Name: _____ Group: _____

THE PROJECT

PUT ON your sports shoes!

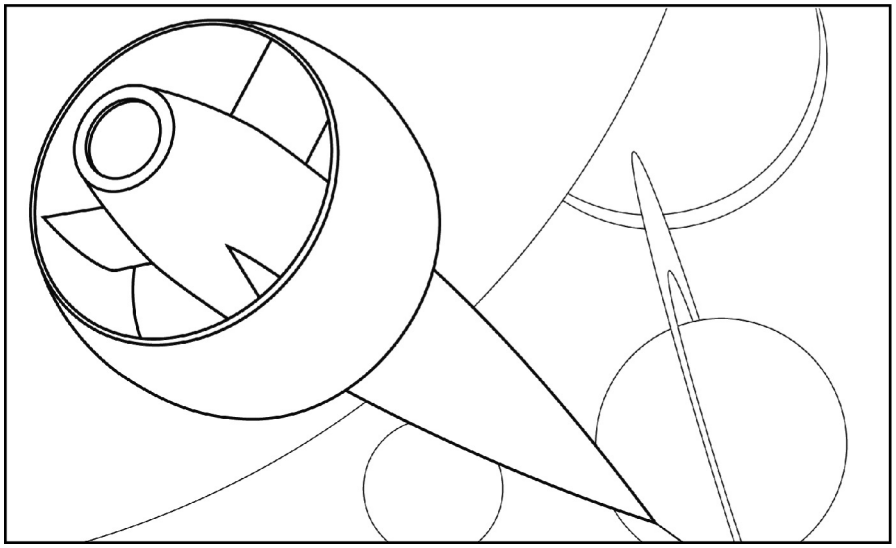
The solar system . . . like you've never seen it before

A gigantic exhibit

A journey light years away . . . or almost!

- June 20– September 2,
- An exhibit created by the Science Museum
- To go on display at a sports facility near you

The Science Museum is planning an exhibit on the solar system. In order to reach the largest possible audience, the exhibit will go on display in various sports facilities around Québec. The museum will use one sports facility at each chosen location to allow technicians in museology to use a scale reduction as they reproduce distances within the solar system. It hopes to correct a popular misconception—fuelled by science fiction films—that distances in the solar system can be spanned with ease.



In this simulation exercise, you are to play the role of a technician in museology and your mandate is to design an installation of the exhibit by creating a scale model (poster, mock-up, etc.) of the eight planets of the solar system projected on the "platform" of a sports area. To complete the task, you are to:

- Select a platform for your model from among the various sports areas listed below:
  - Ⓐ soccer field
  - Ⓑ Canadian football field
  - Ⓒ basketball court
  - Ⓓ Olympic ice rink
- Determine the scale for your model.

Then, using your model:

