PROJECT FOUR: MILESTONE 1 – COVER PAGE

Team Number: Thurs 07

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

Full Name:	MacID:
Samuel Parent	Parens4
Blake Freer	freerb
Kartik Chaudhari	chaudk4
Dehe Meng	mengd9

MILESTONE 1.1 – CLIENT NOTES

Team Number: Thurs 07

You should have already completed this task individually prior to Design Studio/Lab for Week 7.

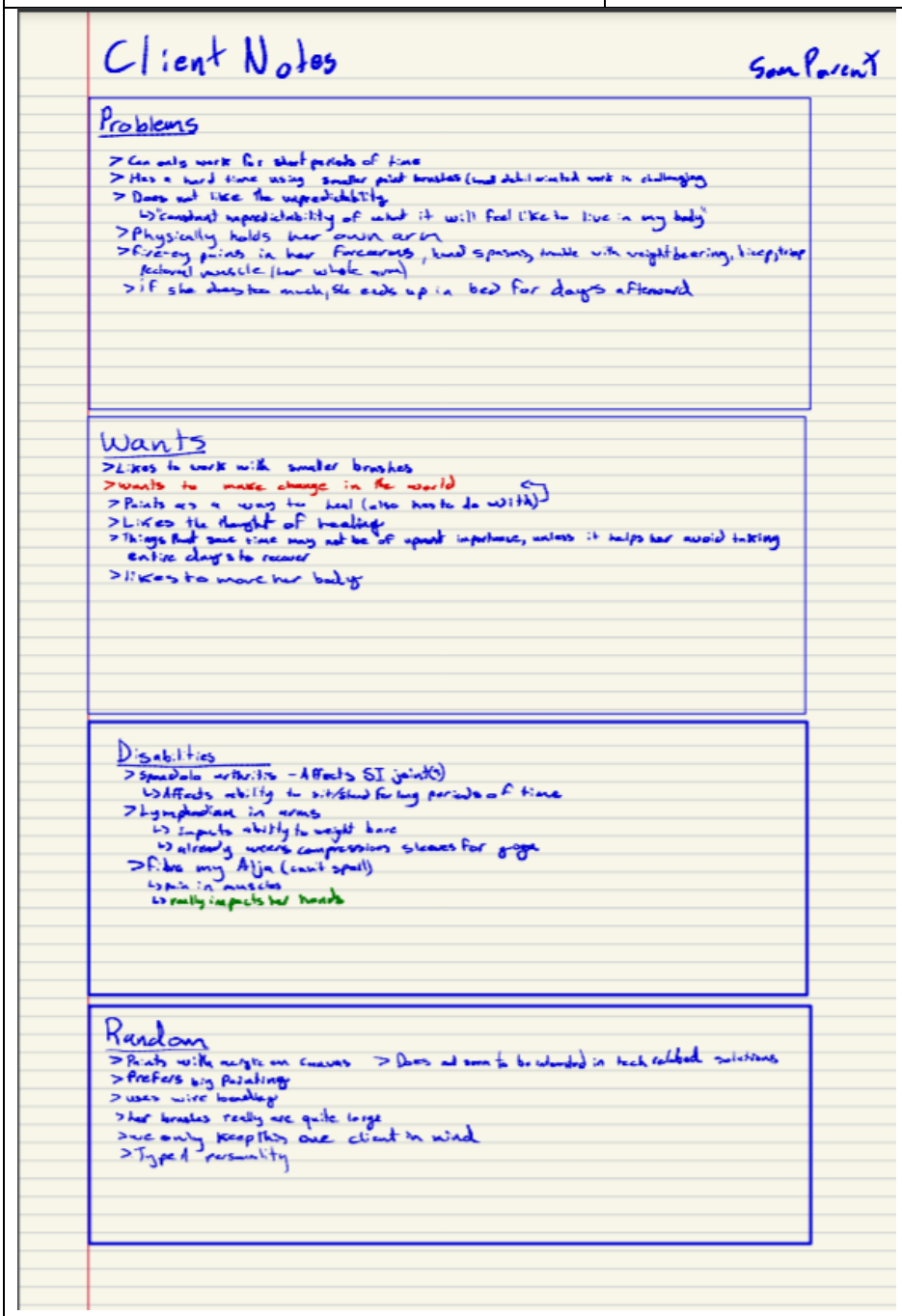
1. Copy-and-paste each team member's client notes on the following pages (1 team member per page)
   → Be sure to indicate each team member's Name and MacID

