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TECHNOLOGY

GRADE 8

TERM 1: 2024

PAT - MARKING GUIDELINES

Structures, Systems & Control

INVESTIGATION SKILLS: Identify the problem, design brief, specifications, and constraints	____/15
DESIGN SKILLS: Initial Ideas, Evaluation & Choice of the final idea	____/20
MAKING SKILLS: Orthographic Projection / Working Drawing	____/15
MAKING SKILLS: Building the scale model	____/20
TOTAL	____/70

WEEK 5: SCENARIO**[FORMAL ASSESSMENT]**

INSTRUCTION: Read the scenario below and answer the questions.

OVERCOMING THE LIMITATIONS OF STADIUM ROOFS

The local Cricket Stadium will be used for several games during the National Annual Cricket League. The stadium has a grandstand, but it has no roof.

In many instances, a stadium roof makes sound business sense for developers, but these roofs are also a double-edged sword. In large stadiums, where they are mainly used for both sporting and non-sporting events, roofs protect the spectators from environmental effects such as sun, rain, and wind.



You are requested to use your knowledge on structures to design and make a scale model of a roof for the grandstand on stadium.

REQUIREMENTS

1. The roof must extend to cover the entire main grandstand.
2. The roof should provide spectators with protection and a safe unobstructed view of the action on the field of play.
3. The roof must be an **effective, efficient, and dynamic solution** that will enhance the aesthetic appearance of the stadium.
4. The passages on either side of the main grandstand must be modified to prevent any danger of injury to spectators due to crowd pressure. (As it happened tragically before at other stadiums e.g., Ellis Park in 2001).
5. The size of the scale model of the roof should adhere to 600 mm x 250 mm.
6. The construction of the scale model should not exceed R 500.
7. Only local residence should be used for the labour during the construction of the roof.
8. The design of the roof should be strong and stable enough to withstand severe weather conditions and forces acting on the stadium.
9. The design of the roof should include triangulation and internal cross bracing to stabilize the structure

1.1.1 Answer the following questions.

Identify the problem that must be solved? (1)

The local cricket stadium does not have a roof on the grandstand that could protect spectators against wind, sun and rain. ✓

1.1.2 Who will benefit from the final product? (2)

The spectators ✓ as well as the local municipality ✓ will benefit from a roof for the stadium.

1.1.3 Write a design brief for the identified problem.

(3)

Design and make ✓ a scale model of a roof structure ✓ for the grandstand of the local stadium to protect the spectators against rain, sun, and wind. ✓

1.1.4 Identify SIX specifications from the identified problem.

(6)

- The roof must extend to cover the entire main grandstand.
- The roof should provide spectators with protection and a safe unobstructed view of the action on the field of play.
- The roof must be an **effective, efficient, and dynamic solution** that will enhance the aesthetic appearance of the stadium.
- The passages on either side of the main grandstand must be modified to prevent any danger of injury to spectators due to crowd pressure. (As it happened tragically before at other stadiums e.g., Ellis Park in 2001).
- The design of the roof should include triangulation and internal cross bracing to stabilize the structure.
- The design of the roof should be strong and stable enough to withstand severe weather conditions and forces acting on the stadium.

1.1.5 Identify THREE constraints mentioned in the scenario.

(3)

- The size of the scale model of the roof should adhere to 600 mm x 250 mm.
- The construction of the scale model should not exceed R 500.
- Only local residence should be used for the labour during the construction of the roof.

[SUB TOTAL = 15]

WEEK 6: DESIGN: GRAPHIC COMMUNICATION

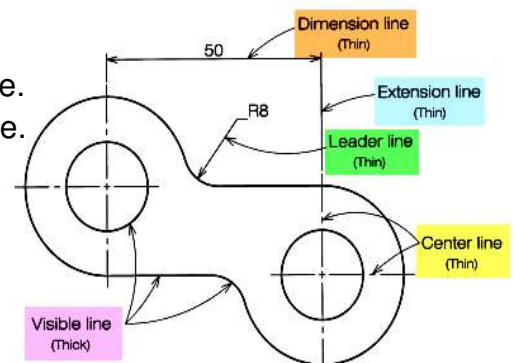
PURPOSE OF GRAPHICS: TO DEVELOP AND COMMUNICATE IDEAS

Graphic communication is **using skills and techniques to record and communicate the shape and size of a product**. Every product we have today (e.g. cars, houses, beds, tables, chairs, desks, appliances and tools) started as an idea. These **ideas were communicated by means of different types of drawings**. These drawings form a universal graphic language that can be understood by anyone, regardless of the country they come from.

RULES OF DRAWING

1. Always use a sharp pencil.
2. HB or 2H pencil is the best type to use when drawing.
3. Always use a ruler to draw straight lines.
4. The horizontal line goes from the left to the right of the page.
5. The vertical line goes from the top to the bottom of the page.
6. Always use a protractor or set square to draw angles.
7. The best way to draw a circle is to use a compass.
8. You also need an eraser (rubber)