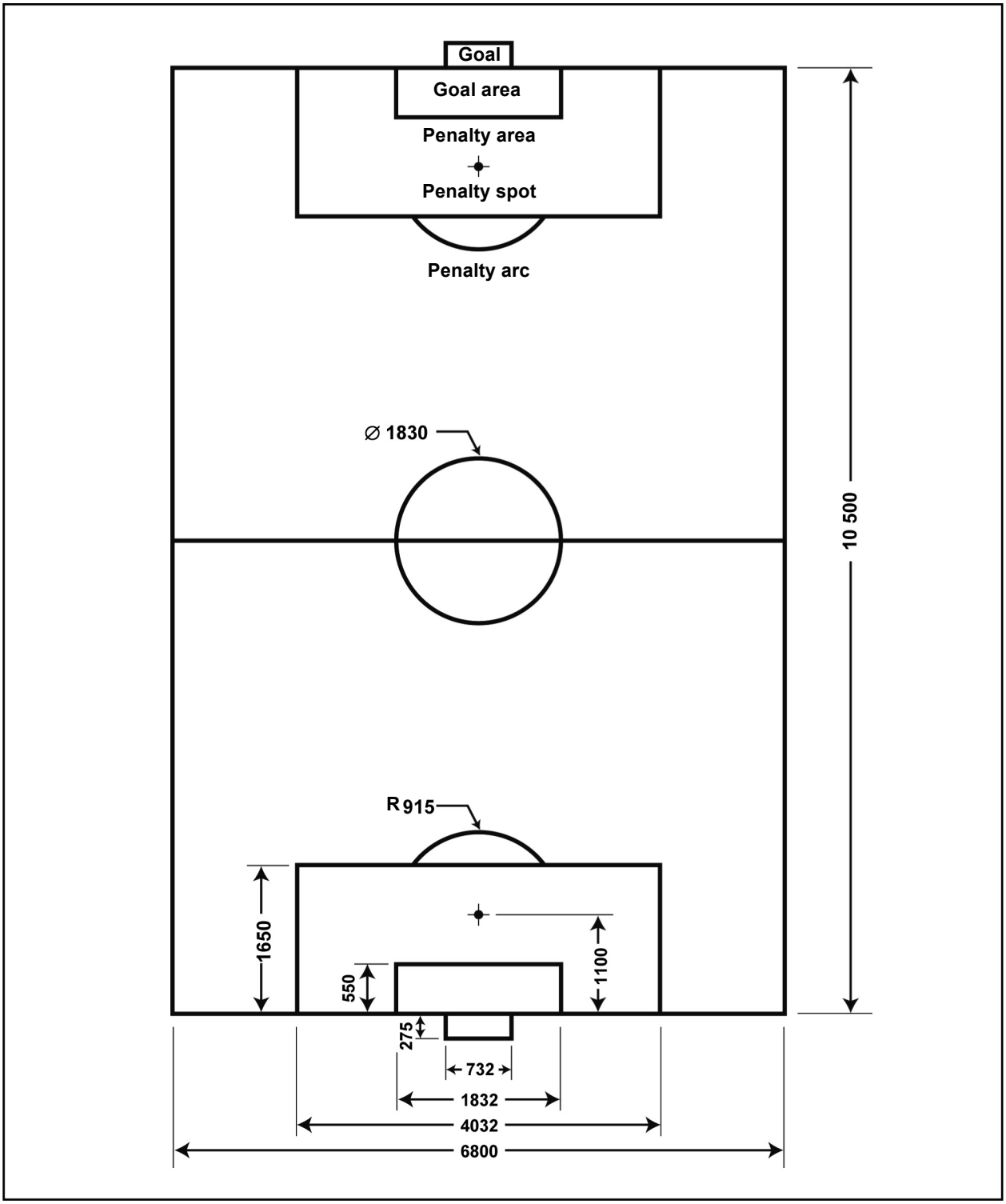
- Estimate greater distances in the Universe.
- Compare your model to those of your classmates.

Name: _____ Group: _____

THE PROJECT (*continued*)

A Soccer field

(Dimensions in centimetres)