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

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

Team Number: Thurs 07

Name: Samuel Parent	MacID: Parens4



Client Notes — Sam Parent

Problems

> Can only work for short periods of time
> Has a hard time using smaller paint brushes (and detailed work is challenging)
> Does not like the unpredictability
↳ "emotional unpredictability of what it will feel like to live in my body"
> Physically holds their own arm
> Pins-and-needles points in her forearms, hand spasms, trouble with weight bearing, bicep/tricep fatigue/muscle (her whole arm)
> If she does too much, she ends up in bed for days afterward

Wants

> Likes to work with smaller brushes
> wants to make change in the world
> Paints as a way to heal (also how to do with it)
> Likes the thought of healing
> Things that once time may not be of equal importance, unless it helps her avoid taking entire days to recover
> likes to move her body

Disabilities

> Spondylo arthritis - Affects SI joint(s)
↳ Affects ability to sit/stand for long periods of time
> Lymphedema in arms
↳ Impacts ability to weight bear
↳ already wears compression sleeves for yoga
> Fibro my Alja (can't spell)
↳ pain in muscles
↳ really impacts her hands

Random

> Paints with weights on ankles > Does not seem to be interested in tech related solutions
> Prefers big Paintings
> uses wire hangers
> her brushes really are quite large
> we only keep this one client in mind
> Typed personality

Team Number: Thurs-07

Name: Kartik Chaudhari	MacID: chaudk4

- Worked as a midwife for 15 years
- Worked in reproductive health
- In 2016, she developed enough autoimmune disorders that she had to retire as a midwife - Worked long hours, causing her body and immune system to suffer
- Involved in a traffic accident that resulted in a variety of injuries.
- After that, she was diagnosed with breast cancer and needed medication and surgery.
- She began painting in 2017 to concentrate on healing her body and doing work she loves.
- She spends a lot of time drawing - She channels her strength into sculpture work and Brazilian Jiu Jitsu training, which she has adapted to help her body recover.
- She began a dynamic daily yoga and meditation practice to help her cope with the unpredictability of dealing with many chronic illnesses.
- Her longest painting took her 8 months in 201 because she could only work for short periods of time due to physical disabilities that affect how she paints (working with various tools).