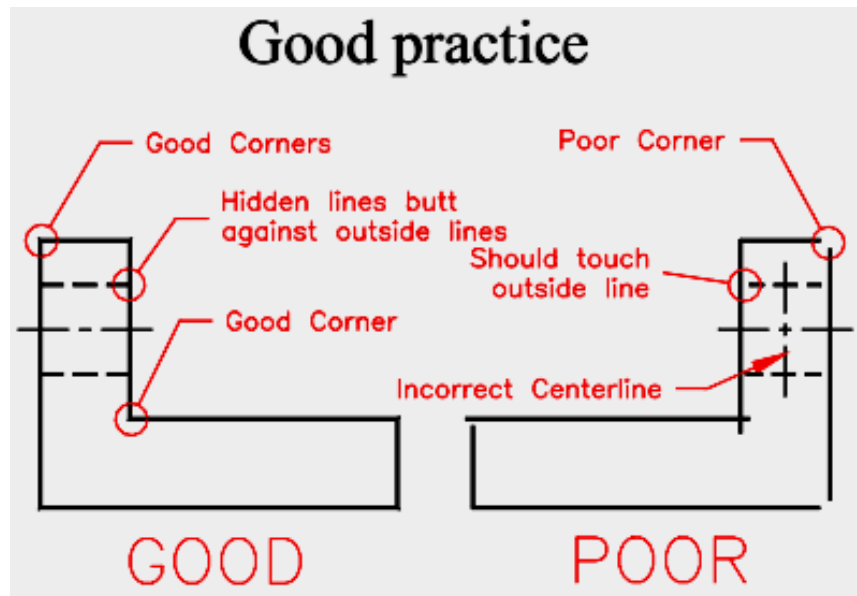
Example : Line conventions in engineering drawing



LINE TYPES

- The correct use of lines and measurements are compulsory to avoid any confusion that might occur during the designing process. The following is an illustration of the types of line used in graphic communication.

LINE TYPE	EXAMPLE	DESCRIPTION
Outline		Visible outlines, visible edges, continuous thick solid line that is used to show the outlines, planes, curved surfaces and the edges of an object and that are visible from the projection plane view.
Construction line		Imaginary lines, projection lines, leader lines. These lines are known as Feint lines. A line that is not more than 0.3 mm. They are thin and used to guide the designer to complete the drawing.
Dashed line		Dashed thick line and is used to show the hidden detail of edges, planes, curved surfaces that are not visible in the projected view.
Centre lines		Chained thin dashed lines that are used to represent symmetry, path of motion, centers of circles, axis of axisymmetric parts (to cut and object in half at the centre) features.
Dimensioning and extension lines		Very thin, feint continuous line with arrowheads on both ends and measurement on top of the line are used to show the dimension of the side.
Curved lines		Represents an area of the object that has been removed to make a clearer or shorten view.



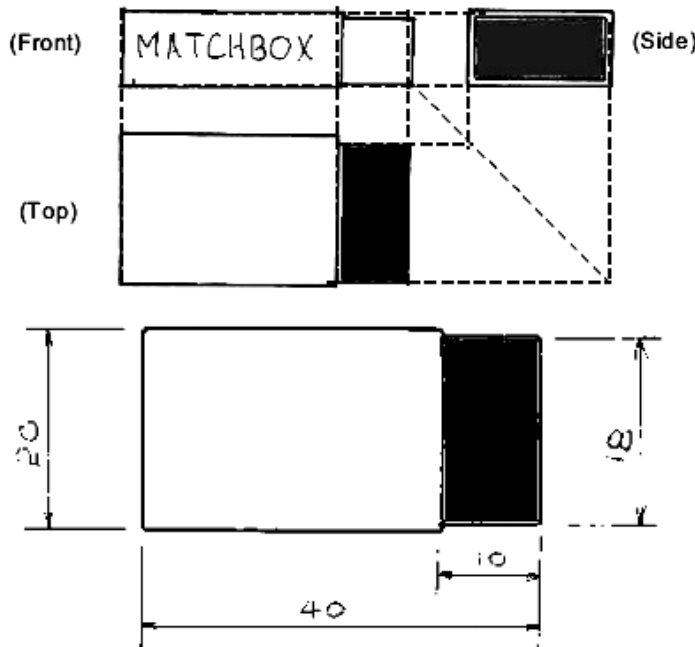
MISTAKES THAT OCCUR WHEN DRAWING

In each example the correct and wrong way are illustrated. Make sure you do not use the wrong method to draw.

DIMENSIONING AND EXTENSION LINES	
<u>CORRECT WAY</u>	<u>INCORRECT / WRONG WAY</u>
A.	OR b. OR c. ALL 3 methods are wrong
B.	
C.	
D.	

DIMENSIONING

- Working drawings are either full size or scaled if they are too big to fit on a page.
- All measurements are placed on the drawing to enable it to be made on the factory floor.
- When we add measurements, we call it dimensioning

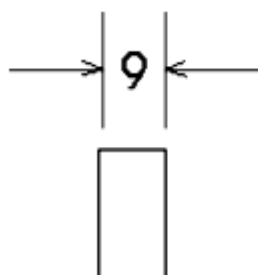
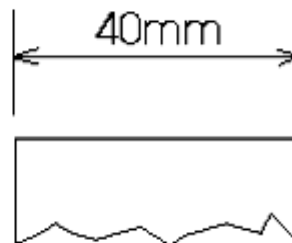


Rules for dimensioning:

- Don't let measurements clutter the drawing.
- All vertical measurements should be read from the right i.e. turn the drawing 90° (clockwise) to read them.
- Do not repeat dimensions if you already have them or they can be worked out from others you have on the drawing.
- Avoid putting dimensions inside a drawing or between the different views.
- Use arrowheads showing exactly where you are measuring from and to.
- Measurements should be in mm.

- It is very important to add dimensions (measurements) when drawing accurate orthographic or working drawings.
- Dimensions can also be applied to simple sketches and designs as they help anyone looking at these to understand the overall size or scale. However, dimensions are usually drawn in a particular way and some examples are shown below.
- **The arrowhead must be sharp but above all the dimensions must be accurate.**

Example of a standard dimension. The dimension is drawn quite faint with the exception of the number and arrow heads.



If a measurement is 9mm or smaller the dimension is drawn in a slightly different way. The arrows point inwards, towards the number.

