Name: _____ Group: _____

THE CASE STUDY

WORK ORDER

Good Measure Designs, Inc.

TO: All designers
DATE: April 12, 2018
SUBJECT: Signing of a contract with the municipal library

We are proud to announce that we have just signed an important contract with the municipal library. To ensure the comfort and well-being of its patrons, the library has ordered ergonomic reading chairs adapted to its clientele. They have chosen to target four separate groups: young children, children, small adults and tall adults. We are asking our designers to submit multiview projections for each of the target clientele, keeping in mind technical and ergonomic norms. Later, the designers will undertake to create the chair's style and maximize its potential for comfort.
Thank you for your collaboration.

Jim Gray
President

Ergonomic

Anyone who works sitting down knows what it's like to have back pain. Thanks to ergonomics, it is now possible to have chairs that are designed to help prevent such discomfort. The field of ergonomics studies working conditions and the relationship between people and objects. The designer, by adapting the object to its user, increases the user's well-being and productivity. More and more companies are integrating ergonomic norms into their workplace design. The municipal library recently received complaints from users who have experienced back pain sitting in its chairs. In an effort to maintain its patronage, the library has decided to purchase some ergonomic reading chairs.

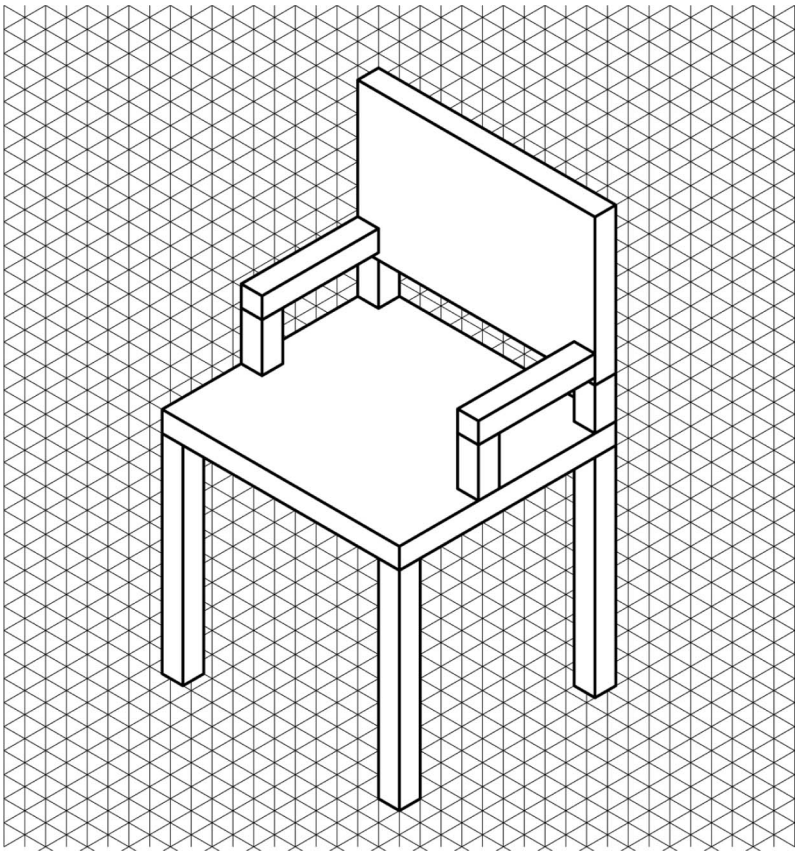
In this learning and evaluation situation, you will play the role of a designer. To complete the task, you will need to:

- Calculate the measurements for each part of the chair;
- Make multiview projections of the chair at a scale of 1:10;
- Provide dimensions for each of the following chair parts:
  - height of the chair-back supports,
  - total height of the chair back,
  - height of the armrest supports,
  - height of the armrests,
  - length of the armrests,
  - depth of the chair seat,
  - width of the chair seat,
  - height of the chair legs.

Name: _____ Group: _____

THE CASE STUDY (*continued*)

Technical and ergonomic norms established by Good Measure Designs, Inc.



Technical norms

1.1 The chair-back supports, armrest supports, armrests and chair legs are made of square wooden balusters (posts), measuring 5 cm x 5 cm.