Team Number: Thurs-07

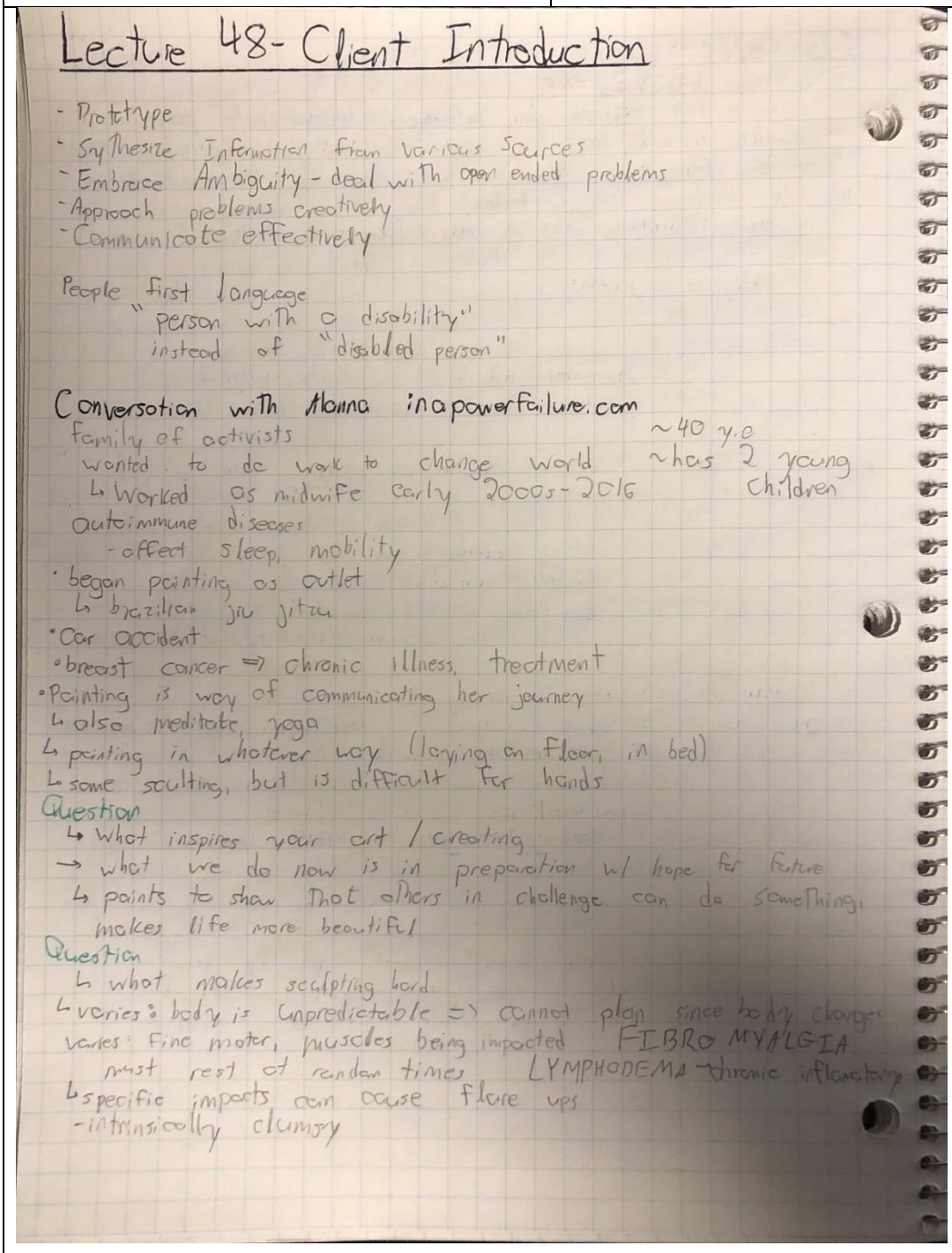
Name: Dehe Meng	MacID: mengd9

Copy-and-paste the notes from the introductory client visit for one team member in the space below.

1. The client usually feels painful with muscles and find it hard to write.
2. The client's pain become worse sometimes when muscle is impacted or hurt, so she is very careful and try to avoid possible impact.
3. She has a problem adapting what she wants to do with physically movement. And due to spondylitis arthritis, she could not stand, or sit.
4. The client loves creating some paintings which she believes can relief her pain mentally.
5. She is trying using different methods to fight for her disease, she has tried traditional Chinese medicine approaches, exercise, and movement to overcome internalized ableism.
6. Her pain is unpredictable, but it has pattens at some extend, when stress pain level is higher, it tends to appear more frequently.
7. She feels extremely painful for certain movements such as bending at waist and motions up and down, also it is hard bearing arms with weight on it.
8. The client is a vegetarian.

