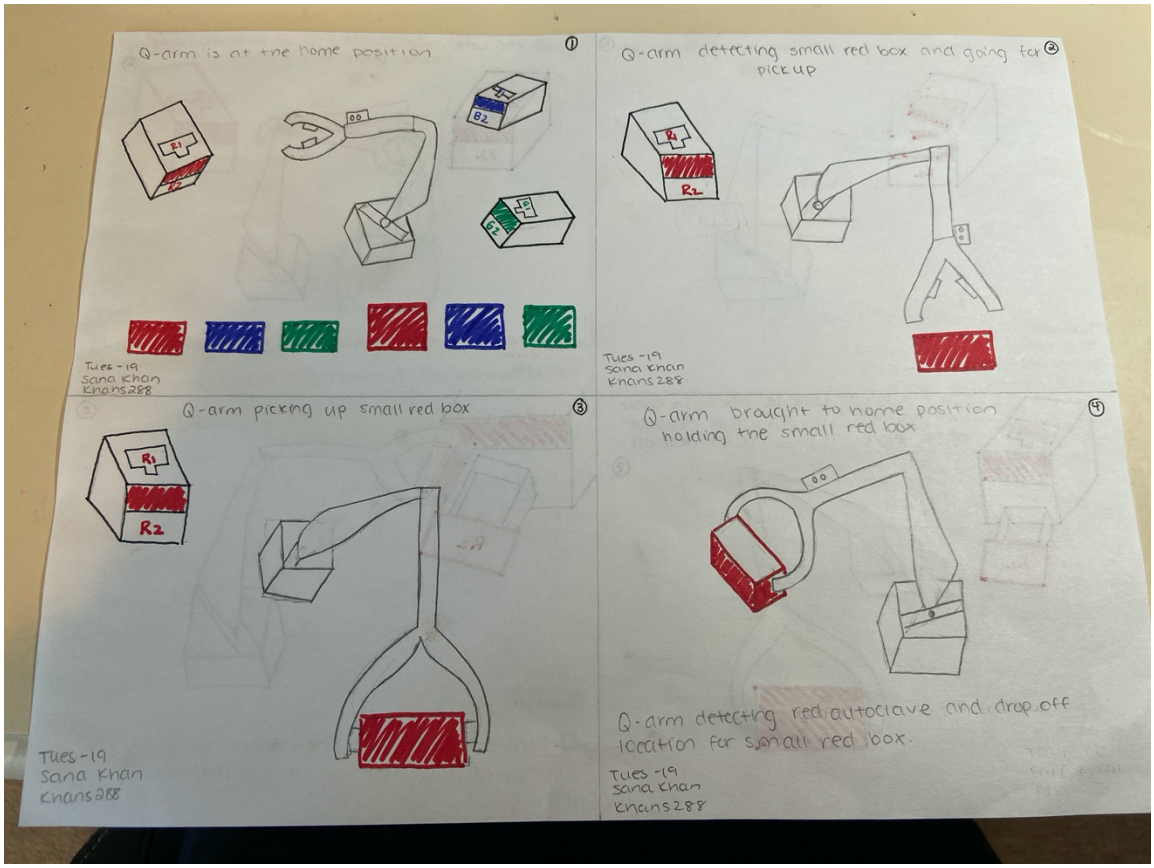
Insert screenshot(s) of your workflow below



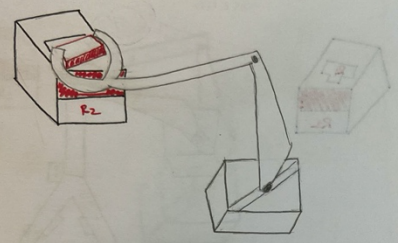
Team Number: TUES-19

Name: Sana Khan	MacID: khans288

Insert screenshot(s) of your concept workflow below



Q-arm dropping off small red box to red autoclave ⑤



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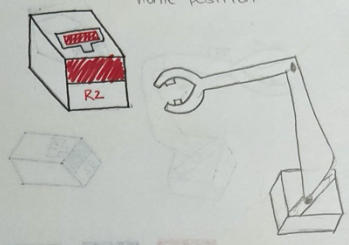
small red box dropped off and Q-arm returned to home position ⑥