1.2 The chair seat and the chair back are 5 cm thick.

Ergonomic norms

Chair legs

2.1 Height

The highest part of the chair seat should be at knee height. In this way, the user, when seated, can rest his/her feet comfortably on the floor.

Seat

2.2 Depth

When seated, the user should be able to rest his/her back against the chair back without there being any pressure on the back of the knees from the seat; there should be 5 cm of space between the back of the user's knees and the edge of the seat.

2.3 Width

The seat should be wide enough so that there is no pressure placed on either side of the user's thighs and pelvis, so leave 2.5 cm of space on either side of the pelvis when the legs are slightly apart. In addition, the designer must leave 10 cm for space to secure the armrests.

Name: _____ Group: _____

THE CASE STUDY *(continued)*

The chair back

2.4 Total height
The height of the chair back should correspond to the height of the user's shoulders when he/she is seated. The user should be able to rest his/her neck on the top of the chair back when stretching.

2.5 Width
For maximum comfort, the chair back should be the same width as the seat.

The chair-back supports

2.6 Height
The chair-back supports should be 10 cm high. They should be positioned on the right and left sides of the chair back and at the two back corners of the seat.

Note: The space that this creates will allow the natural curve in the user's lower spine to occupy the 5-cm space below the chair back.

The armrests

2.7 Length
The armrests should provide enough room for the user's entire forearms—from elbow to wrist—to rest comfortably.

The armrest supports

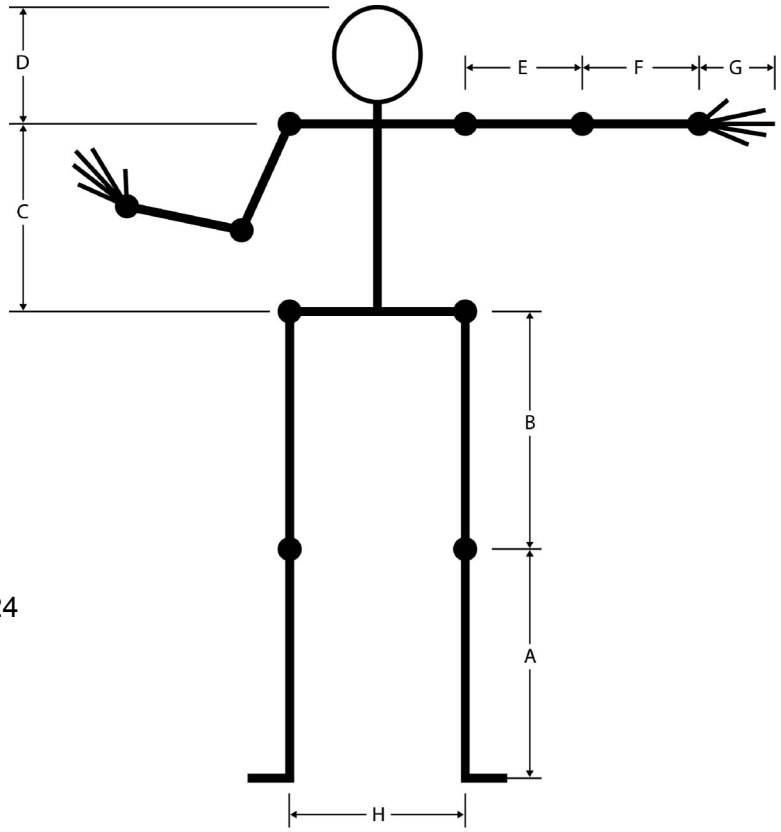
2.8 Height
The user should be able to rest his/her elbows on the armrests, with arms vertical and shoulders relaxed. The armrests must not hamper natural movement.