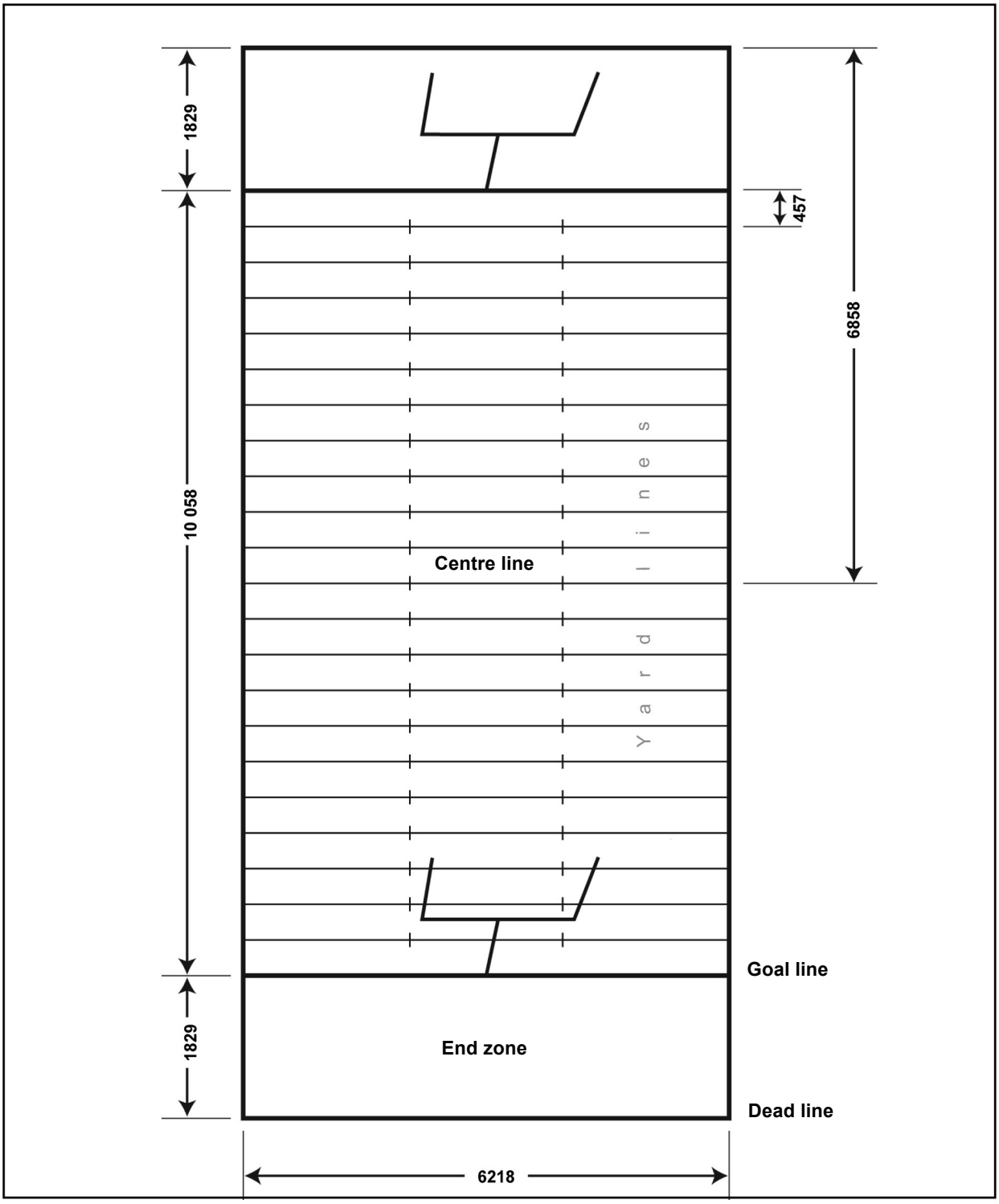


Name: _____ Group: _____

THE PROJECT (*continued*)

B Canadian football field

(Dimensions in centimetres)