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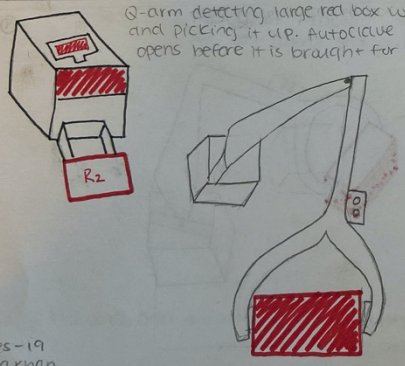
Q-arm detecting large red box with sensor and picking it up. Autoclave drawer opens before it is brought for drop off. ⑦



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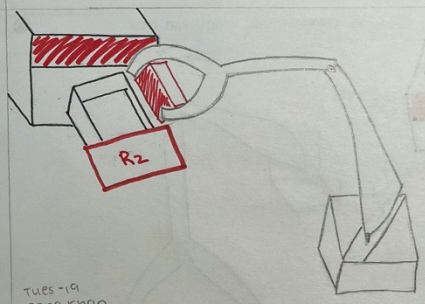
Sana Khan
Khans288

⑧



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Khans288

Q-arm returned home then went to drop off location of large red box at red autoclave drawer

⑨

Q-arm returned back to home position, autoclave drawer closed.
Steps 1-9 are repeated for the rest of the pairs of bins, then the program terminates.

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Sana Khan
Khans288

MILESTONE 2 (STAGE 3A) – LOW-FIDELITY PROTOTYPE (MODELLING SUB-TEAM)

Team Number: TUES-19

Complete this worksheet during design studio 8 after creating the low-fidelity prototypes.

1. Take multiple photos of your low-fidelity prototypes
   → Include an index card (or similar) next to the prototype, clearly indicating your Team Number, Name and MacID on *each* sketch
2. Insert your photo(s) as a Picture (Insert > Picture > This Device)
3. **Do not include more than *two* prototype photo's per page**