Team Number: Thurs-07

Name: Blake Freer	MacID: freerb



Lecture 48- Client Introduction

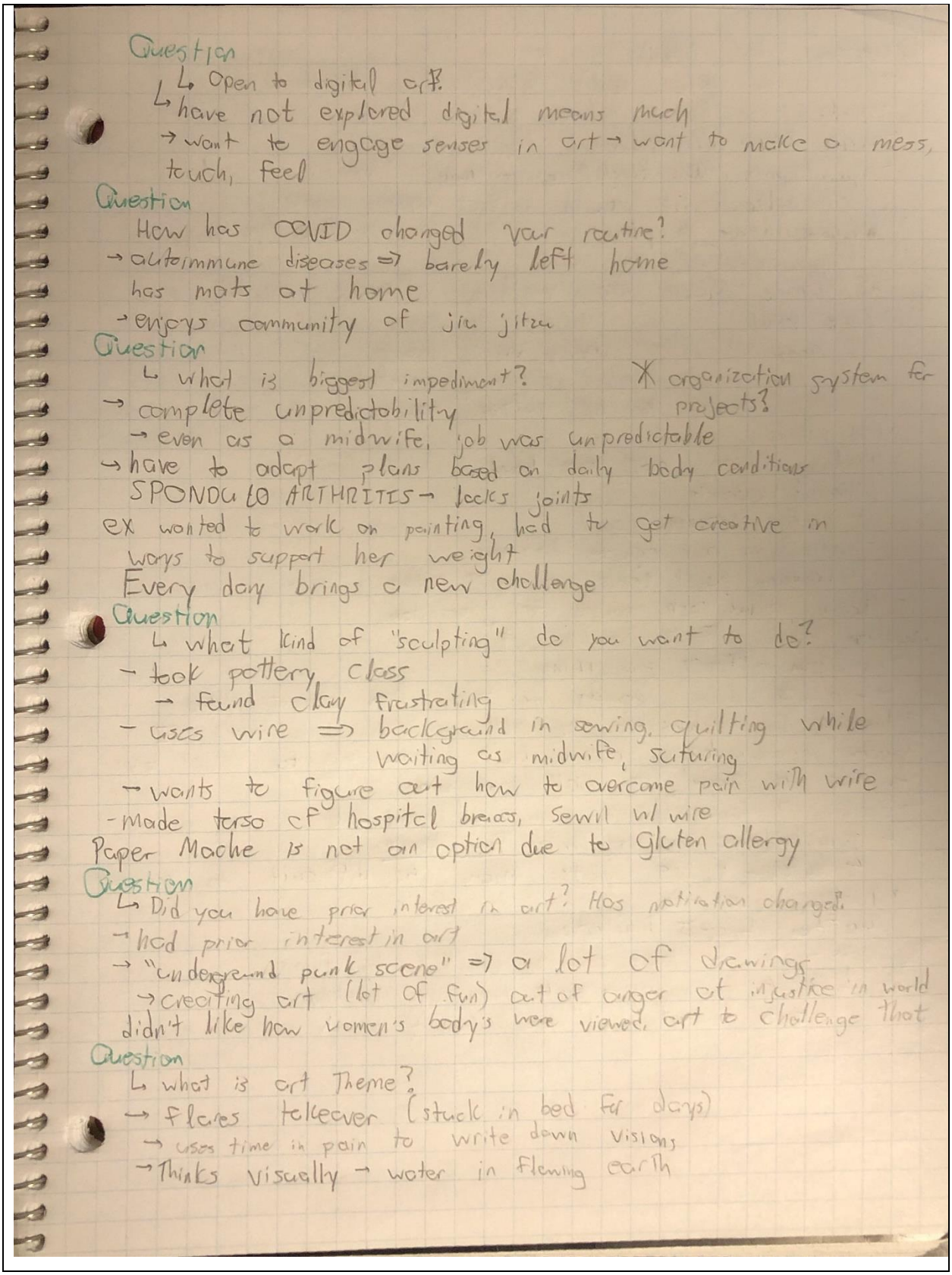
- Prototype
- Synthesize Information from various sources
- Embrace Ambiguity - deal with open ended problems
- Approach problems creatively
- Communicate effectively

People first language
"person with a disability"
instead of "disabled person"

Conversation with Alanna inapowerfailure.com
family of activists
wanted to do work to change world
↳ worked as midwife early 2000s - 2016
~40 y.o
~has 2 young children
autoimmune diseases
- affect sleep, mobility
- began painting as outlet
↳ brazilian jiu jitzu
- Car accident
- breast cancer ⇒ chronic illness, treatment
- Painting is way of communicating her journey
↳ also meditate, yoga
↳ painting in whatever way (laying on floor, in bed)
↳ some sculting, but is difficult for hands

Question
↳ what inspires your art / creating
→ what we do now is in preparation w/ hope for future
↳ paints to show that others in challenge can do something, makes life more beautiful

Question
↳ what makes sculpting hard
↳ varies: body is unpredictable => cannot plan since body changes
varies: fine motor, muscles being impacted FIBROMYALGIA
must rest at random times LYMPHODEMA - chronic inflammatory
↳ specific impacts can cause flare ups
- intrinsically clumsy



Question
↳ Open to digital art?
↳ have not explored digital means much
→ want to engage senses in art → want to make a mess, touch, feel

Question
How has COVID changed your routine?
→ autoimmune diseases ⇒ barely left home
has mats at home
→ enjoys community of jiu jitzu

Question
↳ what is biggest impediment? * organization system for projects?
→ complete unpredictability
→ even as a midwife, job was unpredictable
→ have to adapt plans based on daily body conditions
SPONDYLO ARTHRITIS → locks joints
ex wanted to work on painting, had to get creative in ways to support her weight
Every day brings a new challenge