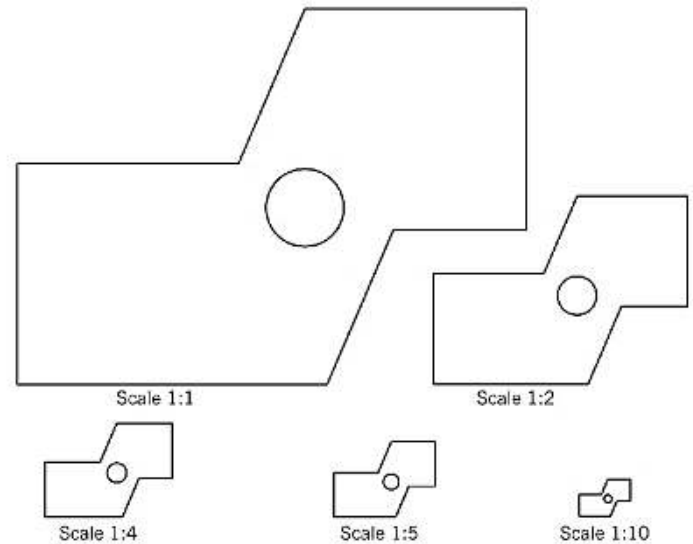
SCALE DRAWINGS

There are mainly three types of scales:

- (1) Full Scale
- (2) Reduced Scale
- (3) Enlarged Scale.

FULL SCALE

- 1:1 means the drawing has to be drawn/are drawn exactly the same size as the real object.
E.g. One circle's radius is 20 mm in data, and you are drawing it of 20 mm in drawing then you are using full scale in drawing.
Example: 1:1, 2:2, 3:3, 4:4, 5:5 etc.



REDUCED SCALE

- Using **reduced** scale means you are **drawing the object SMALLER than the REAL SIZE**.
E.g.: One circle's radius is 20 mm in data, but you are drawing it of 10 mm in drawing then you are using reduced scale in drawing.
Example: 1:2, 1:3, 1:4, 1:5, 1:6 etc.

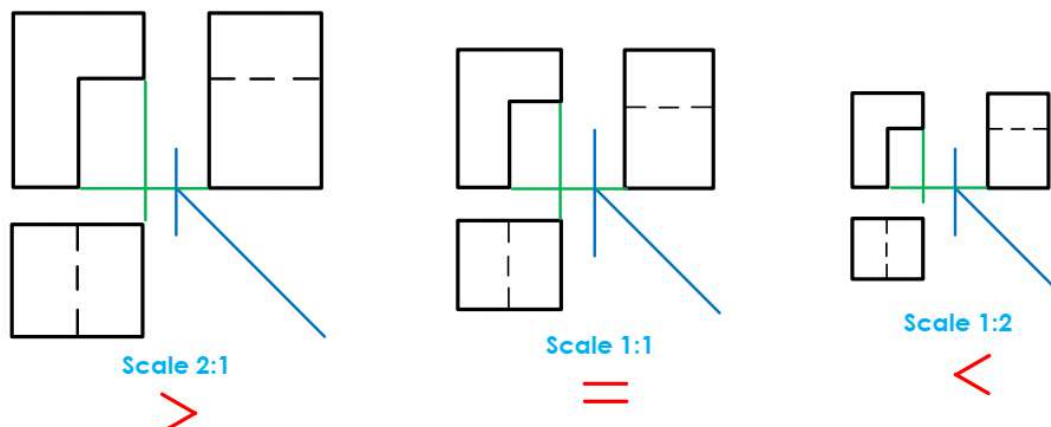
ENLARGED SCALE

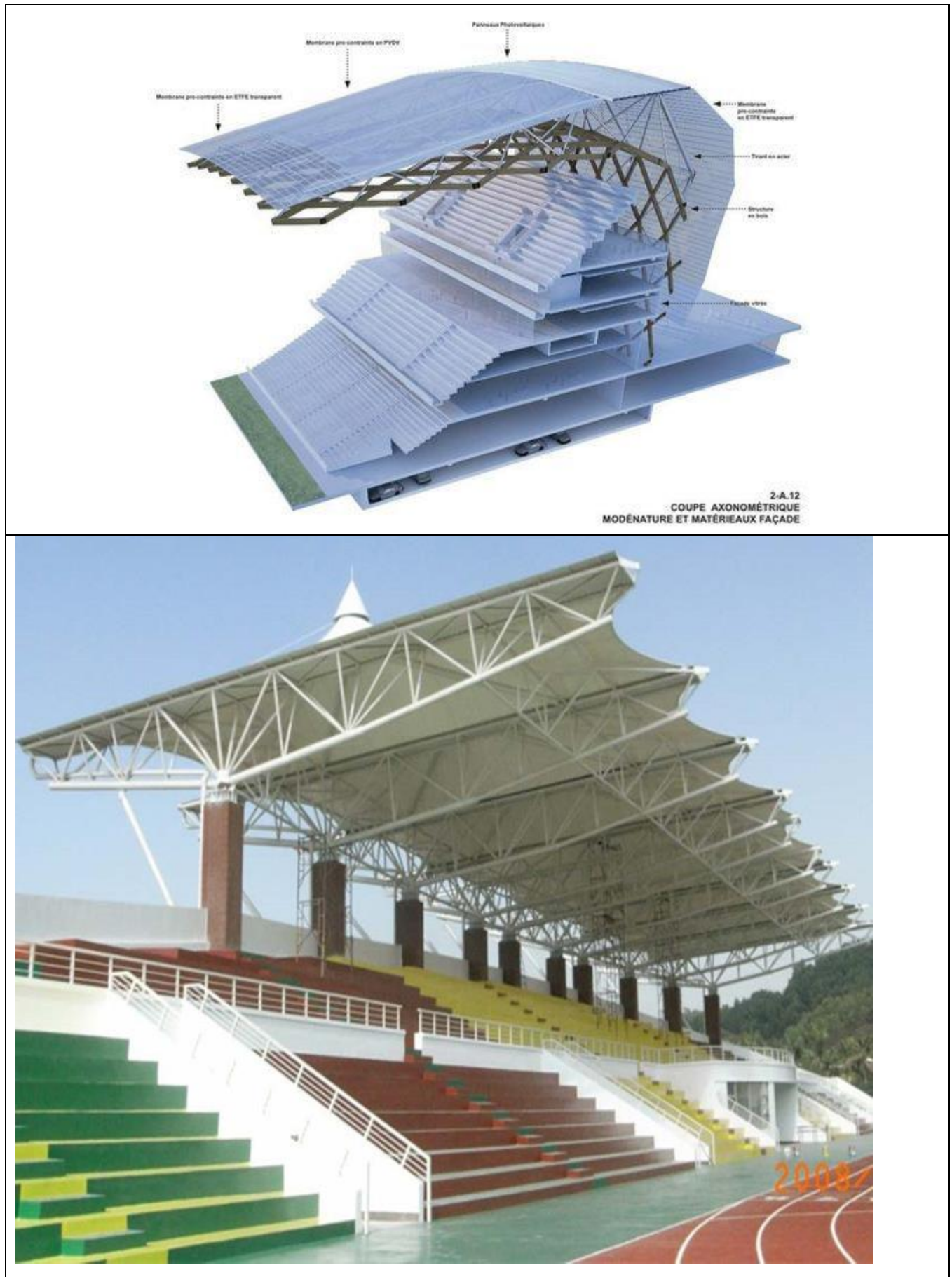
- Using **enlarged scale** means you are drawing the object **BIGGER THAN the REAL SIZE**
- E.g.: One circle's radius is 20 mm in data but you are drawing it of 40 mm in drawing then you are using enlarged scale in drawing. Example: 2:1, 3:1, 4:1, 5:1, 6:1 etc.
- Indicating the scale of the drawing, you write the word "SCALE" followed by the indication of its ratio, as follow