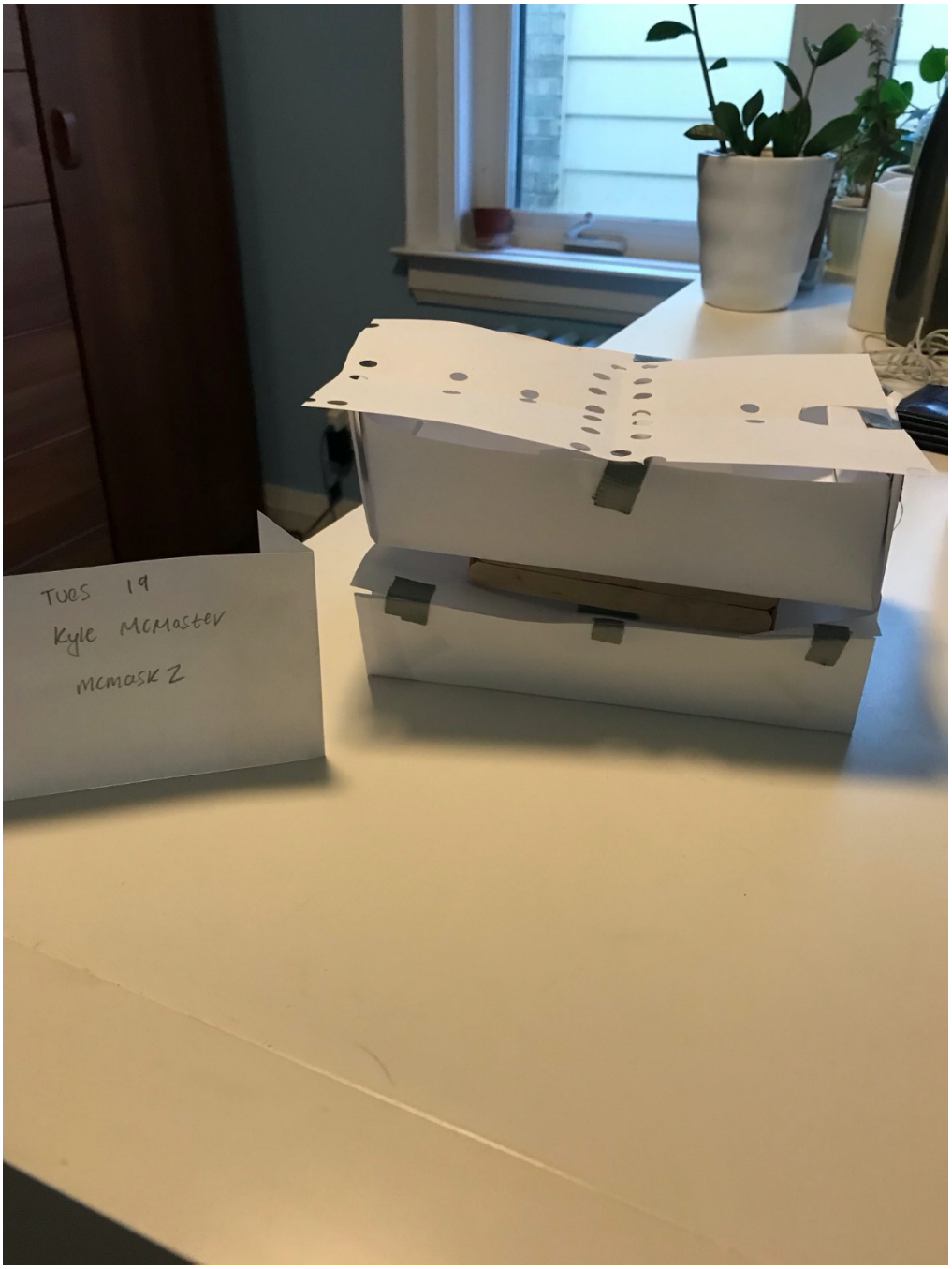
Make sure to include photos of each team member's prototype

