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TECHNOLOGY



Western Cape
Government

Education

GRADE 8

PRACTICAL ASSESSMENT TASK: TERM 1

(RATP week 4 & week 6 - 10)

70 MARKS

Name: _____ Grade 8: ____		Possible mark	Learners' mark
Investigate (15) (week 4)	Activity 1: Investigate Structures	9	
	Activity 2: Evaluate structures: Advantages and disadvantages	6	
Design (20) (week 6)	Activity 3: Design brief, specifications, and constraints	10	
	Activity 4: Sketch of initial Idea	10	
Make (35) (week 6-10)	Activity 5: 2D Working drawing	15	
	Activity 6: Make the model	20	
TOTAL		70	

PAT: Scenario

How does maize become maize meal? Before machines were invented to grind or crush the seeds, it took a lot of hard work to make maize meal. See the picture below.

The Makeba family lives on a farm far away from town. They grow their own maize and wheat. The family wants to make meal or flour from the maize or wheat. They want a quick and easy way to make the meal or flour that does not require a lot of hard work. You have been asked to design and make a grain crusher that will solve their problem.

A machine to crush grain will usually be powered by an electrical motor that provides rotational movement. You will not use an electrical motor in your model but will rather turn a handle of a crank by hand.

This rotational movement should be changed into a reciprocating movement so that the grain will be crushed, like hitting it with a hammer. The mechanisms that your model uses should be housed inside a strong and stable structure.



PAT: Case Study

ACTIVITY 1: INVESTIGATE: STRUCTURES

(9)

Look at the pictures below and on the next page. Answer the questions that follow. **All** questions must be answered before the task will be marked.