SCALE 1:1	for FULL SCALE / SAME SIZE
SCALE 1:X	for REDUCED SCALE / SIZE
SCALE X:1	for ENLARGED SCALE / SIZE

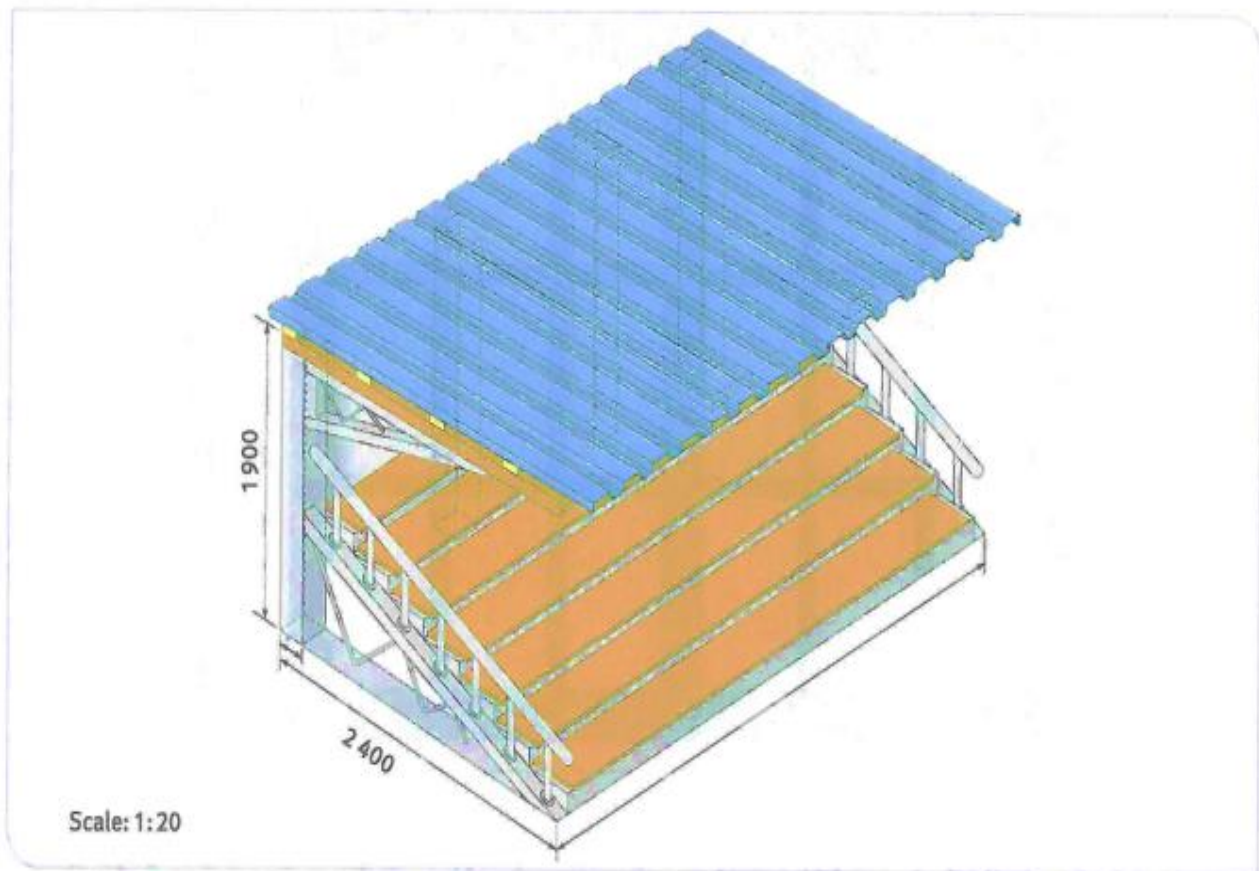
The ratio normally used is...