Name: _____ Group: _____

THE CASE STUDY *(continued)*

Measurements for the target groups

Unit of measurement: cm



Young child

A. Length floor–knee: 30
B. Length knee–hip: 30
C. Length hip–top of shoulder: 35
D. Length top of shoulder–top of head: 22
E. Length shoulder–elbow: 15
F. Length elbow–beginning of wrist: 12
G. Length wrist–tips of fingers: 14
H. Width of pelvis, legs slightly apart: 24

Child

A. Length floor–knee: 40
B. Length knee–hip: 40
C. Length hip–top of shoulder: 38
D. Length top of shoulder–top of head: 24
E. Length shoulder–elbow: 22
F. Length elbow–beginning of wrist: 20
G. Length wrist–tips of fingers: 16
H. Width of pelvis, legs slightly apart: 26

Small adult

A. Length floor–knee: 42
B. Length knee–hip: 46
C. Length hip–top of shoulder: 42
D. Length top of shoulder–top of head: 24
E. Length shoulder–elbow: 26
F. Length elbow–beginning of wrist: 22
G. Length wrist–tips of fingers: 17
H. Width of pelvis, legs slightly apart: 37

Tall adult

A. Length floor–knee: 55
B. Length knee–hip: 57
C. Length hip–top of shoulder: 45
D. Length top of shoulder–top of head: 28
E. Length shoulder–elbow: 28
F. Length elbow–beginning of wrist: 28
G. Length wrist–tips of fingers: 18
H. Width of pelvis, legs slightly apart: 42

Name: _____ Group: _____

CREATING THE CONTEXT

Who is your target clientele?