Figure 1

1. What purposes do these structures serve? Why do we build them? (1)

2. Why do you think the pylon in Figure 2 is designed the way it is, and not in the way shown in Figure 3?
(1)

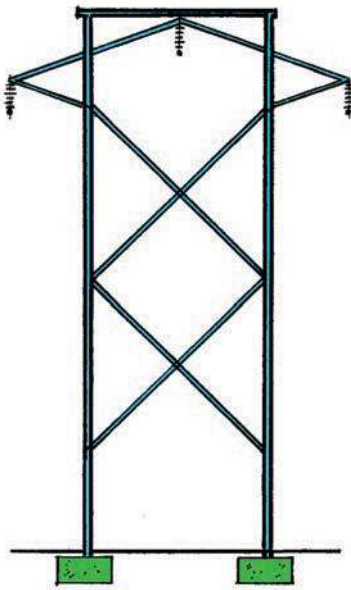


Figure 2

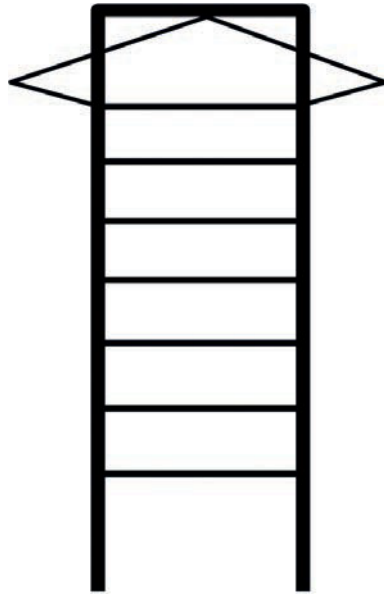


Figure 3

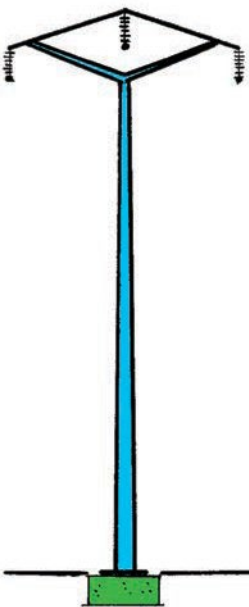


Figure 4

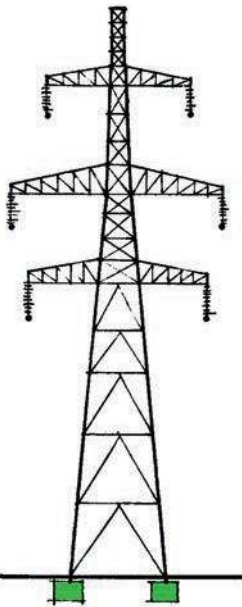


Figure 5

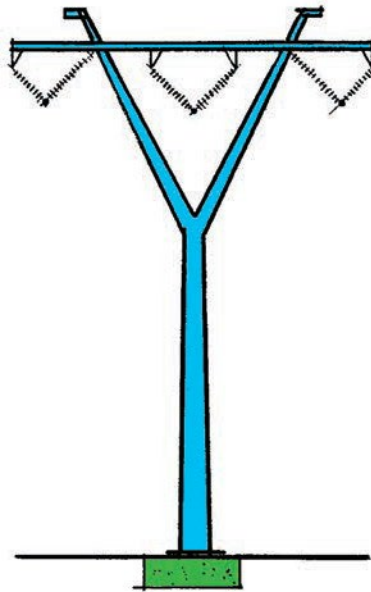
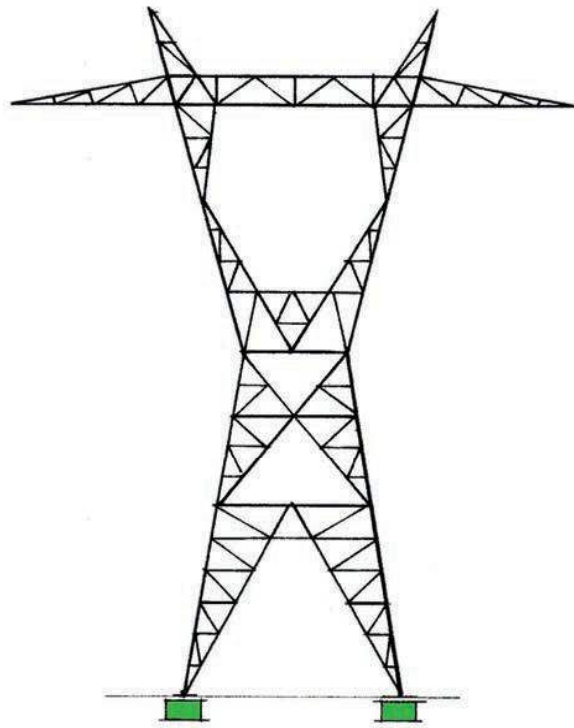


Figure 6

The pylons in Figures 4 and 6 are solid structures made from concrete. All the other pylons are steel frame structures.

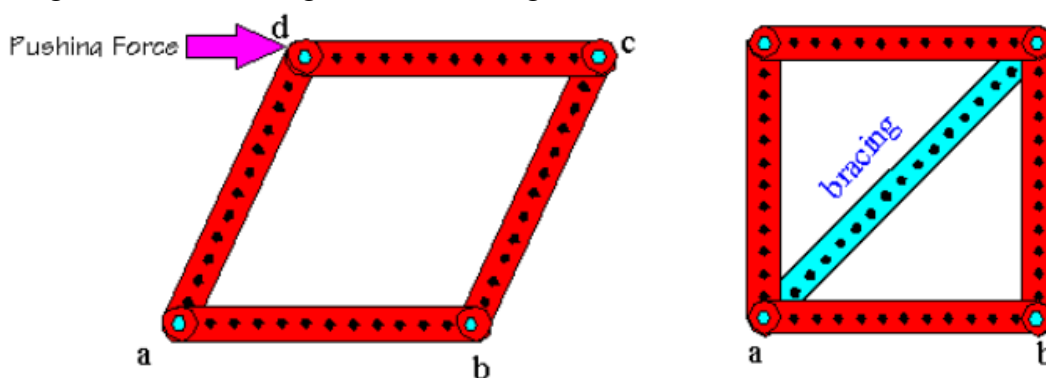
Figure 7



3. What do you think is indicated by the green parts at the bottom of the structure (solid blocks) in Figure 2 and Figures 4 to 7? (1)

Triangulation and bracing

By adding an extra bar or member to a square, the structure cannot be forced out of shape, and is said to be rigid. The additional member has formed two triangles in the structure. This is known as triangulation. The triangle is the most rigid frame structure.



A support inserted to triangulate a frame can also be called a **brace**.

Figure 8: Skewing of a rectangular frame

If you look at some pictures of familiar frame structures like cranes, electricity pylons (see fig 1-7) or roof supports you may notice that triangulation is used to make them rigid.