1:1, 1:2, 1:5, 1:10, 1:20, 1:50, 1:100, etc.
or
1:1, 2:1, 5:1, 10:1, 20:1, 5:1, 100:1, etc

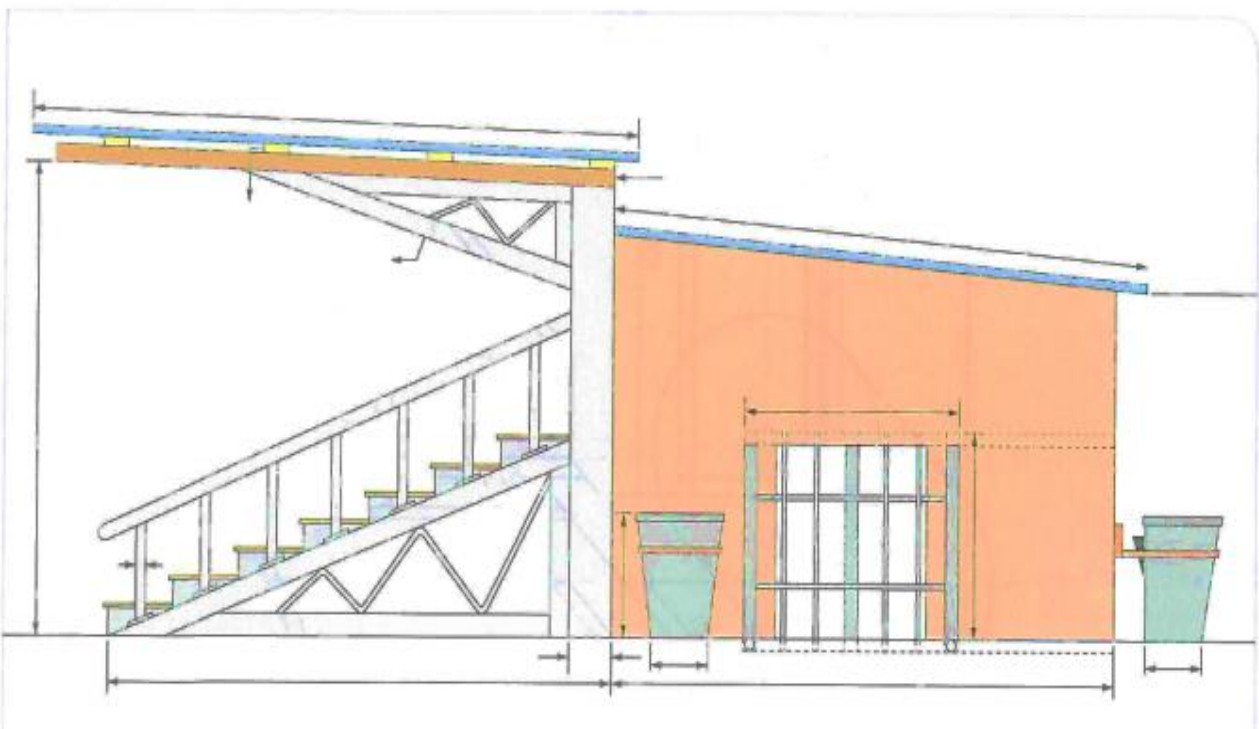




Drawing 1: A three-dimensional isometric projection with dimensions and drawn to scale: for Activity 4, page 65



Drawing 2: A working drawing in two-dimensional view: for Activity 5 page 66



GROUP WORK

- 2.4 Each member of the group chooses his / her best design idea for the two free hand sketches. As a group, look at all the initial design sketches and evaluate each one using questions like these:

CRITERIA	Member 1:	Member 2:	Member 3:	Member 4:
1. Is the solution an effective solution?	[ANSWERS WILL DIFFER – DEPENDING ON THE DESIGNS]			
2. Does it meet the requirements as stated in the scenario?				
3. What are the problems / weaknesses of this solution?				
4. Do the sketches clearly indicate how the parts will be joined?				

- 2.4.1 After your group has evaluated all the designs, you must choose the most suitable design to make.

We have decided that _____'s design is the most suitable solution to the problem.

- 2.4.2 Motivate your choice in 2.3.1. Give at least 2 reasons for your groups' choice.