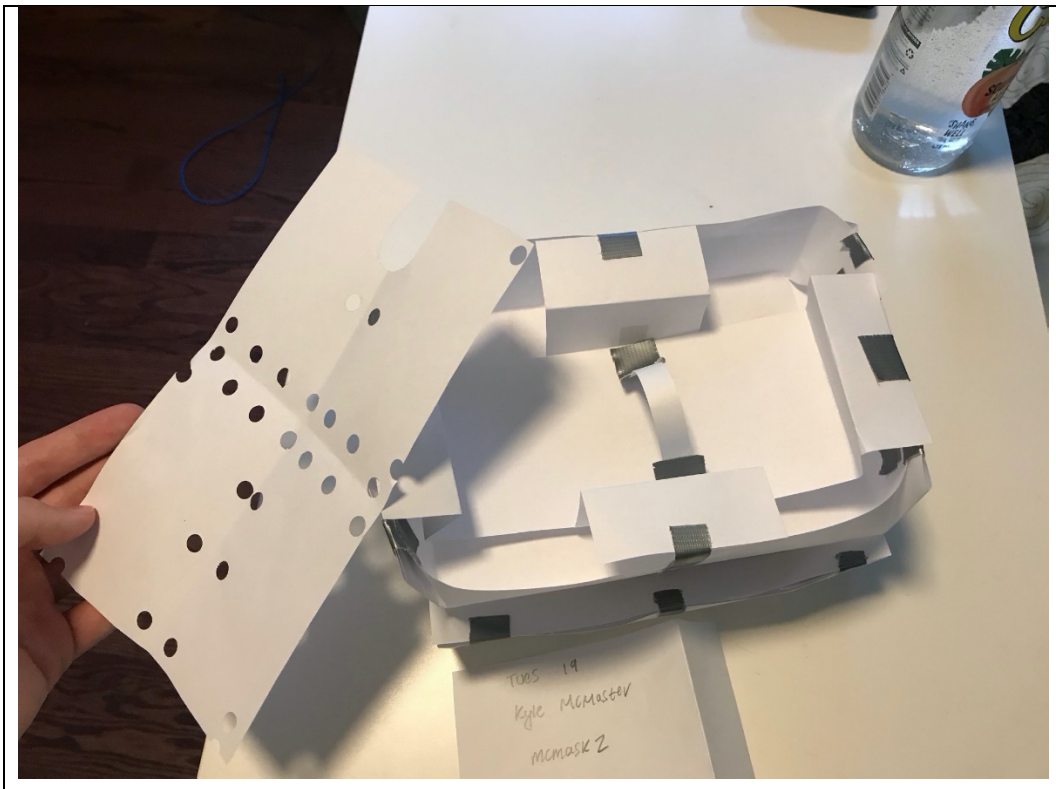
Team Number: TUES-19

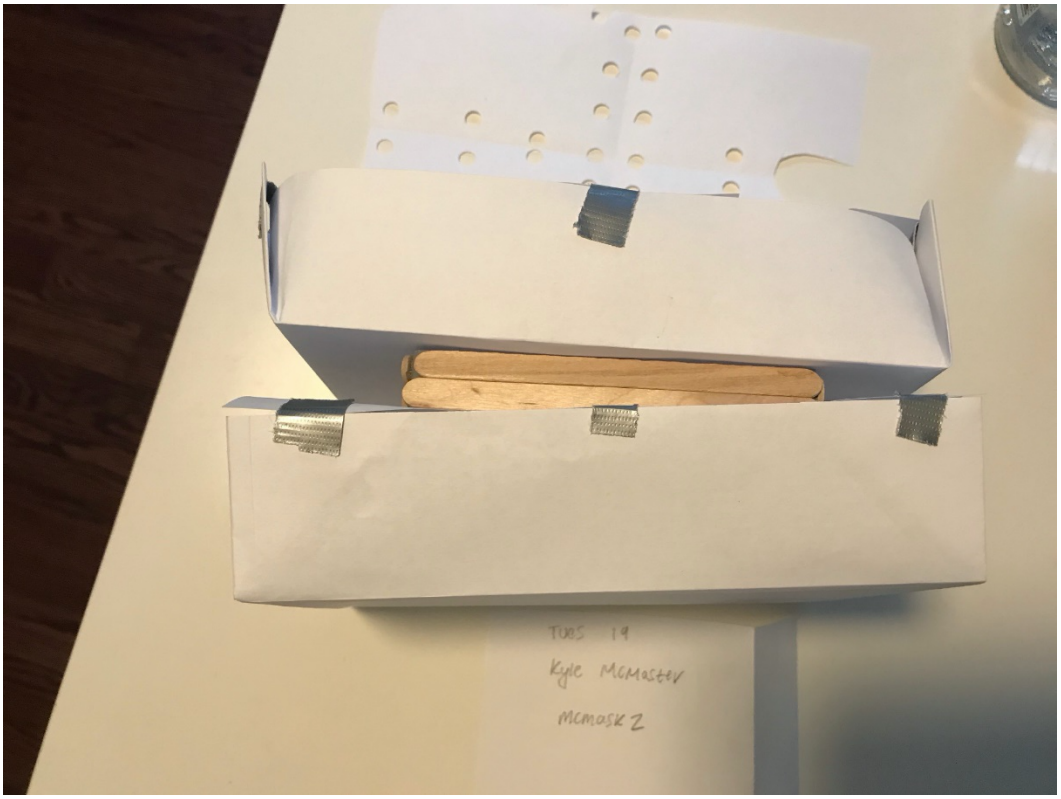
Name: Kyle McMaster	MacID: mcmask2

Insert screenshot(s) of your low-fidelity prototype below

PROTOTYPE 1




TUES 19
Kyle McMaster
mcmask2

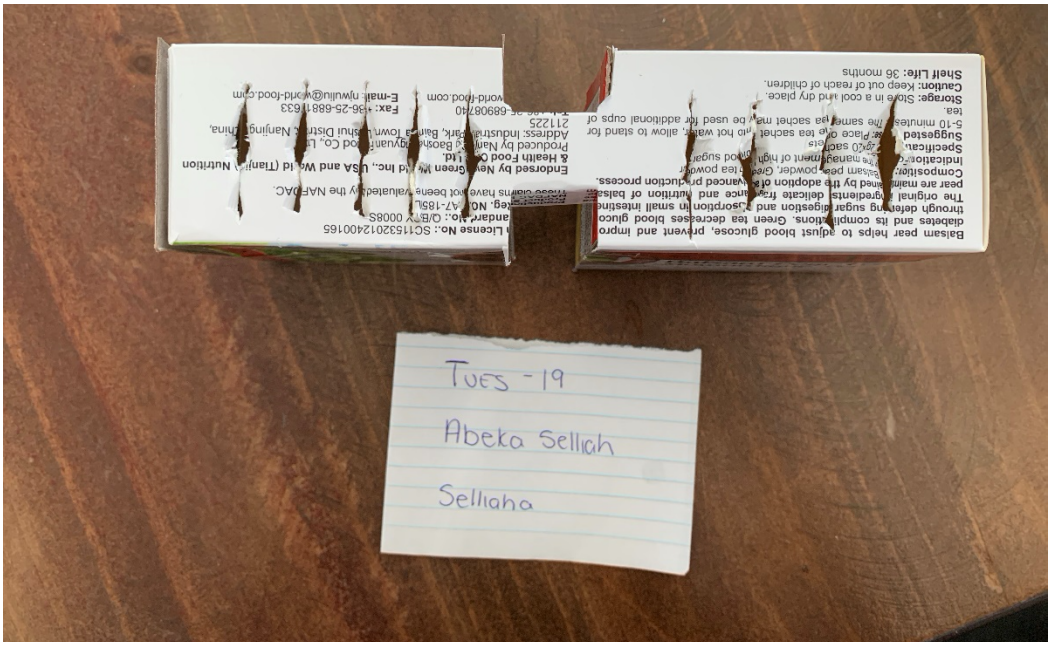

TUES 19
Kyle McMaster
mcmask2

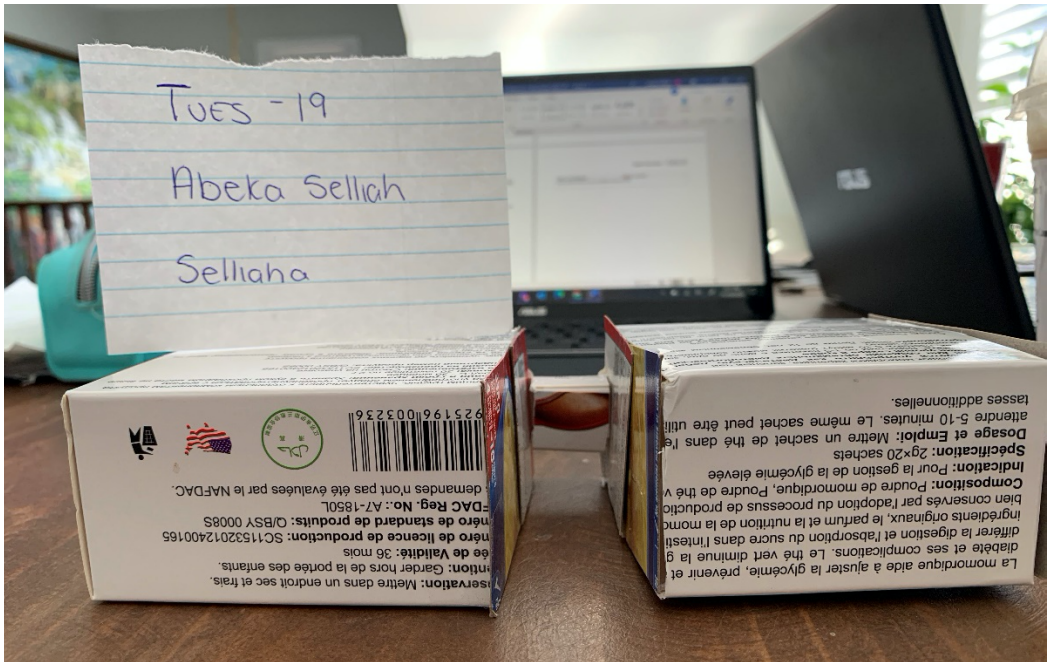
Team Number: TUES-19

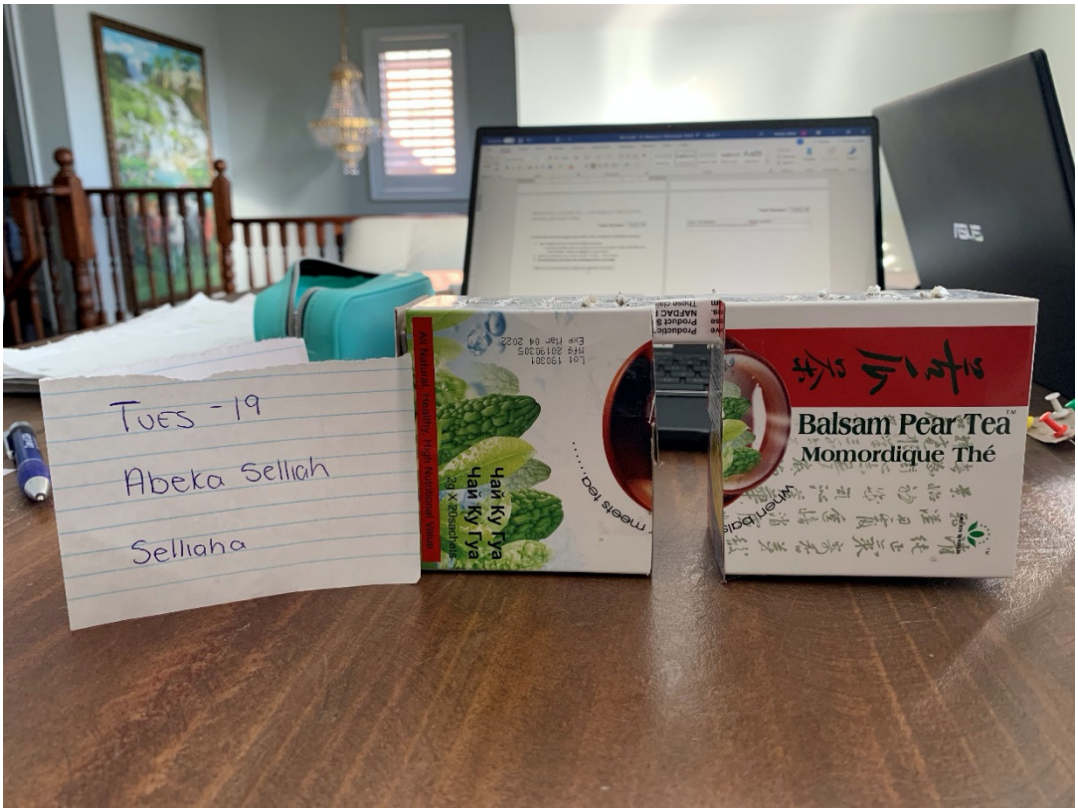
Name: Abeka Selliah	MacID: selliaha

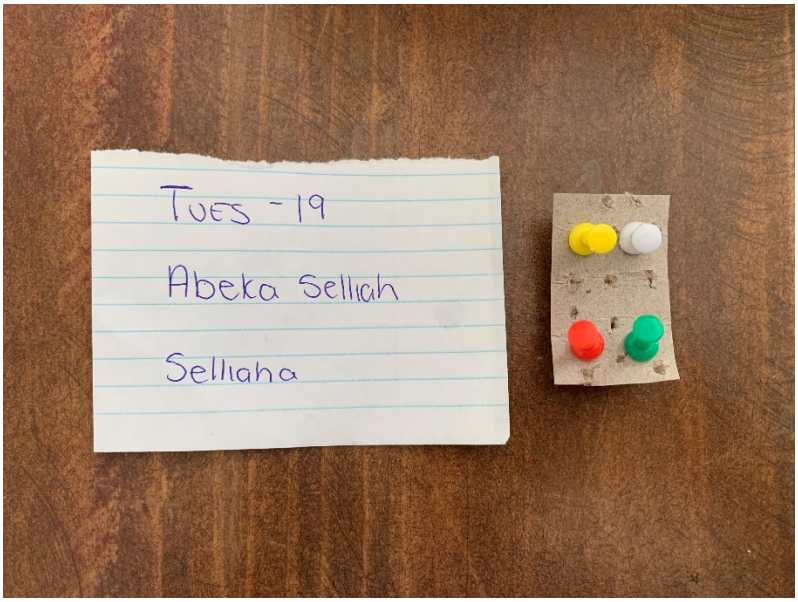
Insert screenshot(s) of your low-fidelity prototype below

PROTOTYPE 2









