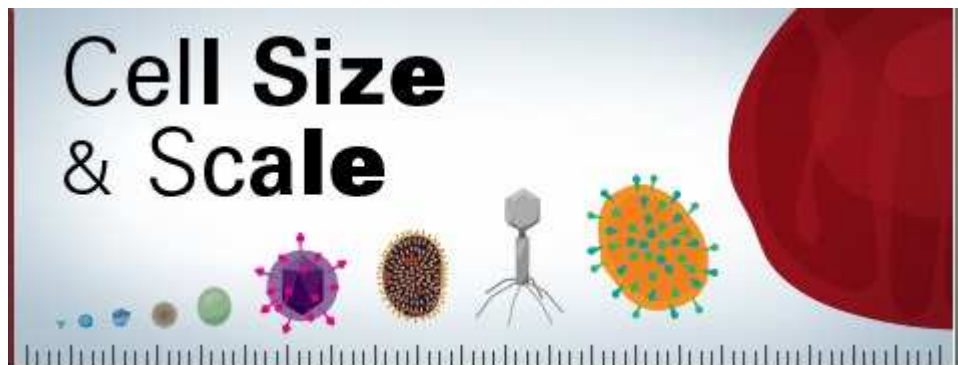


## How can we measure living things?



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**Generació Plurilingüe**

Second Year  
2017-2018

## CONTENT

PROJECT PLANNING TEMPLATE .....	4
UNIT OVERVIEW .....	13
GENERAL ORGANIZATION .....	15
INTRODUCTION .....	15
OBJECTIVES .....	15
COURSE CONTENTS .....	15
ASSESSMENT CRITERIA .....	15
ASSESSMENT TOOL .....	15
FINAL PRODUCT / OUTCOME .....	15
INTRODUCTION .....	16
Task 1: HOW CAN WE REPRESENT THINGS THAT WE CANNOT SEE? .....	16
RATIO AND PROPORTIONS .....	17
Task 2: BRAINSTORM .....	17
Task 3: FLASH CARDS: .....	17
VOCABULARY: .....	17
Flashcards .....	18
EXPLORING SCALE COPIES .....	19
Task 4: Proportional scale .....	19
Task 5: Practice on scale copies .....	20
Task 6: Identifying scale copies .....	20
Task 7: Practice identifying scale copies .....	21
Task 8: Drawing .....	22
Task 9: Scale copy .....	22
Task 10: Increasing scale copy .....	23
Task 11: Decreasing scale copy .....	24
WRITING SCALE .....	25
Task 12: Finding scale .....	25
FINAL PROJECT: REPRESENT THREE TYPES OF CELL .....	27
PROJECT TIMELINE .....	27
Task P_1: Understanding what the project is about .....	28
Task P_2: Choose a type of cell .....	28
Task P_3: Choosing a Scale Worksheet .....	29

Task P_4: Prepare your presentation .....	30
Task P_5: Record your presentation .....	30
PROJECT RUBRIC .....	31
PRESENTATION RUBRIC .....	32

# PROJECT PLANNING TEMPLATE

for **CLIL** and **Content-Rich Environments**

## Identification

Title	How would you measure living things?
Authorship	Maria Llopart (Project created in the framework of the GEP2, 2017-2018)
With the support of	Loida Perich and M <sup>a</sup> Elisa Morell
School	INS Vallbona d'Anoia
CEFR Level (A1, A2...)	B2.2



Grade	1st ESO
Content areas	Mathematics
Number of sessions	6
Teacher(s) involved	Pilar Rodríguez Forn, Maria Llopart Font and Karan Joyce Elkin (language assistant)
Key words	living things, cells, size, proportions

## INTRODUCTION TO THE PROJECT

All living things are made of cells but cells are usually difficult to be seen, so we have to use specific devices such as the microscope. Then, we realize that cells do not always look the same. There are different types, sizes, shapes, functions...

The driving question: **How can you measure living things?**



GOALS	HOW DO YOU KNOW STUDENTS ARE MAKING PROGRESS? (assessment criteria)
<p><b>1. Recognise and explain</b> when two magnitudes are proportional and discuss how to calculate the ratio.</p> <p><b>2. Calculate and describe</b> corresponding values of two directly proportional magnitudes.</p> <p><b>3. Analyse and compare</b> scale representations (maps, models, etc.) and calculate measures related to them.</p>	<p>Students can:</p> <ul style="list-style-type: none"> <li>● Identify and explain proportional quantities.</li> <li>● Understand the concept of ratio and calculate it between two numbers or quantities sharing their findings with a partner.</li> <li>● Analyse and apply to the model corresponding values of two directly proportional quantities by means of proportionality and exposing orally their results..</li> <li>● Solve problems of proportional quantities in groups. Describe strategies to calculate real measures from those of a scale representation, and the other way around</li> </ul>

PRODUCT/S	In groups, create a scale representation of cells to present orally and show it on open doors day at school .
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## CURRICULUM CONNECTIONS

Link your project to the curriculum

## SPECIFIC COMPETENCES AND KEY CONTENTS

Subject-matter curriculum	Foreign language curriculum
<p>Contingut de Matemàtiques de 1r curs:</p> <p>Proporcionalitat i semblança en figures de dues dimensions (CC9 i CC10)</p> <ul style="list-style-type: none"> <li>• Escales</li> </ul> <p>Contingut de Biologia i Geologia de 1r curs:</p> <p>La vida a la Terra (CC9 i CC10)</p> <ul style="list-style-type: none"> <li>• Trets comuns dels éssers vius. Estructura cel·lular</li> <li>• La cèl·lula, unitat estructural i funcional. Diversitat de les cèl·lules. Principals estructures cel·lulars.</li> </ul>	<p>Primer curs ESO:</p> <p>Dimensió comunicació oral:</p> <ul style="list-style-type: none"> <li>• Comprensió oral: global i específica. Tema i idea principal (CC1)</li> <li>• Estratègies de comprensió oral: identificació de paraules i expressions clau (CC2)</li> </ul>