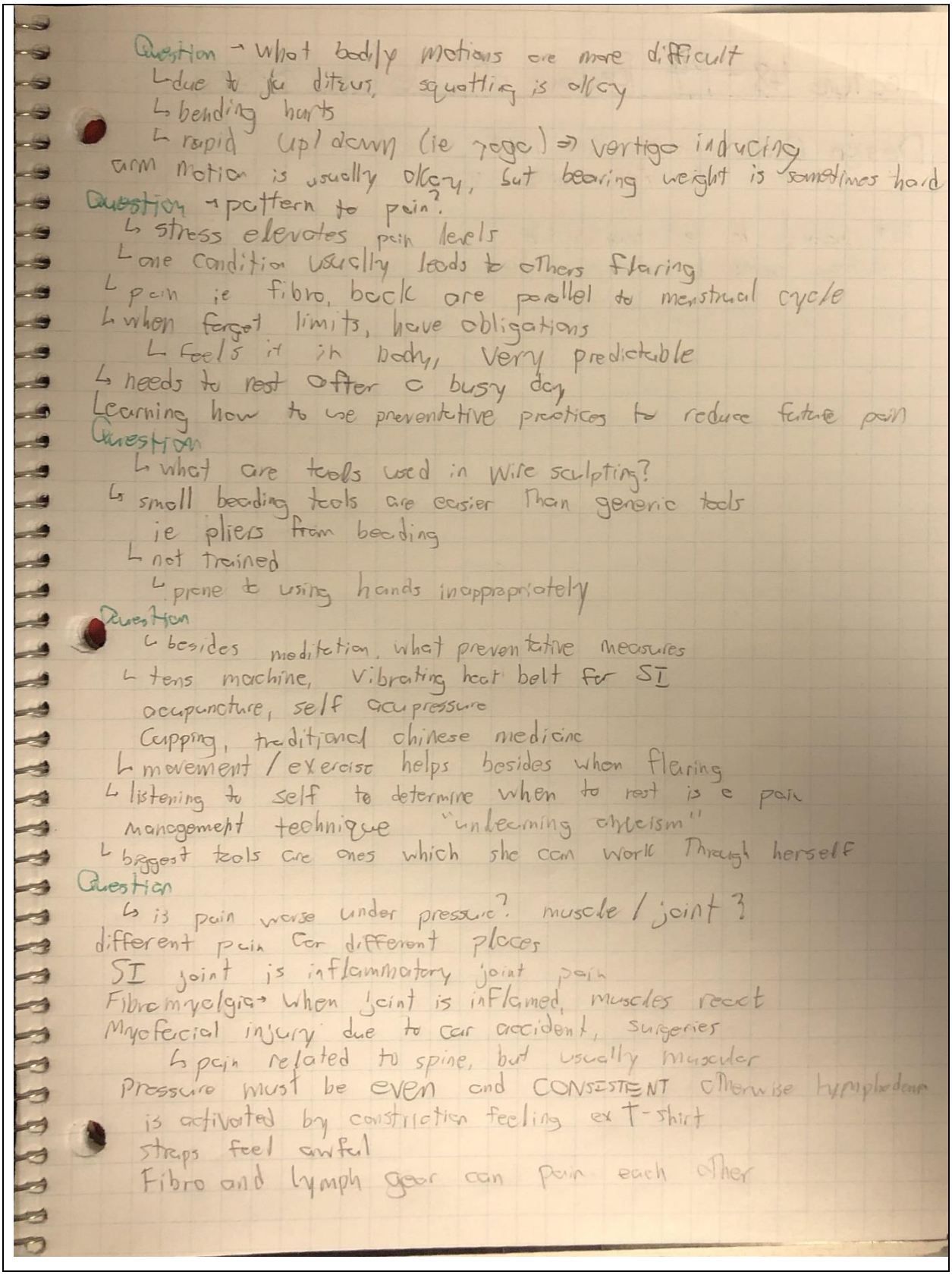
Question
↳ what kind of "sculpting" do you want to do?
- took pottery class
→ found clay frustrating
- uses wire ⇒ background in sewing, quilting while waiting as midwife, suturing
→ wants to figure out how to overcome pain with wire
- made torso of hospital braces, sewn w/ wire
Paper Mache is not an option due to gluten allergy

Question
↳ Did you have prior interest in art? Has motivation changed?
→ had prior interest in art
→ "underground punk scene" ⇒ a lot of drawings
→ creating art (lot of fun) out of anger at injustice in world
didn't like how women's body's were viewed, art to challenge that

Question
↳ what is art Theme?
→ flares takeover (stuck in bed for days)
→ uses time in pain to write down visions
→ Thinks visually → water in flowing earth

Question What devices in use
- compression vest, sleeves gauntlets lymphedema
- medical arthritis gloves ✓ incompatible
- will try lymphedema gloves
- spinal pain from forgetting posture
  spondulcarthritis could effect upper back
- homemade device to place on back for posture reminding
  ↳ unsuccessful
- SI Brace good for walking, otherwise painful
- Knee pads
- kid suggested roller derby wrist brace
  ↳ Fibromyalgia makes pressure painful
- "material needs to be softer" maybe.
- Hot pillows
- making floor not as hard
- different easels
  - prefer wooden easel
  - medication can cause dizziness
    ↳ wooden easel feels sturdy ⇒ safer
- Silicone padded rash gourd for jiu-jitsu