_____

I ask myself questions

1. What is ergonomics?

_____

_____

_____

2. Who are the actors in this case study?

_____

_____

3. Formulate the questions that you will have to answer as you make a technical drawing of your chair.

_____

_____

_____

_____

_____

_____

I must

4. Reformulate the case study goal.

_____

_____

_____

_____

_____

_____

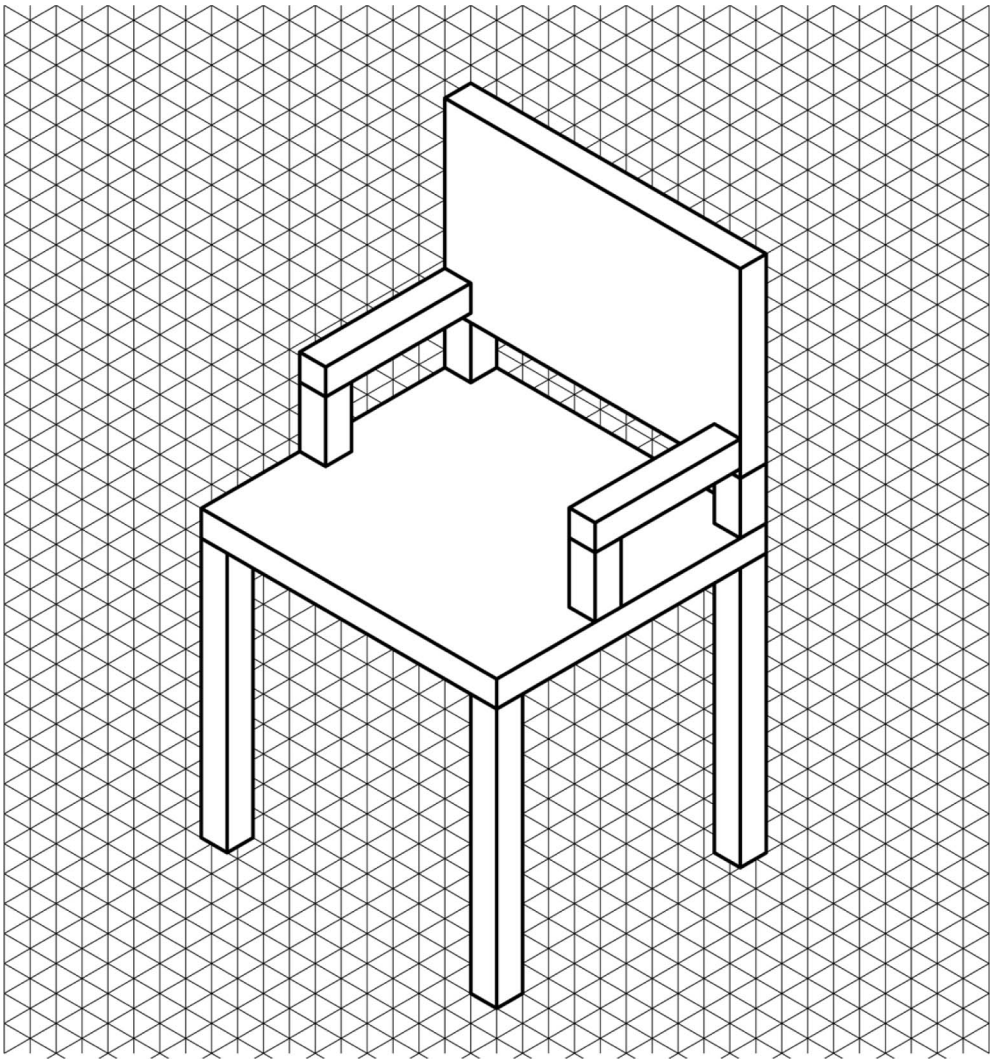
_____

Name: _____ Group: _____

CREATING THE CONTEXT *(continued)*

I think

5. Which views do you think should appear on the drawing (e.g. front view, top view, bottom view, right-side view, left-side view, rear view)? Use arrows to indicate your choices on the drawing below, and justify your answers.



Justification:

_____

_____

_____

_____

Name: _____ Group: _____

CREATING THE CONTEXT *(continued)*

What I know and what I must find out

6. Write down the information you have, and what you need to find out.

What I know . . .	What I need to find out . . .

I prepare my work

7. Where can you find the information you need to produce your technical drawing?

_____

_____

8. In chronological order, list the principal steps of your work.

_____

_____

_____

_____

_____

_____

Reflection

	Yes	No
Do I have a good understanding of the work to be done?	☐	☐

Name: _____ Group: _____

GATHERING INFORMATION

I prepare my work

1. To make a technical drawing of a custom-made chair, you need to use certain basic lines. In the table below, name the lines and explain their use.

Name of the basic line	Line	Use
	2.75	

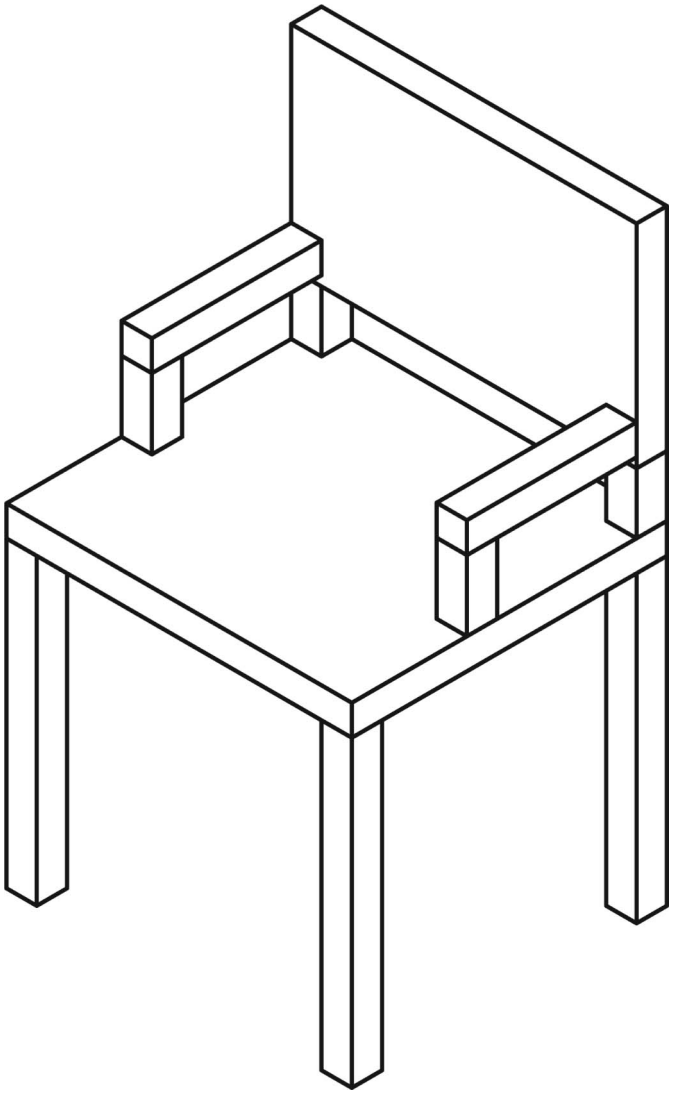
2. What calculation should be used to convert a real measurement to a scale reduction of 1:10?