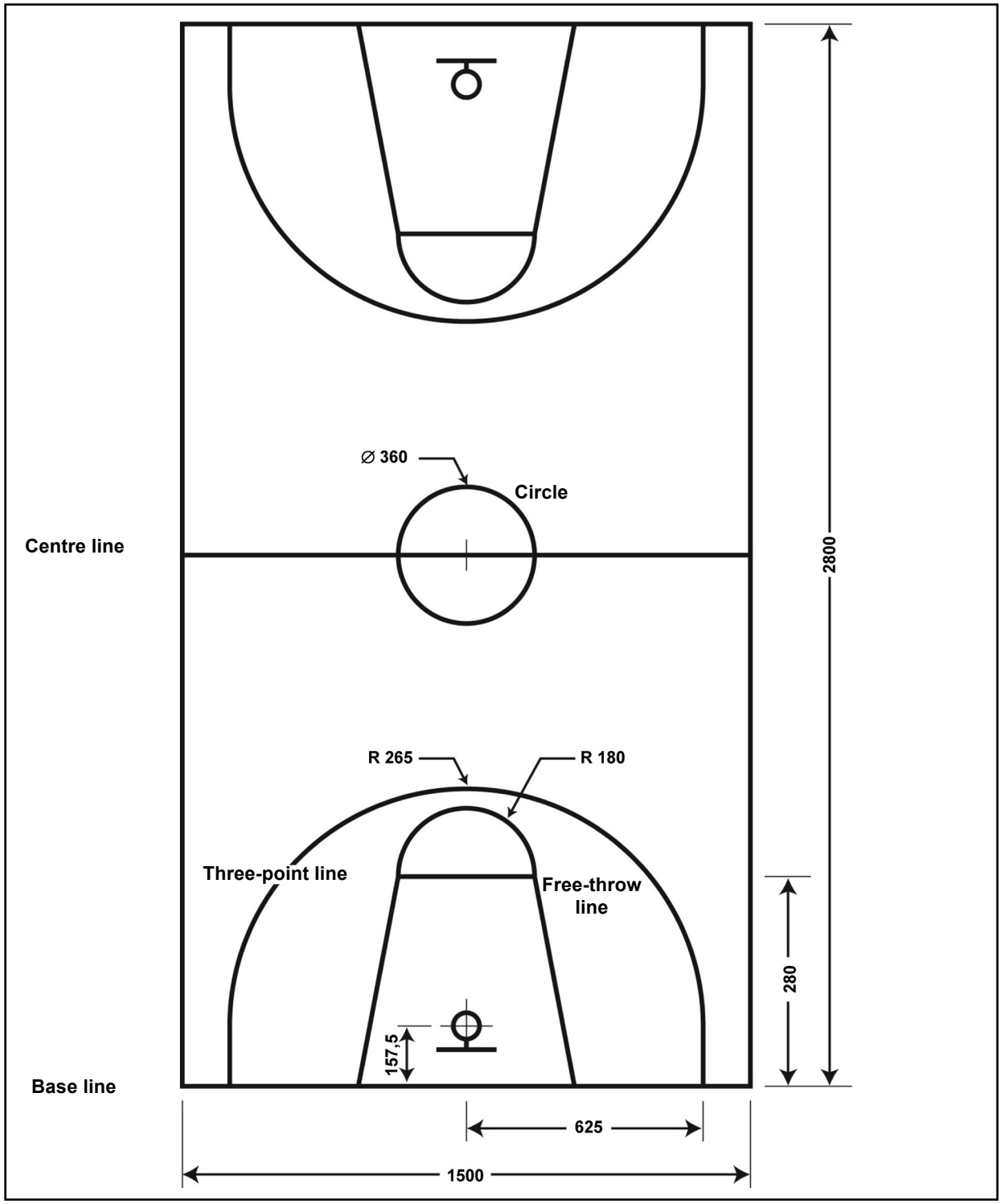


Name: _____ Group: _____

THE PROJECT (*continued*)

C Basketball court

(Dimensions in centimetres)