21st CENTURY COMPETENCES			
Collaboration	✓	Information, media and technology	✓
Communication	✓	Leadership & Responsibility	✓
Critical Thinking and Problem Solving	✓	Initiative & Self-direction	✓
Creativity & Innovation	✓	Social & Cross-cultural	
Others:			





KEY COMPETENCES			
Communicative, linguistic and audiovisual competence	✓	Digital competence	✓
Mathematical competence	✓	Social and civic competence	✓
Interaction with the physical world competence	✓	Learning to learn competence	✓
Cultural & artistic competence		Personal initiative and entrepreneurship competence	✓



## CONTENTS (Knowledge and Skills)

TOPIC-RELATED KNOWLEDGE	TOPIC-RELATED SKILLS
<ul style="list-style-type: none"> <li>• Reading and explaining the use of positive numbers and operations.</li> <li>• Developing proportional thinking and discuss proporcionality in context.</li> <li>• Become aware of patterns, relations and functions.</li> </ul>	<ul style="list-style-type: none"> <li>• Designing a 3D scale model of a cell and 3D print it in groups.</li> <li>• Exposing orally their model relating it with magnitudes and measurement.</li> </ul>

## CONTENT-OBLIGATORY LANGUAGE

Size. Micrometers. Microns.

Measure. Proportion. Ratio. Width. Height. Length.

Prokaryotic. Eukaryotic. Bacteria. Animal and Plant Cells.

Parts of the cell: organelles.



## PERSONAL & EMOTIONAL DEVELOPMENT

Students are working in groups so they can develop respect for their partners, manage their feelings and improve their abilities.

## MATERIALS & RESOURCES

A big piece of paper to make the cell poster. Colours and material according the students' creativity.

Personal computer and Internet connection.

Introduction video and worksheets on drawing scales.

Camera



## REFERENCES

### Videos:

[http://youtu.be/z2E\\_GpucfeA](http://youtu.be/z2E_GpucfeA)

<https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-geometry/cc-7th-scale-drawings/e/explore-scale-copies>

<http://virtualnerd.com/middle-math/ratio-proportions-percent/scale-drawings-models/scale-drawing-definition>

<http://virtualnerd.com/middle-math/ratio-proportions-percent/scale-drawings-models/proportion-word-problem-example>

## COMMENTS

## ACKNOWLEDGEMENTS



## UNIT OVERVIEW

S	Activities	Content-obligatory Language	Timing	R/S/L/ W/I Skills	Interaction T-S S-S S-Expert S-World	CMC	Assessment Peer assessment Self-assessment Teacher assessment ...
1	Brainstorm: How can we measure things we cannot see?	Width, height, length	30min		T-S-S	✓	Teacher assessment
	Presentation of the driving question and products	Presentation. Teamwork.	20min		T-S-S	✓	Teacher assessment
2	Exploring scale copies	Length, scale, ratio, proportion	1 session		T-S	✓	Teacher assessment
3	Scale drawing		1 session		T-S	✓	Teacher



	<b>Choosing a Scale</b>						<b>assessment</b>
<b>4 - 5</b>	<b>Creating a poster</b>	<b>Micron, scale, centimetre.</b>	<b>2 sessions</b>		<b>S-S</b>	✓	<b>Peer assessment</b>
<b>6</b>	<b>Preparing the oral presentation and record a TED video</b>	<b>Cell, scale, meter, organelles.</b>	<b>1 session</b>		<b>T-S S-S</b>	✓	<b>Peer and Teacher assessment</b>



# GENERAL ORGANIZATION

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## INTRODUCTION

Living things and proportionality.

**How would you measure living things?**

## OBJECTIVES

- **Recognise and explain** when two magnitudes are proportional and discuss how to calculate the ratio.
- **Calculate and describe** corresponding values of two directly proportional magnitudes.
- **Analyse and compare** scale representations (maps, models, etc.) and calculate measures related to them.

## COURSE CONTENTS

- Reading and explaining the use of positive numbers and operations.
- Developing proportional thinking and discuss proportionality in context.
- become aware of patterns, relations and functions.
- Designing a 3D scale model of a cell and 3D printing it in groups.
- Present orally their model relating it with magnitudes and measurement.

## ASSESSMENT CRITERIA

At the end of the course students should be able to:

- Identify and explain proportional quantities.
- Understand the concept of ratio and calculate it between two numbers or quantities sharing their findings with a partner.
- Analyse and apply to the model corresponding values of two directly proportional quantities by means of proportionality and presenting orally their results.
- Solve problems of proportional quantities in groups.
- Describe strategies to calculate real measures from those of a scale representation, and the other way around.

## ASSESSMENT TOOL

### Formative

- Peer assessment through a rubric about the final product.
- Teacher assessment.