_____

Name: _____ Group: _____

GATHERING INFORMATION *(continued)*

3. Here is the chair that you will need to draw. On the drawing, label each of the parts using dimension lines.



Chair parts	
Nos.	**Characteristics**
1	Thickness of chair seat
2	Depth of chair seat
3	Width of chair seat
4	Dimensions (length, width) of chair legs
5	Height of chair legs
6	Thickness of chair back
7	Dimensions (length, width) of chair-back supports
8	Height of chair-back supports
9	Width of chair back
10	Height of chair back
11	Total height of chair back
12	Dimensions (length, width) of armrests and their supports
13	Length of armrests
14	Height of armrest supports
15	Total height of armrests

Name: _____ Group: _____

GATHERING INFORMATION *(continued)*

4. What is the formula that you will use to determine the measurements for each of the parts of your chair? Your formula will include the measurements for your target group, and where necessary, the extra space for ease as defined by the norms of the firm.

Example:
Depth of chair seat = *length knee-hip – 5 cm*

Seat width = _____

_____

Height of chair leg = _____

_____

Width of chair back = _____

_____

Height of chair back = _____

_____

Total height of chair back = _____

_____

Armrest length = _____

_____

Height of armrest supports = _____

_____

Total height of armrests = _____

_____

Name: _____ Group: _____

GATHERING INFORMATION *(continued)*

I apply my research results

5. Using the data gathered in No. 4, find the measurements of the chair parts and record them in the column "True value" in the table below. Next, record the value to scale in the adjacent column.

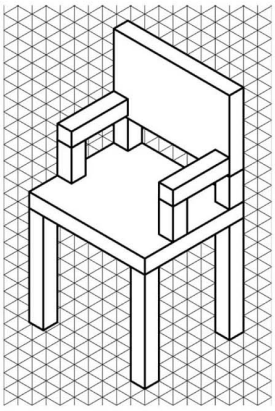
Chair parts		Measurement of part	
Nos.	**Aspect**	**True value (mm)**	**Value to a scale of 1:10 (mm)**
1	Thickness of seat		
2	Depth of seat		
3	Width of seat		
4	Dimensions (length, width) of chair legs		
5	Height of chair legs		
6	Thickness of chair back		
7	Dimensions (length, width) of chair back supports		
8	Height of chair back supports		
9	Width of chair back		
10	Height of chair back		
11	Total height of chair back		
12	Dimensions (length, width) of armrests and their supports		
13	Length of armrests		
14	Height of armrest supports		
15	Total height of armrests		

Name: _____ Group: _____

GATHERING INFORMATION *(continued)*

6. Make sketches of the front view, the right-side view and the top view of the chair illustrated here.

- Lay out the three views in an L-shape.
- You don't have to make a drawing to scale just yet.



Reflection

Do I have a good understanding of:	Yes	No
• geometric lines?	☐	☐
• forms of representation (such as sketch, perspective drawing, oblique projection)?	☐	☐
• basic lines?	☐	☐
• orthogonal projections (multiview, isometric)?	☐	☐
• dimensioning?	☐	☐
• scales?	☐	☐

Name: _____ Group: _____

COMPLETING THE CASE STUDY

I make suggestions

1. On the next page, complete your drawings of the front, right-side and top views of the chair that is adapted to your target group.

- Make your technical drawing to a scale of 1:10.
- Use dimensioning to indicate:
  - ☐ height of the chair-back supports;
  - ☐ total height of the chair back;
  - ☐ height of the armrest supports;
  - ☐ height of the armrests;
  - ☐ length of the armrests;
  - ☐ depth of the chair seat;
  - ☐ width of the chair seat;
  - ☐ height of the chair legs.

Reflection

	Yes	No
Have I explored different ways of using drafting instruments?	☐	☐

Name: _____ Group: _____

COMPLETING THE CASE STUDY *(continued)*

NAME:	DATE:
TITLE:	SCALE:

Name: _____ Group: _____

VALIDATING THE CASE STUDY

I justify my approach

1. On the next two pages, you will find silhouettes of the users from the four target clienteles, drawn according to the data provided and at a scale of 1:10.

a) Copy the right-side view of the chair as if the user were sitting in it.

b) Does your drawing of a chair respect the ergonomic norms as established by the firm? Include at least four justifications (numbered) on your drawing.