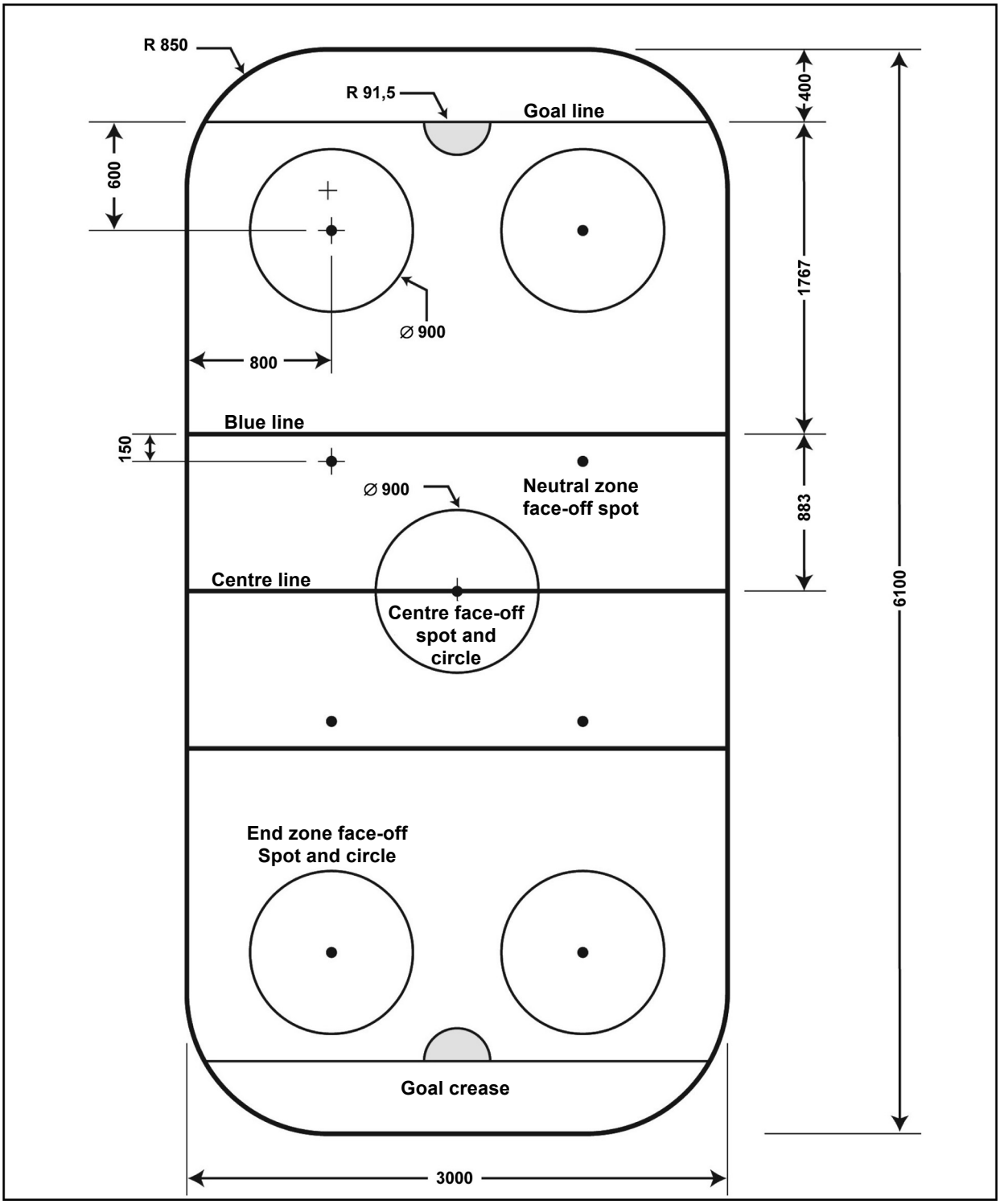


Name: _____ Group: _____

THE PROJECT (*continued*)

D Olympic ice rink

(Dimensions in centimetres)



Name: _____ Group: _____

CREATING THE CONTEXT

I ask myself questions

1. What is modelling?

_____

2. What is the advantage of creating a model?

_____

3. Who is your model intended for?

_____

4. What aspect of the solar system should viewers of your model be able to see easily?

_____

5. Write down the questions that will guide you in gathering the necessary information you need to create your model.

_____

_____

_____

_____

_____

_____

I must

6. Reformulate the goal of the project in my own words.

_____

_____

7. In your opinion, what would be the medium to use to model the distances between the planets on a sports area (diagram, poster, 3D model, drawing, etc.)? Justify your choice.

_____

_____

Name: _____ Group: _____

CREATING THE CONTEXT *(continued)*

8. In your opinion, what factors will influence your choice of materials to use in creating your model? Justify your answer.

_____

_____

What I know and what I must find out

9. Write down the information you already have and what you must find out.

What I know . . .	What I must find out . . .

I prepare my work

10. Where will you find the information you need to create your model?

_____

_____

11. List in chronological order the principal steps of your work.

_____

_____

_____

_____

_____

_____

_____

_____

Reflection

	Yes	No
Do I understand what I need to do?	☐	☐

Name: _____ Group: _____

GATHERING INFORMATION

I do research

1. Look at the factors below and check the ones you think are necessary for creating your model.

- ☐ Availability of materials
- ☐ Cost of objects
- ☐ Availability of tools at school
- ☐ Allocation of time for creating the model
- ☐ Size of objects

2. List the materials you will need to create your model.

Medium: _____ Size: _____ × _____ _____ (unit of measurement)

List of materials:

•	•
•	•
•	•
•	•
•	•

Where appropriate, underline any materials to be brought from home.

3. What are the distances between each of the eight planets of the solar system and the Sun?

I. Distances in the solar system

Planet name	Mean distance from the Sun (AU)
Mercury	
Venus	
Earth	
Mars	
Jupiter	
Saturn	
Uranus	
Neptune	

Name: _____ Group: _____

GATHERING INFORMATION (*continued*)

4. Consult the drawing of your chosen sports area (pp. 2–5 in the LES12 Student log) and indicate in the table below the following information: the type of sports area, the names of the zones (or lines) on the area and the measurements of each of these zones.

II. Sports area measurements

Chosen area: _____

Names of zones on sports area	Sports area measurements (cm)
Field (total length)	
Field (total width)	

5. What is a scale?

_____

_____

6. What type of scale will you use to convert the distances of your sports area and the solar system to the dimensions of your model?

_____

7. What mathematical equations will you use to convert these distances to the scale of your model?

– Distances between the planets and the Sun? _____

– Sports area measurements? _____

Name: _____ Group: _____

GATHERING INFORMATION (*continued*)

8. Convert the distances to the scale of your model. Write your results in the following tables.

III. Distances in the solar system to scale of model

Names of planet	Distances to scale of model (cm)
Mercury	
Venus	
Earth	
Mars	
Jupiter	
Saturn	
Uranus	
Neptune	

IV. Measurements of the sports area to scale of model

Chosen area: _____

Names of zones on the sports area	Distances to scale of model (cm)
Field (total length)	
Field (total width)	

Name: _____ Group: _____

GATHERING INFORMATION (*continued*)

9. Calculate the scales to be indicated in your model. What will the scale of the model be in order to represent:

- the solar system? _____
- the sports area? _____

Reflection

	Yes	No
Do I understand the following concepts:		
• scale?	☐	☐
• astronomical unit?	☐	☐
• light year?	☐	☐
• the location of Earth in the Universe?	☐	☐

Name: _____ Group: _____

COMPLETING THE PROJECT

I make suggestions

1. On a separate sheet, create a rough draft of your model. You are to:

- Draw the eight planets of the solar system and the sports area so as to clearly differentiate them.
- Organize the information so that your model is easy to understand.