### Summative

- Public presentation self-assessment rubric and teacher's feedback.
- Teacher assessment through a rubric (about the whole project)

## FINAL PRODUCT / OUTCOME

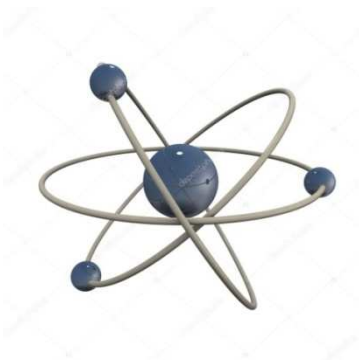
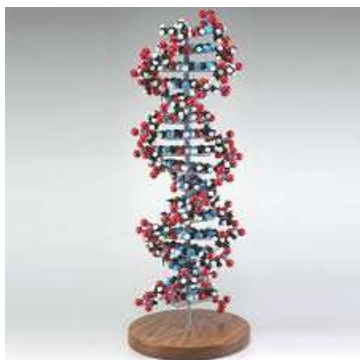
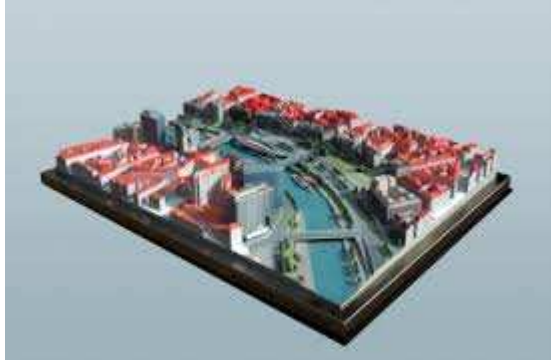
In groups, create a scale representation and scale reproduction of cells to present orally and show it on open doors day at school.

# INTRODUCTION

Sometimes we cannot see the whole image of a big object, like all the rooms in a house, a whole city, in and out of a sport stadium, the planets, etc. And sometimes we are not able to see very little things, like cells, atom's structure, much more little than an ant.

## Task 1: HOW CAN WE REPRESENT THINGS THAT WE CANNOT SEE?

Look at the images below and explain to your partner how can you imagine we can represent them?



**More??**

You can open these links to see more objects:

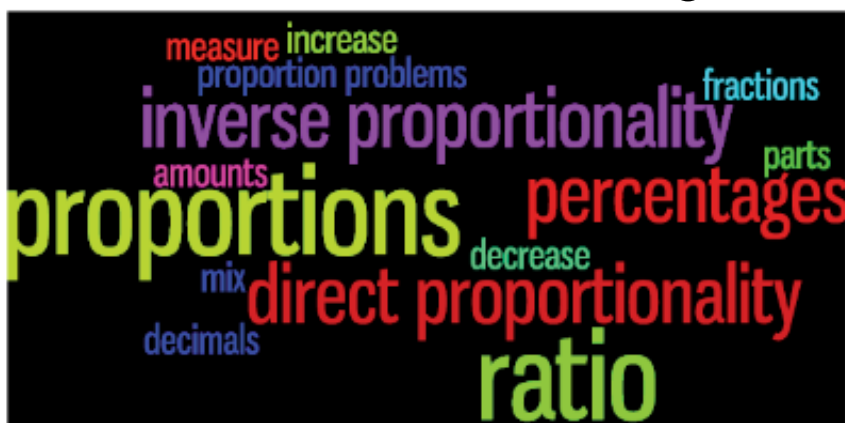
- <http://www.omgspace.net/>
- <http://learn.genetics.utah.edu/content/cells/scale/>



# RATIO AND PROPORTIONS

## Task 2: BRAINSTORM

Think and share your ideas about this topic: In daily life and business operations it is necessary to compare things.



## Task 3: FLASH CARDS:

With your partner, match each word with each definition and explain when you use in your daily life these words. You have some sentences to practice.

To express measures...

You must use ...

I would use...

Two numbers are direct / inverse proportional

To work out a percentage of something, you have to ...

Any percentage / fraction / decimal is just ...

### VOCABULARY:

Ratio,  
proportions,  
scale, quantities,  
rate, measures,  
amounts, direct  
proportionality,  
inverse  
proportionality,  
fractions,  
decimals,  
percentages,  
decrease,  
increase, reduce,  
find out,...

## Flashcards

<b>Ratio</b>	A comparison of two quantities	<b>Equivalent Ratios</b>	Two equal ratios that are multiplied or divided by the same number
<b>Rate</b>	a certain quantity or amount of one thing considered in relation to a unit of another thing and used as a standard or measure	<b>Ratio Table</b>	..., a table with columns filled with pairs of numbers that have the same ratio.
<b>Magnitude</b>	a number characteristic of a quantity and forming a basis for comparison with similar quantities, as length.	<b>Proportion</b>	comparative relation between things or magnitudes as to size, quantity, number, etc.
<b>scale</b>	the ratio of the size of a figure on a drawing to the actual size of the figure.	<b>Inversely Proportional</b>	when one value decreases at the same rate that the other increases
<b>Directly proportional</b>	Ratios are directly proportional when they increase or decrease in the same ratio.	<b>Percentage</b>	number or ratio expressed as a fraction of 100. (%)

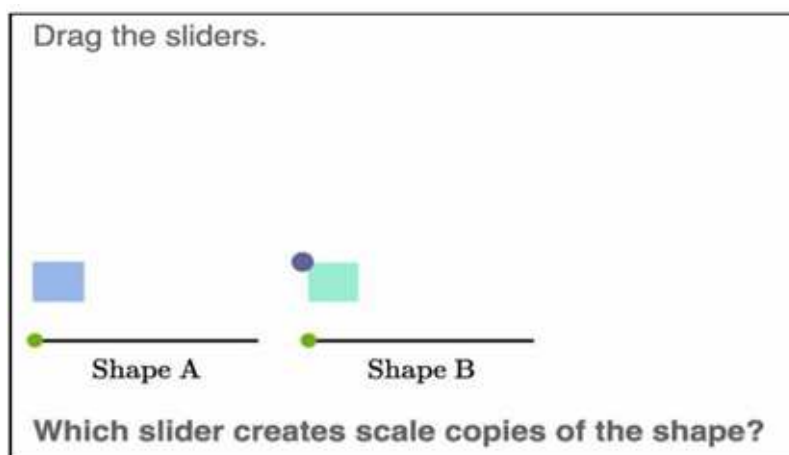


# EXPLORING SCALE COPIES

## Task 4: Proportional scale

Watch the video on the web: [https://youtu.be/z2E\\_GpucfeA](https://youtu.be/z2E_GpucfeA)

Read the explanation of the example 1 and complete the second example.