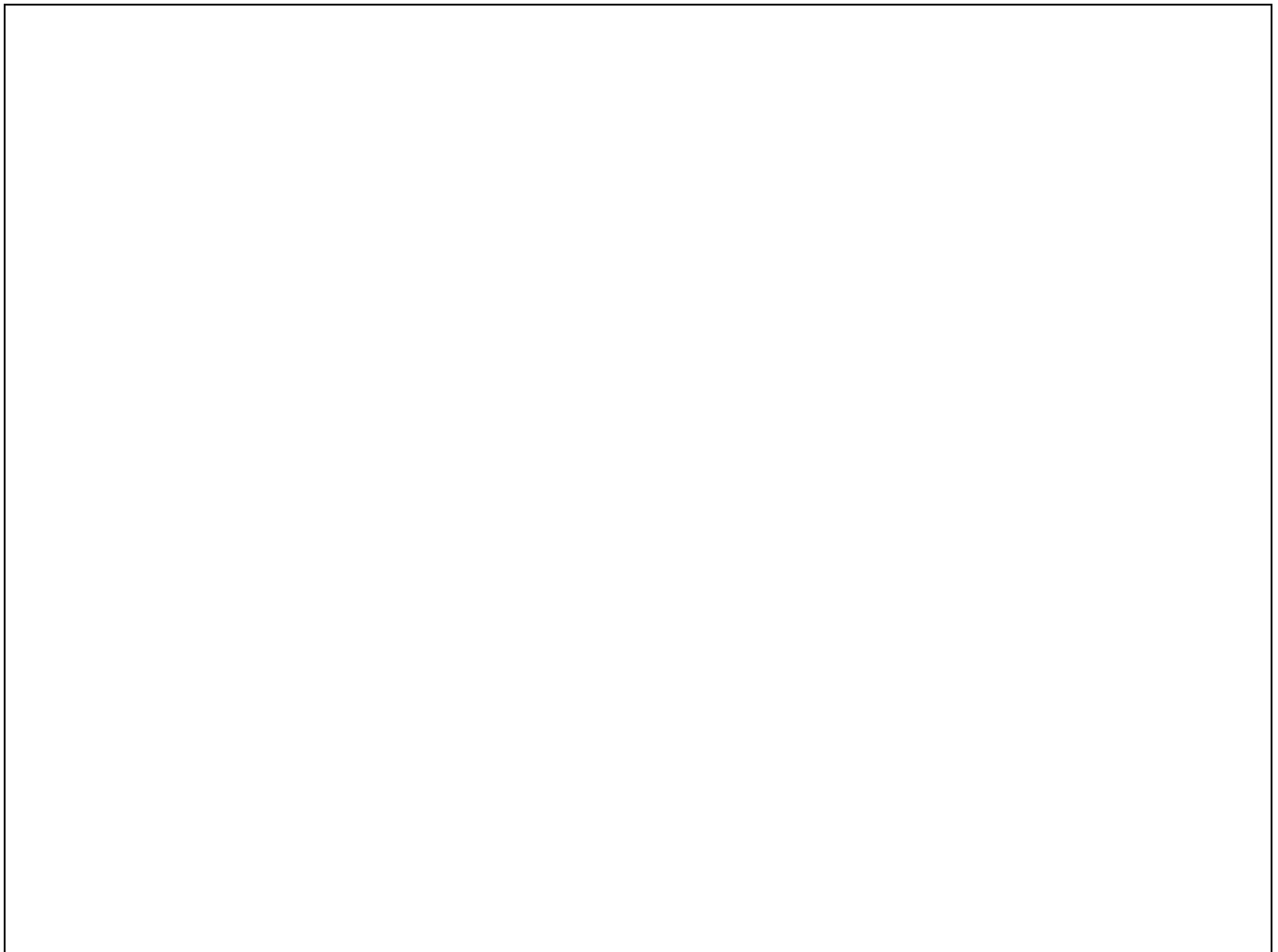
ASSESSMENT GUIDELINES FOR INITIAL IDEAS, EVALUATION & CHOICE OF THE FINAL IDEA

CRITERIA	The learner(s).....	Marks allocated
1.	Sketched TWO FREEHAND ideas – individually (2 marks per drawing)	___/4
2.	Labels and notes were added to the drawings	___/2
3.	Different line types were clearly visible	___/2
4.	Ideas of all group members were evaluated, and a final choice was made	___/3
5.	A final choice from the possible ideas was made	___/1
6.	Indicated possible problems to the different designs	___/4
7.	Made sketches that are neat and complete (2 marks per drawing)	___/4
SUB TOTAL		___/20

2.5 DRAW THE FINAL CHOICE OF ROOF FOR THE STADIUM IN THE SPACE BELOW

Remember to add labels and dimensions.

[INDIVIDUAL WORK]



WEEK 7: MAKE A 2-D WORKING DRAWING OF ONE VIEW OF YOUR DESIGN

3.1 WORKING DRAWING [INDIVIDUAL WORK]

*You must draw a **WORKING DRAWING** of your chosen design showing ONE VIEW OF THE ROOF STRUCTURE WITH DIMENSIONS.*

This drawing should use the correct line types as taught in the graphic communications course.

1. Select the view of your model to draw.
2. Determine the scale and dimensions according to the 3-D drawing done in activity 6.4.
3. Identify different parts of the roof structure.

ANSWERS WILL DIFFER

MARKING GUIDELINES FOR ORTHOGRAPHIC PROJECTION / WORKING DRAWING

Description	Marks allocated
1. ONE view was developed	____/1
2. Labels (2 marks) and annotated notes were used (2 marks)	____/4
3. Parts of the ROOF were identified	____/4
4. Materials were indicated	____/2
5. Line work (consistency in line thickness and line types; neat corners)	____/2
6. Dimensions were indicated (overall length & height)	____/2
TOTAL	____/15

3.2 BUILD A SCALE MODEL OF A ROOF STRUCTURE FOR THE GRANDSTAND OF THE STADIUM

GROUP / INDIVIDUAL WORK

- Before you start working, compare the scale and dimensions of your working drawing with those of the other learners in your group to ensure that the model works out correctly.
- Make a scale model that accurately represents your design of the roof structure. Each member of the team must contribute to this process.
- The model should be made as neatly as possible using suitable materials.
- Use the following criteria to evaluate your model of the roof for the stadium:

	Criteria	Yes / No
1.	Have we managed to sketch a 3D isometric projection with dimensions and to scale?	
2	Have we drawn a 2D working drawing showing one view with dimensions and line types?	
3.	Have we interpreted the working drawing correctly?	
4.	Have we built our roof structure using safe working practices?	
5.	Have we designed the stadium according to the design brief specifications, such as rigidity and stability?	
6.	Does our model show that we have mastered the necessary making skills?	