2. Once your rough draft has been approved, create your model. Check the following items after they have been clearly indicated on your model:

- ☐ the Sun and its eight planets
- ☐ the sports area
- ☐ the names of the planets
- ☐ the names of the zones on the sports area
- ☐ the scales
- ☐ the units of measurements

3. Using your model, estimate distances beyond the eight planets of the solar system.

a) You must extend your model to illustrate the distance from the Sun to the outer edge of the solar system. How many of your models would you need at this scale to represent this distance? Justify your answer.

Calculation:

Name: _____ Group: _____

COMPLETING THE PROJECT (*continued*)

b) You must extend your model to illustrate the distance from the Sun to the Canis Major galaxy. How many of your models would you need at this scale to represent this distance? Justify your answer.

Calculation:

c) Would you be able to create a model of the entire Universe in your classroom? What would it look like?

Reflection

	Yes	No
Have I explored several solutions for creating my model?	☐	☐

Name: _____ Group: _____

VALIDATING THE PROJECT

I justify my approach

1. What are the advantages of your model?

2. Which aspects of your model are not realistic?

3. How could you present these aspects in a realistic manner?

Name: _____ Group: _____

COMPARING THE MODELS

Compare the different models in the class using the following questions:

1. Are the scales identical? Explain.

2. Describe the similarities among the models in the class.

3. Describe the differences among the models.

4. What are the strong points of the models that most adequately represent the solar system?

Name: _____ Group: _____

MY EVALUATION

Use the evaluation grid on the next page for your self-evaluation. Enter A, B, C, D or E in the appropriate space on that table.

SSC3 Communicates in the languages used in science and technology				
Criteria*	**Observable indicators**	**Me**	**Teacher**	**Comments**
1	**Gathering information** Gathering data and converting measurements to scale		☐ With help	
2	**Completing the project** Accuracy and clarity of the model of the solar system; the model itself		☐ With help	
3	**Completing the project** Notation of the two scales and units of measurement on the model; the model itself		☐ With help	

*** Evaluation criteria**

1 Accurate interpretation of scientific and technological messages

2 Appropriate production or sharing of scientific and technological messages

3 Use of appropriate scientific and technological terminology, rules and conventions

EVALUATION GRID

Name: _____ Group: _____

SSC 3 Communicates in the languages used in science and technology

Criteria*	Observable indicators	A	B	C	D	E
1	**GATHERING INFORMATION** Gathering data and converting measurements to scale	All the useful information has been gathered. All the measurements converted to scale are correct	All the useful information has been gathered. Most of the measurements converted to scale are correct.	Most of the useful information has been gathered. Most of the measurements converted to scale are correct.	Little useful information has been gathered. Almost all of the measurements converted to scale are incorrect.	The work needs to be redone.
2	**COMPLETING THE PROJECT** Accuracy and clarity of the model of the solar system; the model itself	All the information presented is correct. The visual presentation clearly distinguishes all the elements.	All the information presented is correct. The visual presentation clearly distinguishes most of the elements.	Most of the information presented is correct. The visual presentation clearly distinguishes some of the elements.	Some information is correct OR most of the elements are not clearly presented.	The work needs to be redone.
3	**COMPLETING THE PROJECT** Notation of the two scales and units of measurement on the model; the model itself	The two scales are correctly indicated on the model. The units of measurement are appropriate and the correct abbreviations are used.	The two scales are correctly indicated on the model. The units of measurement are appropriate, but the abbreviations used contain errors.	One of the scales is not correctly indicated on the model OR the units of measurement are not relevant.	One of the scales is not correctly indicated on the model, or there is a scale missing on the model AND the units of measurement are not indicated or are not relevant.	The work needs to be redone.

* Evaluation criteria

1 Accurate interpretation of scientific and technological messages

2 Appropriate production or sharing of scientific and technological messages

3 Use of appropriate scientific and technological technological mesterminology, rules and conventions