### VOCABULARY

Width

Height

Length

Scale

Factor

Increase

Decrease

Scale down

**Which slider creates scale copies of the shape?**

*First example: (read the sentences before you watch the video a second time)*

In order to create a scale copy you'd want to scale by the same factor.

As we move the slider for shape B, it seems like it's only **scaling the width**, it's not **scaling the height**.

So, the slider for shape B is not creating scale copies of itself. It's only increasing the width not the height.

While shape A, it looks like it is increasing both the width and the height, so that would be a **scale copy**.

*Second example:*

**Complete the sentences with the words below:**

down - B - factor - increasing - A - width - not - height

This does look like we're scaling \_\_\_\_\_, but we're scaling both the width and the height by the same \_\_\_\_\_ so shape \_\_\_\_\_ slider does look like it's creating scale copies of the shape.

So, the slider for shape \_\_\_\_\_ is \_\_\_\_\_ creating scale copies of the original shape. It's only \_\_\_\_\_

the \_\_\_\_\_ not the \_\_\_\_\_. It's elongating it, it's increasing its height, but not the width.

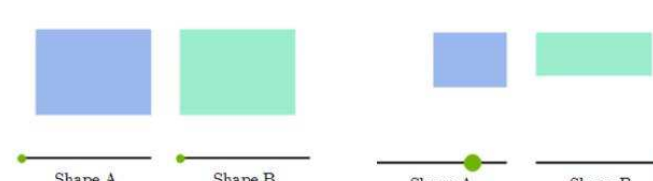
### Task 5: Practice on scale copies.

Open the link below and practice.

<https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-geometry/cc-7th-scale-drawings/e/explore-scale-copies>

**Explore scale copies**

Drag the sliders.



Which slider creates scale copies of the shape?

Choose 1 answer:

☐ A Slider for Shape A

☐ B Slider for Shape B

Image1: Example of the activity, choose the correct answer.

### Task 6: Identifying scale copies

We are going to look at pairs of figures, and see if they are scaled copies of each other. See the examples in the video and practice.

Watch the video: <https://youtu.be/QBiTspq2Wck>

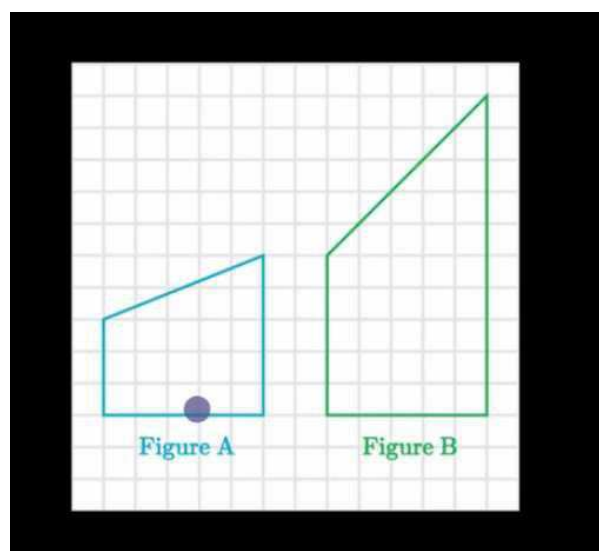


Image 2: Example of the video

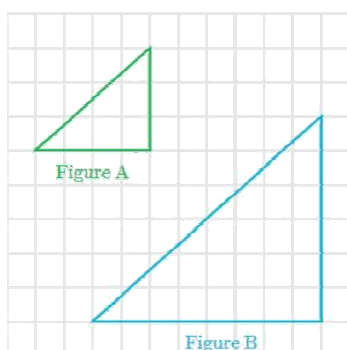
## Task 7: Practice identifying scale copies

Open the link below and practice. Then write down your solutions on a paper.

<https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-geometry/cc-7th-scale-drawings/e/identify-scale-copies>

### Identify scale copies

Is Figure B a scale copy of Figure A?

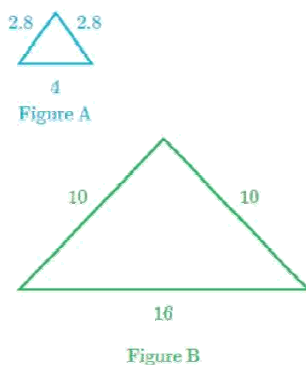


Choose 1 answer:

☐ A Yes

☐ B No

Is Figure B a scale copy of Figure A?

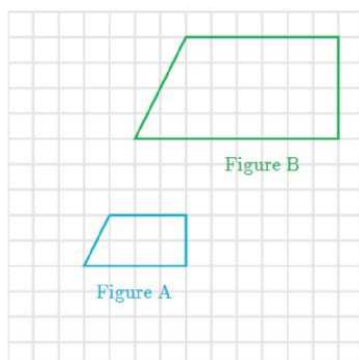


Choose 1 answer:

☐ A Yes

☐ B No

Is Figure B a scale copy of Figure A?