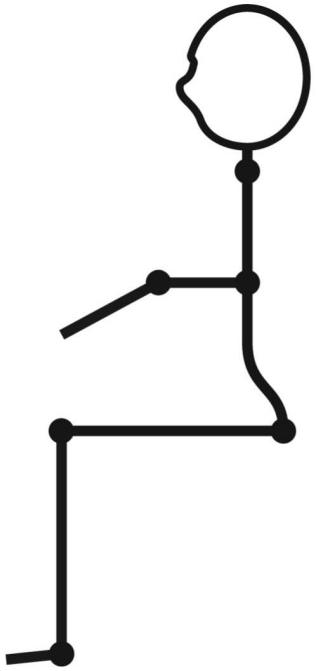
My reflection

Identify the design-related aspects of creating the model.

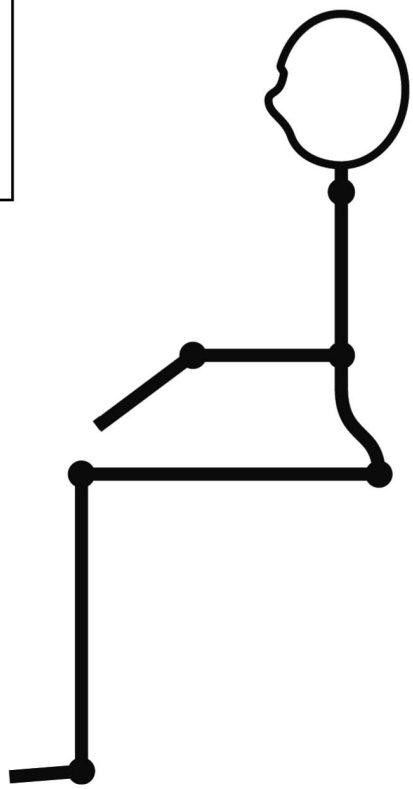
Name: _____ Group: _____

VALIDATING THE CASE STUDY *(continued)*

Young child



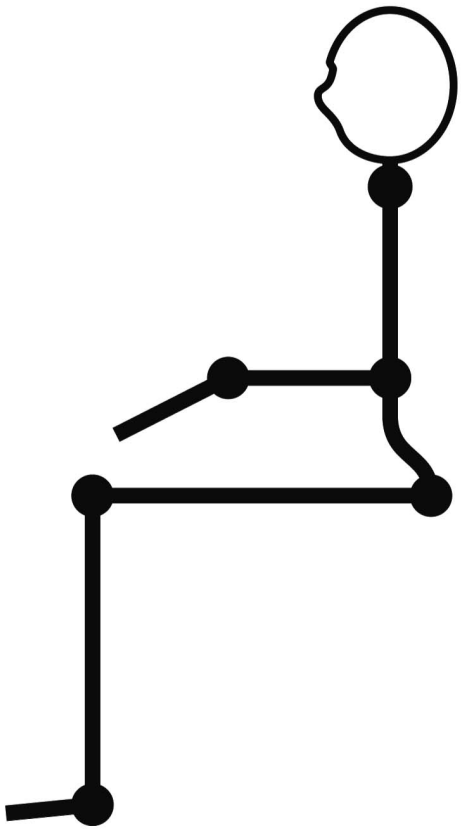
Child



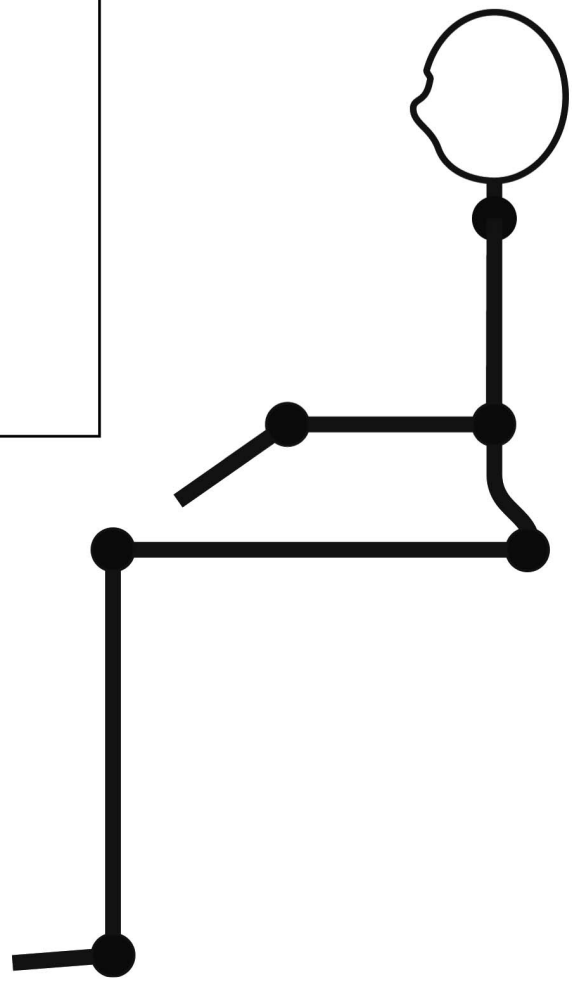
Name: _____ Group: _____

VALIDATING THE CASE STUDY *(continued)*

Small adult



Tall adult



Name: _____ Group: _____

MY EVALUATION

Use the evaluation grid on the next page to do a self-evaluation. Write A, B, C, D or E in the appropriate place in the table.

SSC2 Makes the most of his/her knowledge of science and technology				
Criteria*	**Observable indicators**	**Me**	**Teacher**	**Comments**
1	**Creating the context** Statement of the case study goal and formulation of questions for information gathering.		☐ With help	
2	**Gathering information** Respect for the norms when calculating the dimensions for the chair		☐ With help	
3	**Completing the case study** Production and dimensioning of multiview projections		☐ With help	
4	**Validating the case study** Justification of the respect for ergonomic norms		☐ With help	

*** Evaluation criteria**

1 Formulation of appropriate questions
2 Appropriate use of scientific and technological concepts, laws, models and theories
3 Relevant explanations, solutions or actions
4 Suitable justification of explanations, solutions or actions

EVALUATION GRID

Name: _____ Group: _____

SSC2 Makes the most of his/her knowledge of science and technology

Criteria*	Observable indicators	A	B	C	D	E
1	**CREATING THE CONTEXT** Statement of the case study goal and formulation of questions for information gathering	The questions directing the information gathering are relevant and the case study goal is very clear.	The questions directing the information gathering are relevant and the case study goal is clear.	The questions directing the information gathering are more or less relevant or the goal is more or less clear.	The questions directing the information gathering are more or less relevant and the case study goal is more or less clear.	The work needs to be redone.