Question what affects besides art?
→ condition affects everything
  → use to drive hands on tour, now cannot drive
→ bending for dishwasher, to pick up kids item, hurts SI
→ doctor recommended a claw, but is too big for kids' toys
  ↳ has to crawl to pick toys up
→ cooking ⇒ household is vegan, all homemade
  ↳ lymphedema makes Things feel heave
    ↳ butcher knives, pots may be difficult to support
→ tucks in arms to
  ↳ often forgets limitations
    ↳ forgets to take breaks, walk into Things
    ↳ Fagets to nap → gets tired unpredictably
      ↳ starts project, but too tired to finish



Question → what bodily motions are more difficult
↳ due to fibro, squatting is okay
↳ bending hurts
↳ rapid up/down (ie yoga) ⇒ vertigo inducing
arm motion is usually okay, but bearing weight is sometimes hard
Question → pattern to pain?
↳ stress elevates pain levels
↳ one condition usually leads to others flaring
↳ pain ie fibro, back are parallel to menstrual cycle
↳ when forget limits, have obligations
↳ feels it in body, very predictable
↳ needs to rest after a busy day
Learning how to use preventative practices to reduce future pain
Question
↳ what are tools used in wire sculpting?
↳ small beading tools are easier than generic tools
ie pliers from beading
↳ not trained
↳ prone to using hands inappropriately
Question
↳ besides meditation, what preventative measures
↳ tens machine, vibrating heat belt for SI
acupuncture, self acupressure
Cupping, traditional chinese medicine
↳ movement / exercise helps besides when flaring
↳ listening to self to determine when to rest is a pain
management technique "unlearning ableism"
↳ biggest tools are ones which she can work through herself
Question
↳ is pain worse under pressure? muscle / joint?
different pain for different places
SI joint is inflammatory joint pain
Fibromyalgia → when joint is inflamed, muscles react
Myofecial injury due to car accident, surgeries
↳ pain related to spine, but usually muscular
Pressure must be even and CONSISTENT otherwise lymphedema
is activated by constriction feeling ex T-shirt
straps feel awful
Fibro and lymph gear can pair each other

MILESTONE 1.2 – INITIAL PROBLEM STATEMENT

Team Number: Thurs-07

1. As a team, come up with an initial problem statement and include it in the space below.
   → Make use of your client notes to define your primary function
   → Remember to avoid solution-specific statements
      - Focus on what your design *should* do for the client in a general sense (not *how* to do it)

STATEMENT:

Design a solution to enable Alanna to maintain physical movement for longer periods of time, as her fibromyalgia and spondyloarthritis make it difficult to bear weight or remain in one position for extended periods.

Solution for Art or Life?

Improve her quality of life in some general sense?

Many days she is limited to painting in bed → much of her life revolves around painting / art – it's not just a hobby – "painting is significant because it's a part of my healing process"

Can attempt to solve the general problem or look for one very specific solution

Main Problems:

- Unpredictability of body
- Difficulty bearing weight – even cutting with a butcher's knife is hard
- Vertigo inducing motions

Disabilities:

- Lymphedema
- Fibromyalgia
- Spondyloarthritis

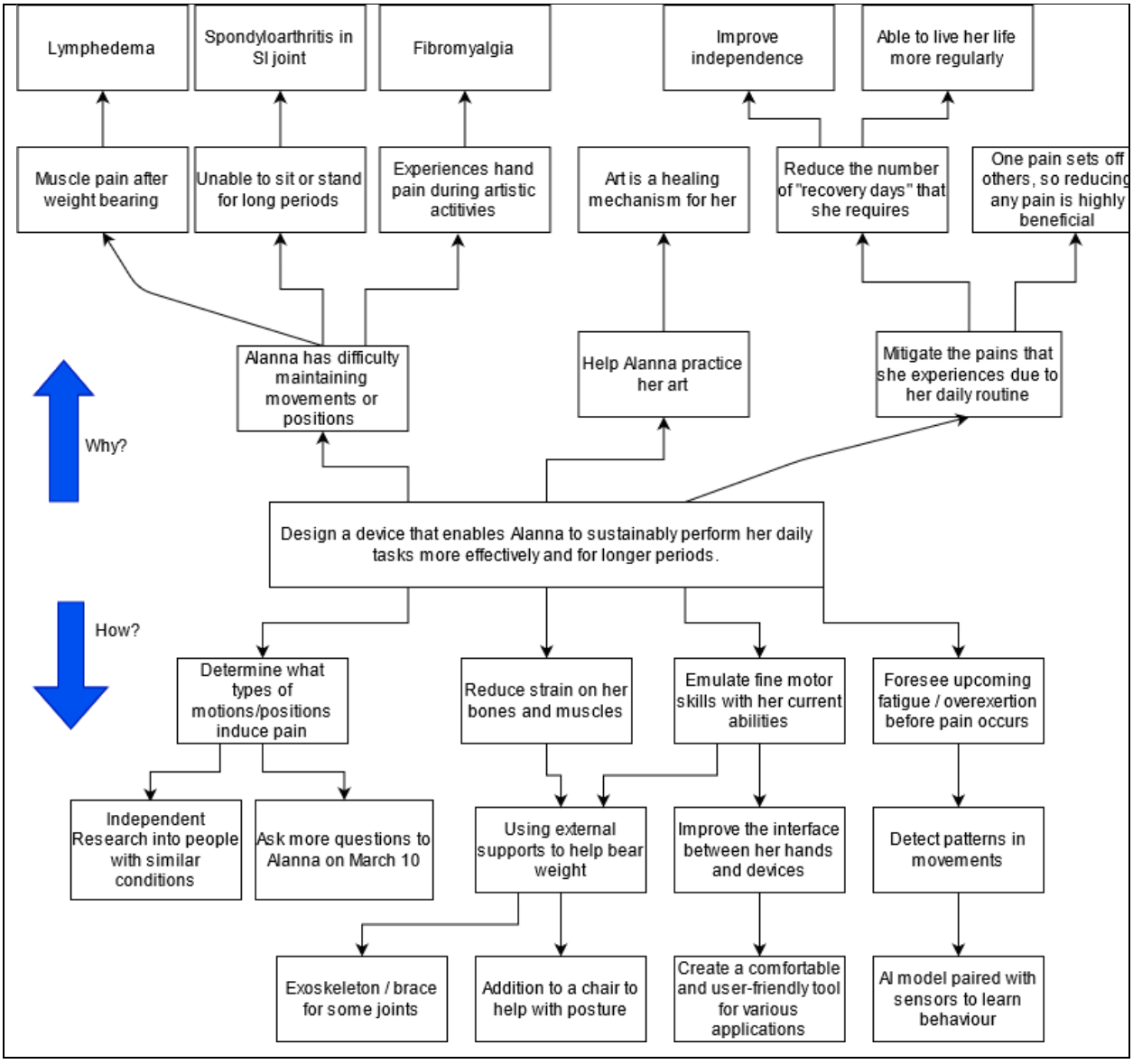
We need to design a solution to enable Alanna to maintain physical movement for longer periods of time, as she has trouble with weight bearing.

We need to design a solution which enables Alanna to do the things that she enjoys doing as she curre

MILESTONE 1.3 – OBJECTIVE TREE, HOW/WHY LADDER, METRICS

Team Number: Thurs-07

1. As a team, use an objective tree and/or How/Why ladder, to refine and guide the focus of the project.
   → If your team chooses to do both, copy and paste the blank box on a separate page
   → Your diagram(s) can be hand-drawn or done on a computer. Please make sure it's well organized and ***readable***.
2. If you need to see examples of each tool see "Review of Design Process" lecture – Wednesday, Feb 24th.



Justify your team's reasoning behind the choice of design tool(s):

Using a how-why ladder allowed us to view our main ideas more accurately. It helped us trace our thought process from the initial problem statement to the root causes and possible solution approaches. In creating this ladder, we first completed the "Why" part of the ladder, which allowed us to further understand the problem and learn the motivation behind the search in the solution space. After this, we were able to efficiently answer "How" we would attempt to create a solution by literally asking our group members "How will we accomplish this?" Our approach to this stage of the milestone gave a broad understanding of the problem as well as directed our thinking towards some possible solutions.

We decided not to use an objective tree as it would not allow such exploration of the nature of the problem. Whereas the how-why ladder helped us to understand the motivation behind the project, an objective tree would force us to try and define the necessary properties of our solution. Since we do not yet have a solution idea, and objective tree would be ineffective in guiding our focus on the project.

1. What are your top three objectives (in no particular order)?

Does not cause significant resistance to movement
Durable
Feasibility

2. What is your rationale for selecting each of these objectives? Write maximum 100 words for each objective.

Objective 1: Low resistance to motion

Rationale: Because the client of our project has sensitive muscles and Lymphedema, it was important to have low resistance to motion as an objective. If the device is resistive, this could cause an onset of pain which is counterproductive to our design solution.