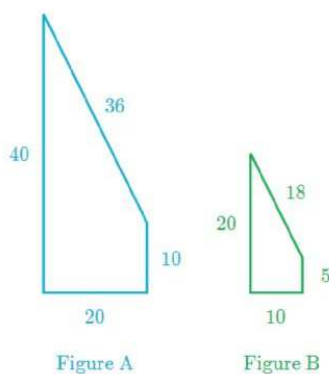


Choose 1 answer:

☐ A Yes

☐ B No

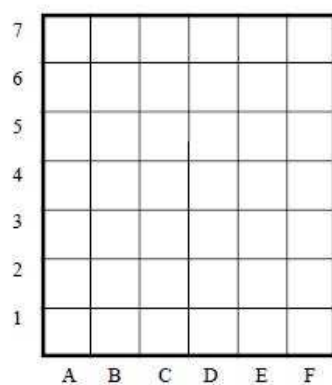
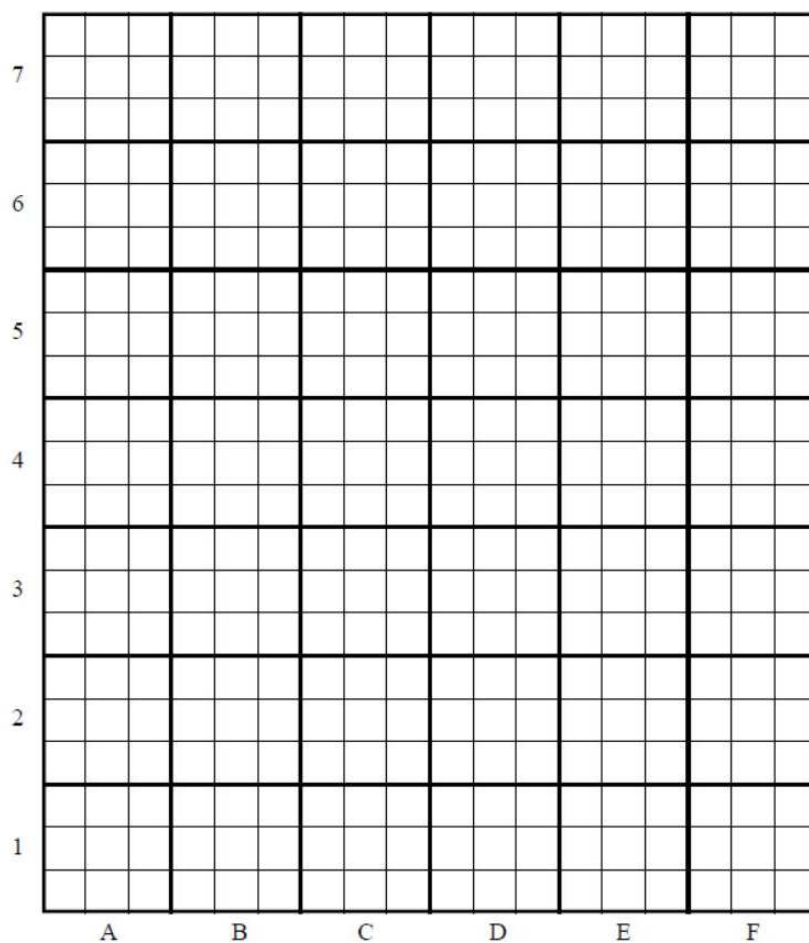
Is Figure B a scale copy of Figure A?



Choose 1 answer:

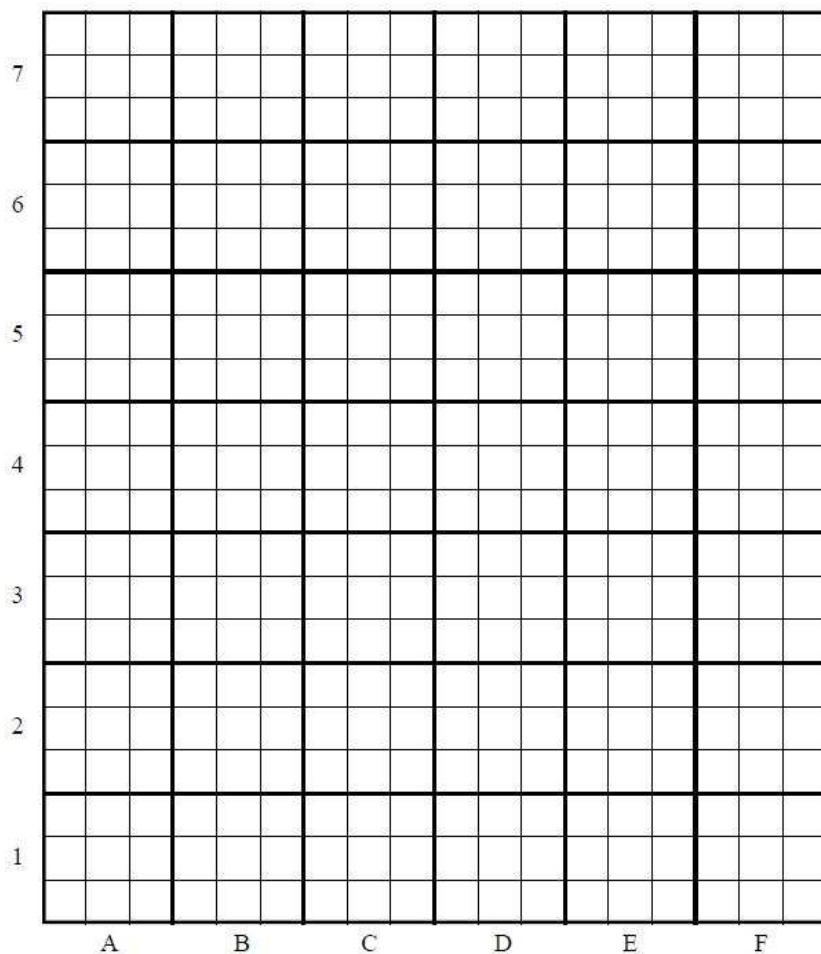
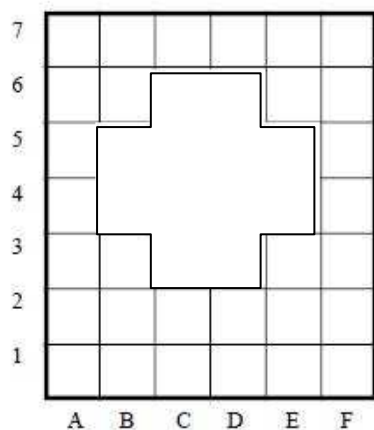
☐ A Yes