ASSESSMENT GUIDELINES OF MAKING SKILLS: [20 MARKS]

DESIGN AND MAKE A SCALE MODEL OF A ROOF STRUCTURE FOR THE GRANDSTAND OF THE STADIUM

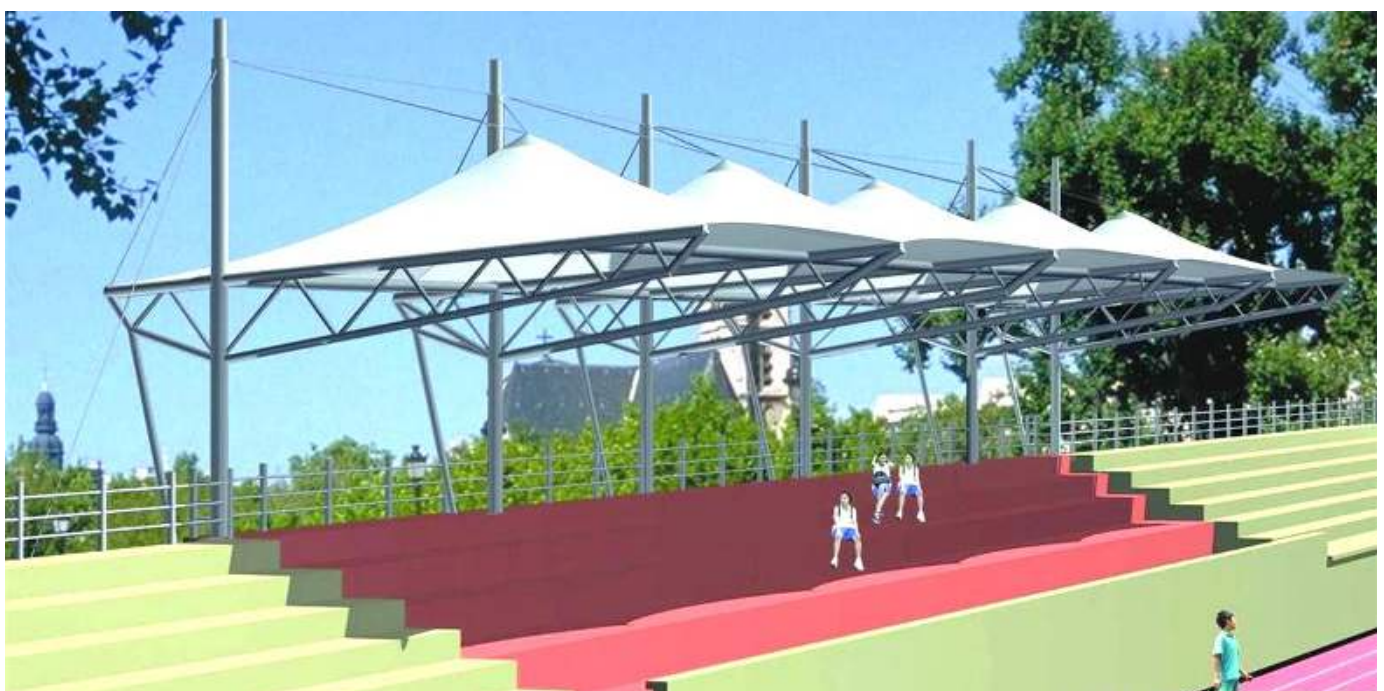
	4 EXCELLENT	3 GOOD	2 ACCEPTABLE	1 UNACCEPTABLE
MAKING SKILLS Make a scale model of a ROOF STRUCTURE FOR THE GRANDSTAND OF THE STADIUM	✓ Shows a VERY GOOD understanding of the making process. ✓ TAKES CARE when working, using tools and materials safely and accurately. ✓ WORKS CONFIDENTLY with others, making a very good contribution. MARKS: 10 – 9	✓ Shows a GENERAL understanding of the making process. ✓ Takes REASONABLE care when working, using tools and materials safely and accurately. ✓ Works EASILY with others, making a very good contribution. MARKS: 8 – 6	✓ Shows UNDERSTANDING of the making process. ✓ Takes SOME care when working, using tools and materials safely and accurately. ✓ Works with others, making a REASONABLE contribution. MARKS: 5 – 3	✓ Shows LITTLE understanding of the making process. ✓ NOT ABLE to use tools and materials safely and accurately. ✓ FINDS it DIFFICULT to work with others, making a very LITTLE or NO contribution. MARKS: 2 – 0
	✓ Produce an EXCELLENT model of a ROOF STRUCTURE. ✓ EXCELLENT usage of triangulation, best usage of available resources and joining techniques. ✓ The ROOF STRUCTURE is VERY STRONG, STABLE and RIGID. ✓ EXCELLENT usage of available resources. MARKS : 10 – 9	✓ Produce a VERY GOOD model of a ROOF STRUCTURE. ✓ VERY GOOD usage of triangulation, good usage of available materials and modern joining techniques. ✓ The ROOF STRUCTURE is VERY STRONG, STABLE and RIGID ✓ VERY GOOD usage of available resources. MARKS : 8 – 6	✓ Produce an ACCEPTABLE model of a ROOF STRUCTURE. ✓ ACCEPTABLE usage of triangulation, reasonable usage of available materials and modern joining techniques. ✓ The ROOF STRUCTURE does not adhere to the specifications of STRENGTH, STABILITY and RIGIDITY. ✓ ACCEPTABLE usage of available resources. MARKS: 5 – 3	✓ Produce and UNACCEPTABLE model of a ROOF STRUCTURE. ✓ UNACCEPTABLE / POOR usage of triangulation, usage of materials and joining techniques. ✓ The ROOF STRUCTURE is NOT AT ALL STRONG, STABLE and RIGID. ✓ VERY FEW materials were used to build the model. MARKS : 2 – 0
SCORE: _____/20				

TOTAL MARKS FOR ASSIGNMENT: 70

WEEK 8: EVALUATE COMPLEX STRUCTURES

1. Evaluate your scale model of the roof structure by identifying the advantages and disadvantages of your model.
2. Use the criteria mentioned in the scenario.