*** Inside the prototype, section to hold the tool(s) in place ***

*If you are in a sub-team of 3, please copy and paste the above on a new page

MILESTONE 2 (STAGE 3B) – LOW-FIDELITY PROTOTYPE OBSERVATIONS (MODELLING SUB-TEAM)

Team Number: TUES-19

As a team, document your observations for each low-fidelity prototype. Make sure to label your observations to indicate which prototype it belongs to. As a starting, consider the following: (note, this does not fully encompass all discussion points)

- → Advantages and disadvantages of each prototype
- → Extent to which each concept aligns (or does not align) with the List of Objectives, Constraints, and Functions you came up with for Milestone 1
- → Reliability of the design in picking up the surgical tool
- → Reliability of the design in securing the surgical tool
- → Extent to which it allows for tool sterilization

*Document your observations for each prototype in the space below. It is recommended you document observations in a **table** or in bullet form (it should be clear which prototype you are referring to for each observation.*

	PROTOTYPE 1 (Kyle's)	*PROTOTYPE 2 (Abeka's)*
Advantages	*-Can be scaled easily depending on footprint required* *-shape is easy to manufacture* *-Strap completely secures tool*	*-Easy for arm to pick up the container* *-Lots of room for multiple tools* *-Easy to insert and remove tools from container*
Disadvantages	*-could be hard for arm to grab the horizontal indentation* *-might be challenging to insert/remove tools from bottom section*	*-Not very durable/steady due to the gap between the left and right side* *-Not enough ventilation, no way for vapour/water to exit the container at the bottom* *-Extra material might make it too heavy*