☐ B No

**Task 8: Drawing****Draw one figures in the first grid****Task 9: Scale copy****Draw a scale copy of the figure in the second grid**

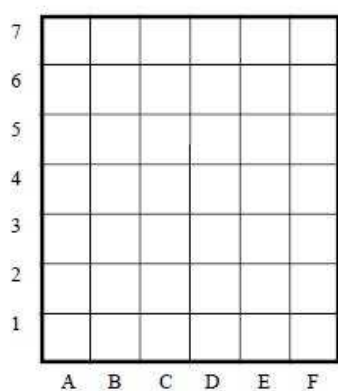
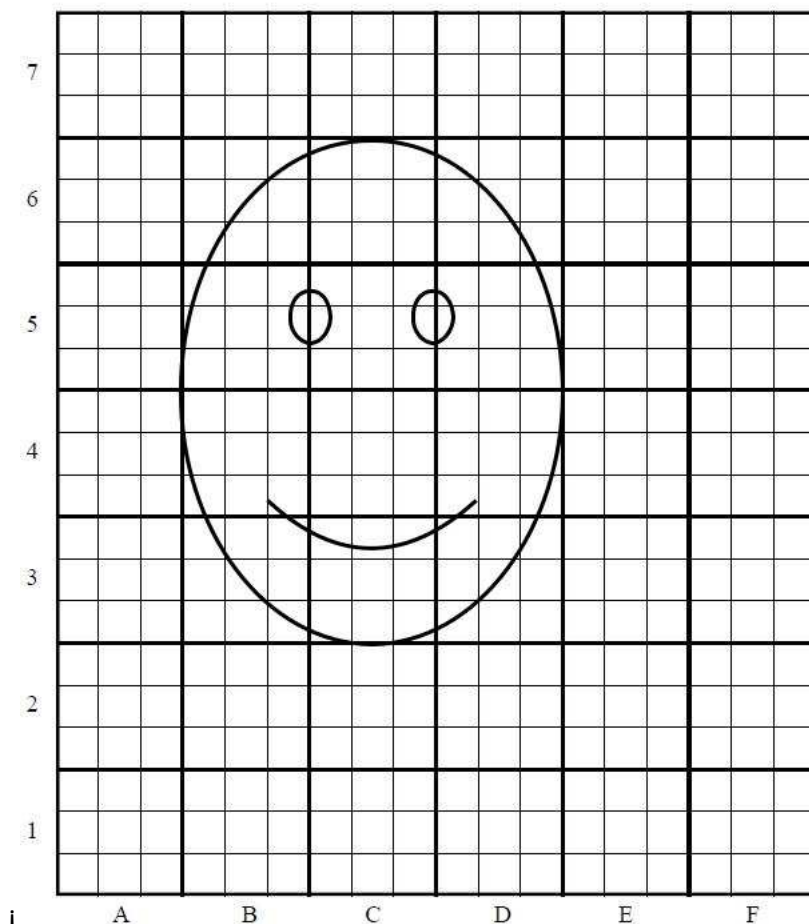
**Task 10: Increasing scale copy**

Look at this figure and make a copy of the figure increasing it three times in the second grid



**Task 11: Decreasing scale copy**

Look at this figure and make a scale copy of the figure decreasing it two times in the second grid.





# WRITING SCALE

Reference : <https://www.slideshare.net/Nad0209/9-scale-drawing>


## Task 12: Finding scale

Look at the reference web and find the scale of each exercise.

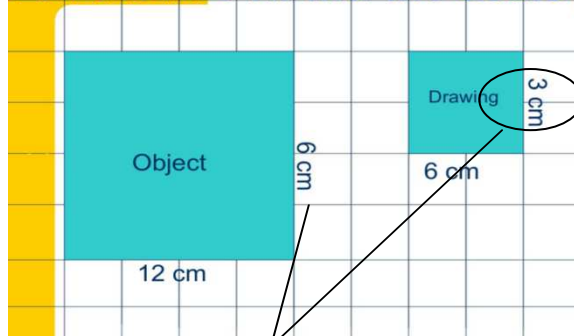
**SCALE DRAWING**

Scale =  $\frac{\text{Length of a side of the drawing}}{\text{Length of corresponding side of the object}}$

Scale =  $\frac{D}{O}$

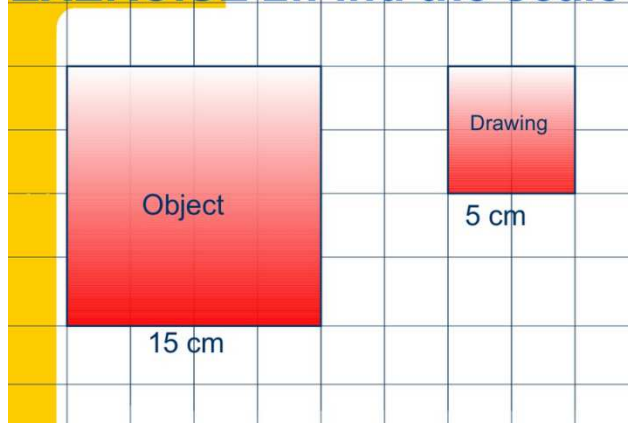


### EXERCISE 1: Find the scale



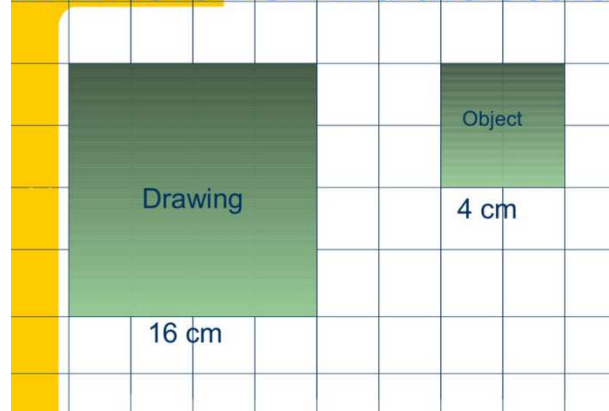
SCALE: ( D/O ) 3 : 6    SIMPLEST FORM: 1 : 2