CRITERIA	ADVANTAGES	DISADVANTAGES



WEEK 9: GROUPS PRESENT THEIR PLANS & SCALE MODEL TO THE REST OF THE CLASS

1. PLAN A JOINT STRATEGY TO PRESENT THE TEAM'S WORK

2. Prepare a five-minute presentation during which you will:

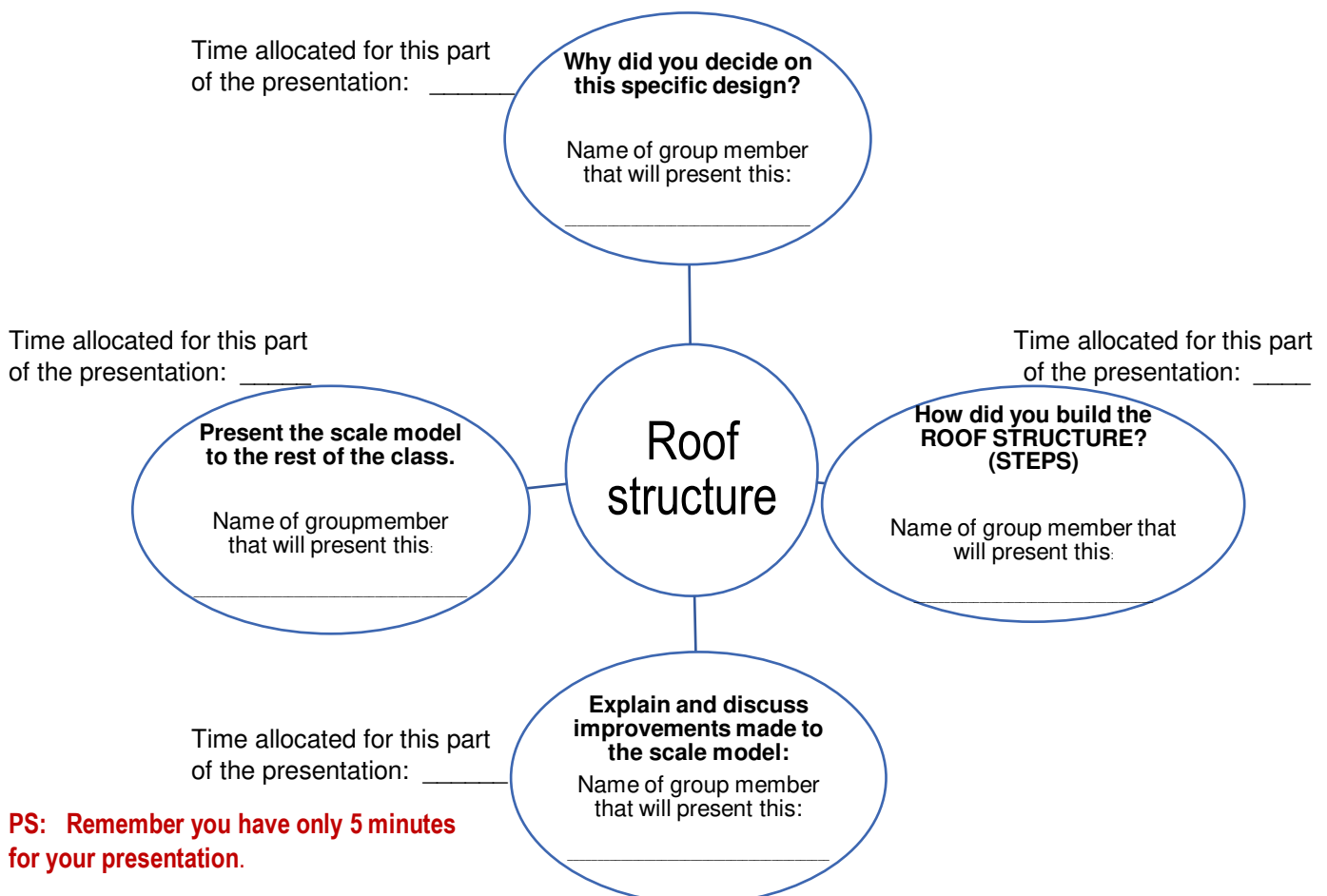
- ❖ show your individual designs sketches;
- ❖ explain the changes you made as a team;
- ❖ show your team's final plans;
- ❖ exhibit (show and explain) your team's model.

3. Each member of the team must speak briefly about the role they played in the following:

- ❖ the development of the design;
- ❖ the making of the scale model;
- ❖ the preparation for the presentation.

4. Use the spider diagram to plan and divide the work amongst the members of the group.

5. Indicate the following concepts/aspects on your diagram:



WEEK 10: MAKE A 3-D ISOMETRIC DRAWING OF THE SCALE MODEL OF THE ROOF STRUCTURE

1. Once you have evaluated the initial sketches and chosen one, you may make changes to the initial sketch to incorporate good ideas from other designs of your group members.
2. Combine the work the members of your group did in activity 2. Use it to make neat drawings of the ROOF OF THE GRANDSTAND.

KEEP THE FOLLOWING IN MIND:

INDIVIDUAL WORK

- decide on the scale to use
- decide which side of the model to use as a front view.

MAKE SURE YOUR DRAWING ADHERES TO THE CRITERIUM

SELF ASSESSMENT FOR THE ISOMETRIC DRAWING

DESCRIPTION	YES	NO
1. Different line types were clearly visible		
2. Labels and notes were used to identify various parts of the bridge and to identify the choice of materials for the bridge.		
3. Dimensions were realistic and clearly visible		
4. Scale of final choice was indicated and drawn to scale		
5. The isometric drawing was neat and complete		



TERM 1

STRUCTURES & SYSTEMS & CONTROL

GRADE 8

Make a 3-D ISOMETRIC projection. Draw your scale model of the roof to scale in all 3 dimensions