		- Waste of material: Both left and right side are not needed to hold tool(s)
Alignment with Objectives, constraints, Functions	*-Arm might have challenge picking up box from floor with horizontal indentation* *-meets objective of holding surgical tool in place* *-meets constraint of having walls, being light, and facilitating sterilization* *-strap used may wear out after repeated use, potentially failing constraint that device must be sterilized repeatedly*	*-meets objectives of arm being able to pick up container and container holding surgical tool in place* *- Meets constraints of having walls, being light and facilitating sterilization. However, it might not be durable enough to be sterilized repeatedly due to the center of the prototype being unsteady* *- Meets functions of holding and transferring tool securely, facilitating sterilization (to some extent) and being able to be caried by robotic arm*
Reliability picking up surgical tool	*-potentially challenging to pick up, perhaps indentation should be adjusted* *-*	*-Container design makes it easy for arm to pick up the container/tool* *-Picking up container from center allows for maximum stability*
Reliability securing surgical tool	*-can hold tools very reliably and adaptable to new tools if needed* *-must ensure strap is durable*	*-reliable if pegs are spaced close together and measured to fit chosen surgical tool* *-not reliable if a variety of tools or different sizes need to be held*
Extent to which it allows tool sterilization	*-allows for entry and exit of steam, tool will be immersed and sterilized*	*-allows for steam to enter the container, however, more holes will be beneficial to maximize sterilization* *-does not have holes/gaps on surfaces other than the top, limiting the extent of sterilization*

MILESTONE 2 (STAGE 4A) – WORKFLOW PEER-REVIEW (COMPUTATION SUB-TEAM)

Team Number: TUES-19

As a team, document your observations, specifically any similarities and differences between each team member's visual storyboard or flowchart in the table below.

Document your observations for each visual storyboard / flowchart in the space below.

Similarities:
-Having drop of location pre-defined so Q-arm knows where to go
-The Q-arm should return to the home position after picking up container
-Detecting the colour and sizes of the container to understand where to drop off the box
-Returning to the origin after dropping off the container

Differences:
-Considering what happens if the box doesn't fit in the container
-Using variables that contain the size and colour of the box for the drop off location instead of specifically stating the colour. So, labelling the autoclave by numbers instead of colour
- Figuring out what to do if the big size container is picked up. So how and when the autoclave drawer will open and close

MILESTONE 2 (STAGE 4B) – PROGRAM PSEUDOCODE (COMPUTATION SUB-TEAM)

Team Number: TUES-19

As a team, write out a pseudocode outlining the high-level workflow of your computer program in the space below.

Assign a variable with coordinates for the Location of the bot's origin and that is where the program begins

If the bot is not at origin it should start at the origin

Find the toolbox coordinates and move the arm to that location

Ask the user to pick from red green or blue toolboxes

Define a function with autoclave red autoclave green and autoclave blue in its parameters

Depending on the angle at which the claw closes, it will determine whether the box is small or large.

If container colour is red

Arm moves to the pickup coordinate of red toolbox

Close claw without assigning a specific angle

Move to the coordinates of the home position

If the angle of claw is >= a specific predefined value

Open the drawer

Move to the red autoclave

Move to drawer coordinates

Open claw

Drop toolbox into the drawer

Close drawer and move back to the location of the home position

Or else

Move to the red autoclave

Drop container into the small container drop off location

Return to the coordinates of the home position

If container colour is blue

Arm moves to the pickup coordinate of blue toolbox

Close claw without assigning a specific angle

Move to the coordinates of the home position

If the angle of claw is >= a specific predefined value

Open the drawer

Move to the blue autoclave

Move to drawer coordinates

Open claw

Drop toolbox into the drawer

Close drawer and move back to the location of the home position

Or else

Move to the blue autoclave

Drop container into the small container drop off location

Return to the coordinates of the home position

If container colour is green

Arm moves to the pickup coordinate of green toolbox

Close claw without assigning a specific angle

Move to the coordinates of the home position

If the angle of claw is >= a specific predefined value

Open the drawer

Move to the green autoclave

Move to drawer coordinates

Open claw

Drop toolbox into the drawer

Close drawer and move back to the location of the home position

Or else

Move to the green autoclave

Drop container into the small container drop off location

Return to the coordinates of the home position

If the user inputs something else

Ask user to input a valid color

All 6 boxes will be able to be transferred using these three if statements. After all boxes have been transferred the program will terminate