### EXERCISE 2: Find the scale



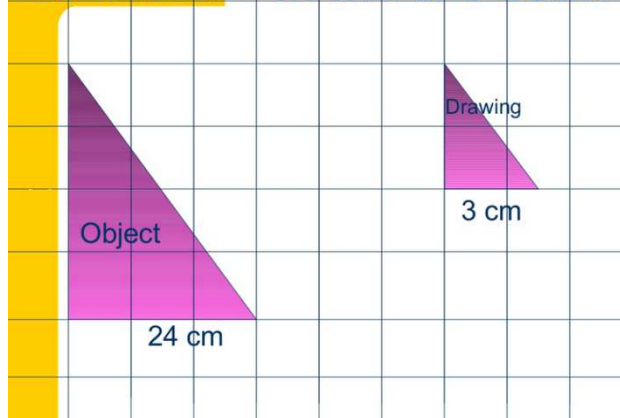
SCALE (D:O) : \_\_\_\_\_ SIMPLEST FORM: \_\_\_\_\_

### EXERCISE 3: Find the scale



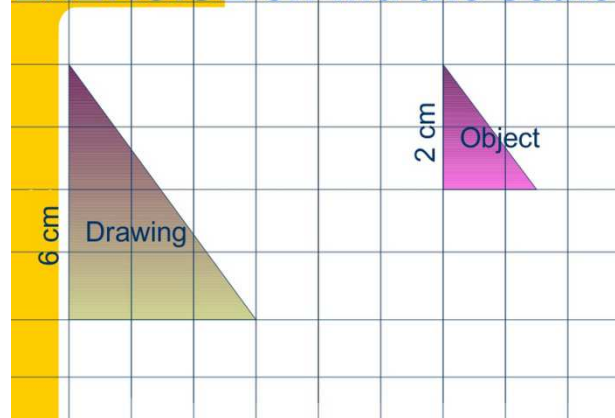
SCALE (D:O) : \_\_\_\_\_ SIMPLEST FORM: \_\_\_\_\_

### EXERCISE 4: Find the scale



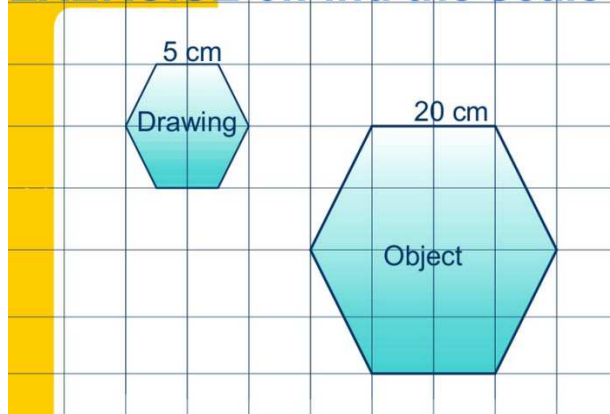
SCALE (D:O) : \_\_\_\_\_ SIMPLEST FORM: \_\_\_\_\_

### EXERCISE 5: Find the scale



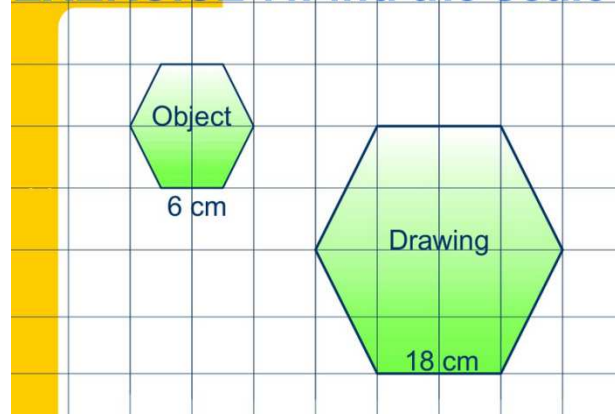
SCALE (D:O) : \_\_\_\_\_ SIMPLEST FORM: \_\_\_\_\_

### EXERCISE 6: Find the scale



SCALE (D:O) : \_\_\_\_\_ SIMPLEST FORM: \_\_\_\_\_

### EXERCISE 7: Find the scale



SCALE (D:O) : \_\_\_\_\_ SIMPLEST FORM: \_\_\_\_\_

# FINAL PROJECT:

## REPRESENT THREE TYPES OF CELL

### Project Overview and Rubrics

For this activity, you will work in groups of three or four. You apply what you have learned to create a **scale drawing project** of a type of cell of your choosing. You pick a type of cell and are responsible for creating scale drawings of the object. Be sure to consider materials and time constraints when deciding on the factor scale.

A detailed timeline and project and presentation grading rubrics follow.