2	**GATHERING INFORMATION** Respect for the norms when calculating the dimensions for the chair	All of the measurements for the chair parts are precise and respect the norms.	Most of the measurements for the chair parts are precise and respect the norms.	Many of the measurements for the chair parts are precise and respect the norms.	Some of the measurements for the chair parts are precise and respect the norms.	The work needs to be redone.
3	**COMPLETING THE CASE STUDY** Production and dimensioning multiview projections	The multiview projections are precise and respect the norms for technical drawing.	The multiview projections are precise and respect the norms for technical drawing, but the drawings contain a few minor errors.	The multiview projections are more or less precise or more or less respect the norms for technical drawing.	The multiview projections are more or less precise and more or less respect the norms for technical drawing.	The work needs to be redone.
4	**VALIDATING THE CASE STUDY** Justification of the respect for ergonomic norms	All of the explanations are relevant and clearly indicated on the drawings.	Most of the explanations are relevant and clearly indicated on the drawings.	The explanations are more or less relevant or are poorly indicated on the drawings.	The explanations are more or less relevant and are poorly indicated on the drawings.	The work needs to be redone.

* Evaluation criteria

1 Formulation of appropriate questions
2 Appropriate use of scientific and technological concepts, laws, models and theories
3 Relevant explanations, solutions or actions
4 Suitable justification of explanations, solutions or actions