Objective 2: Durable

Rationale: Since the client of our project needs to use the device very frequently in her daily life, so the device should fit for the situation that it will be used for many times every day. If the device only works for serval hours or it always broken, it will waste lot of time for maintenance and repair. Thus, it is significant for the device to be long lasting in order to make sure the client can use it sustainably.

Objective 3: Feasibility Rationale: Having a design which the Alanna will want to use is of significant importance to us. If the design is too costly, or takes too much time to develop, there is a possibility that the entire design would not be used by the time the project is completed. For this reason, a feasible design assures that we validate the effort that we put into the project.

3. Fill out the table below with associated metrics (including units) for each objective.
   Remember: Metrics should be something you can actually test or measure as part of your process (e.g., calculate weight of a part by iProperties in CAD, test results of a physical prototype).

Objective:	Does not cause significant resistance to movement
Unit/Metric:	Additional force required to manipulate the solution, measured in Newtons where less force is a better score

Objective:	Durability
Unit/Metric:	Keep the device working and test the last time of it before it is malfunction, measured in hours that it can be operated normally.

Objective:	Feasibility
Unit/Metric:	Composite metric of cost and prototyping / production time where less of both is better 4·cost (CAD $) + 3·time spent (hours)

MILESTONE 1.4 – PROJECT PLAN

Team Number: Thurs-07

1. As a team, outline a project plan where you:
   → Include a few sentences describing each team member's prior experience with physical and/or software prototyping
      • From previous projects in the course, or any other relevant experience
   → Compile a list of potentially useful resources, materials, and/or tools for prototyping

   Reminders:

   → The prototype can be either physical (e.g., cardboard and tape, 3D printed), digital (e.g., Inventor simulation or rendering), software (e.g., code for Raspberry Pi) or some combination of physical, digital and software
   → Keep in mind that there are no ENG 1P13 physical prototyping resources available to you because we are learning online, which is why we are asking you to take inventory of how you might accomplish prototyping as a group
   → As you think about how to prototype, remember that you will eventually need to validate your work somehow. Your validation approach will depend on what prototyping technique you use. Examples of validation approaches include (but are not limited to): hand calculation, physical test, software demonstration or simulation.

Samuel:

Physical

- Assembled robots
- Built automatic rubber band powered door shutter
- Built bike ramps

Software:

- PWM and Timers module (embedded C)
- SPI communication module (embedded C)
- Vex Robotics Tower takeover
- Web development tools (ReactJS, MongoDB, Flask...)
- Arduino

Available resources:

- Possibly various tools (spot welder, various drills/cutting tools)
- Raspberri pi, STM 32 Nucleo F7, Raspberri Pi
- Basic electronic components

Kartik:

Software:

- Javascript,SQL and Python (personal projects and 1P13)
- Front End Development-HTML 5, CSS and Game Development using Alice and Scratch
- Arduino and Raspberry Pi
- Amazon Web Services and Data Science Math Skills
- Inventor

Physical:

- Made an RFID Safe, obstacle avoider robot and fire alarm system
- Tried making a huge hoverboard using RC's and strong motors
- Available Resources:
- Drilling Machine, Cutting Tools, Soldering Machine
- Raspberry Pi
- Servos and other basic electrical components

Blake

- Software in Java / C# (game design) and Python (personal projects and 1P13)
- CAD in Inventor, Fusion360 and AutoCAD specifically for electrical diagrams and 3D printing
- Circuit design and PCB creation
- Woodworking (table saw, band saw, assorted tools) and metalworking (lathe, mill)

Dehe

Physical:

- Raspberry Pi

Software:

- Autodesk Inventor
- Q-labs
- Circuit boards
- Jupyter Notebook

Available resources

Blake: 3D printer, assorted electronics, Arduino, Raspberry Pi, servo motors

Sam: Woodworking tools

Prototyping: Each team member has different tools and materials available, so we could each create a prototype using these different means as a way of exploring the possible production methods of our device.

Design Plan: We plan on creating a device that involves both physical design and software.

Questions for Alanna on March 10

- What notifies you that you need to take a rest? / At what stage do you notice the onset of pain? (Do you notice "too late?" – do not ask this)
- Type A personality: feels need to fight through the pain
- Where are you regular pains concentrated? Ex typically on the wrist or hand or back?
- When painting, do you find it difficult to adjust your body position to access different regions of the canvas?