### PROJECT TIMELINE

Day 1: Project Introduction

Date: \_\_\_\_\_

Day 2: Choose the type of cell - image

Date: \_\_\_\_\_

Day 3: Complete *Choosing a Scale Worksheet (2D cell model)*

Date: \_\_\_\_\_

Day 4: Completed *Choosing a Scale Worksheet (3D cell model)*

Date: \_\_\_\_\_

Day 5 and 6 : Complete scale drawings

Date: \_\_\_\_\_

Day 7: Prepare a presentation

Date: \_\_\_\_\_

Day 8: Record the presentation

Date: \_\_\_\_\_

### Check list of project Deliverables

Turn in the following items on this date:

- ☐ Completed *Choosing a Scale Worksheet (2D cell model)*
- ☐ Completed scale drawing of the cell
- ☐ Completed *Choosing a Scale Worksheet (3D cell model)*
- ☐ Presentation visual aids - student notes

### Scale Drawing Grading

Scale drawing grading is based on the following criteria:

- ☐ Project accuracy
- ☐ Project completeness
- ☐ Challenge level and aesthetics

*See the rubric below for more details.*

### Presentations Grading

Presentation grading is based on the following criteria:

- ☐ Meets time guidelines (each presentation takes 4-6 minutes)
- ☐ Content accuracy; correct usage of technical vocabulary
- ☐ Explain challenges and successes during project
- ☐ Effective presenter
- ☐ Use of visual aids

*See the rubric below for more details.*

**Task P\_1: Understanding what the project is about.**

Read the project overview and rubrics and try to explain what you are going to do to your partners.

Make a list of things you have to do and the date you will have to finish it:


**Task P\_2: Choose a type of cell.**

Write down witch type of cell you want to represent. Make an image search and try to do an sketch drawing before you start your poster.

### Task P\_3: Choosing a Scale Worksheet

Measure and record important dimensions of your object. Pick appropriate units and record them. The *dimension column* might include height, length, width, radius, etc. In the *measurement column*, record the measured number. In the *units' column* indicate the units of your measurements.

*Note: You do not necessarily need to fill in all rows; just make sure you get all the information you need to build an accurate model.*

Dimension	Measurement	Units

Choose a scale factor and then calculate the scaled dimensions of the object. Do this for two different scale factors that you could potentially use for your project.

Scale factor: \_\_\_\_\_

Dimension	Original Measurement (indicate units)	Scaled Measurement (indicate units)

Scale factor: \_\_\_\_\_

Dimension	Original Measurement (indicate units)	Scaled Measurement (indicate units)

Consider the scaled measurements you calculated for the two different scale factors and decide which is more reasonable to use for your final project. Explain your logic.

## Task P\_4: Prepare your presentation

Prepare your oral presentation completing the following sentences:

INSTRUCTIONS	
Present the members of the group	Hello, we are...
Present your project	Our project is... Here we present a...
Tell the audience which type of cell you are presenting.	This is a prokaryotic/eukaryotic/animal/plant cell
Name all the organelles and structures that you can identify, and tell a characteristic of each one (size, colour, shape, position in the cell...)	Here we can see... and it is very big
Explain how did you calculate the scale of your representation of the cell.	The scale is... because the real size is... and our representation in the poster is...

Read the presentation rubric.

Practice your presentation before you record it.

## Task P\_5: Record your presentation

Record your presentation with a camera and deliver the video to your teacher.

## PROJECT RUBRIC

Category/ Points	4	3	2	1	0
Is the scale drawing project complete?	The project is complete and in class on time.	The project is complete, but in class a day late or the project is mostly complete, but some components are missing.	The project is halfway complete or is turned in 2-3 days late.	The project is started, but is not even halfway complete or is turned in 4-5 days late.	The project is not turned in or is more than 5 days late.
Is the scale drawing project accurate?	The project is correctly modelled and the scale is consistent throughout.	The model is mostly accurate, but a few dimensions are slightly off.	About half of the model is accurate.	The project has some aspects that are correctly modelled, but most are not.	The project was not to scale and all measurements are off.
Is the scale drawing project well labelled?	All elements are well labelled. Without errors.	All elements are well labelled. With some errors.	Not all elements are well labelled or there are so much errors.	Few elements are labelled or there are a lot of errors.	The project is not labelled.
Does the scale drawing project look like you put in a lot of effort?	The project was more complex or many details were added to make the project more complex. It is clear that a lot of time and effort were spent on making the project look good.	The project was somewhat complex and elements of detail were added. A good amount of effort was put in to the project to make it look good.	The project was somewhat complex, but no elements of detail were added. Some effort was put in to the project to make it look good.	The project was extremely simple, but one or two elements of detail were added to make it more complex. Some effort was put in to make the project good.	The project was extremely simple and no attempts were made to add detail or complexity. The project is not aesthetically pleasing and appears as if very little effort was put in.
Is the <i>Choosing a Scale Worksheet</i> (2D and 3D) complete with drawings attached?	The worksheet is complete and accurate, and two drawings are attached.	The worksheet is complete and two drawings are attached. The drawings are not complete or inaccurate.	The worksheet is complete and one drawing is attached.	The worksheet is mostly complete and one drawing is attached.	The worksheet is incomplete and no drawings are attached.



## PRESENTATION RUBRIC

Category/Points	4	2	0
Did you meet the time requirements?	The presentation was between 4 and 6 minutes.	The presentation was 3-4 minutes long or 6-7 minutes long.	The presentation was too long (more than 7 minutes) or too short (less than 3 minutes).
Did you mention the challenges you experienced?	At least two challenges experienced were explained.	Only one challenge was explained.	No challenges were explained.
Did you state your scale factor and the dimensions of your original and model?	Scale factor and original and model dimensions were stated and accurate.	Either the scale factor or the original and model dimensions were mentioned.	Scale factor and dimensions of the original object and model were not mentioned.
Were you an effective presenter?	It is clear that you practiced the presentation. You were confident and did not use the words “um” or “like” frequently. You used an appropriate volume and used visual aids.	There is evidence of some practice. While you might be nervous, you knew what you wanted to say and used an appropriate volume. Visual aids were used.	There is no evidence that you practiced. “Um” and “like” were said a lot throughout. You were nervous and unsure of what to say. No visual aids were used for the presentation.