4. Will one brace always work? Compare and evaluate what happens when you apply forces as in case A and case B in fig 9?

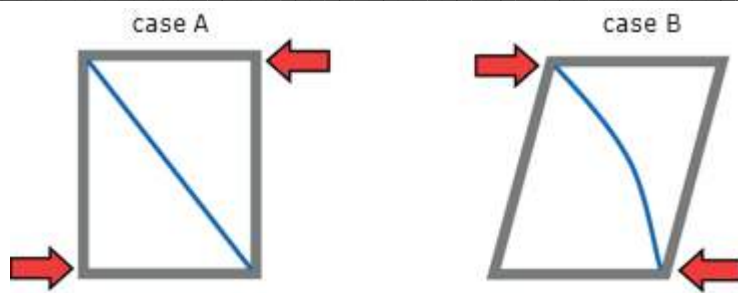


Figure 9: Simple triangulation of a frame

5. Why does the frame keep its shape in case A but changes shape in case B? Hint: Think about the type of forces acting on the diagonal beam? (1)

6. How can you improve the design of the frame so that forces cannot make it skew? (1)

7. Draw a strengthening technique on figure 10 by adding an extra brace. (1)

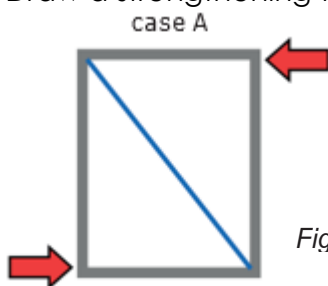


Figure 10

8. What do you call this strengthening technique? (1)

9. Can you use steel cables instead of beams for the braces in the frame designs of fig 8 and fig 10? Explain your answers. (1)

10. If you use steel beams as braces for both frame designs, do you have to use the same thickness beams in both designs? Or can you save material and use thinner braces in one of the designs? (1)

How to make a tower resist twisting

To prevent a tower structure from twisting, you can use cross-bracing inside the frame structure. The photos below show how a frame structure can be built with cross-bracing on the inside and on the outside.

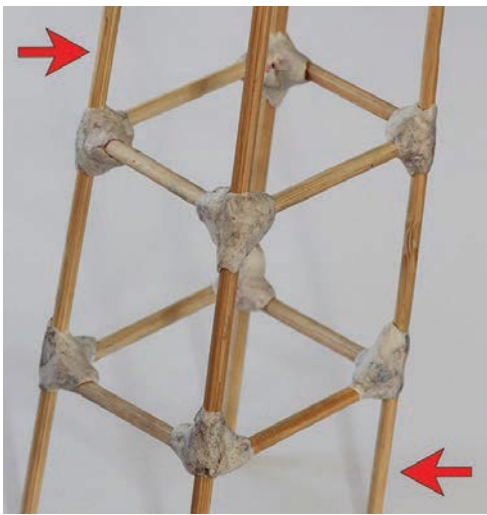


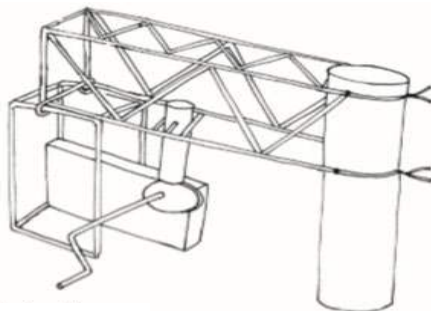
Figure 11: Skewing and twisting forces

Figure 12: Internal and external cross-bracing

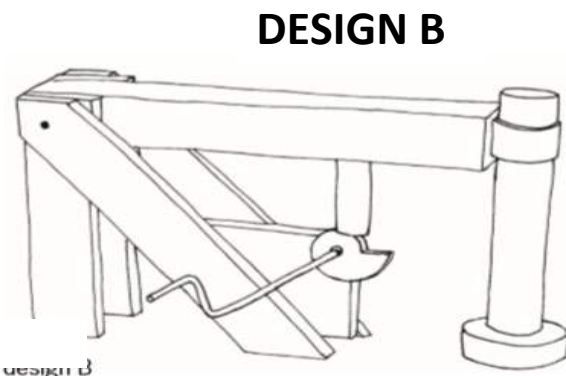
ACTIVITY 2: EVALUATE STRUCTURES

(6)

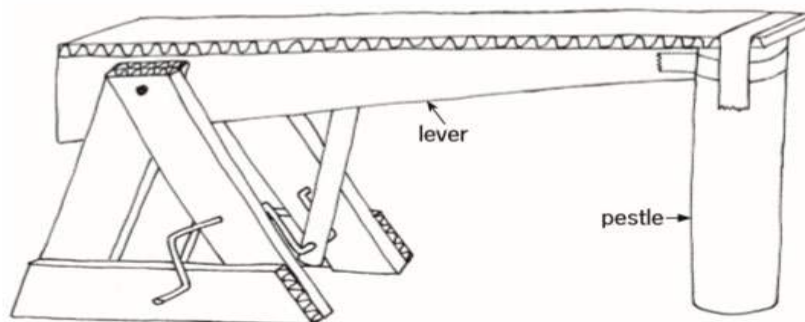
The drawings below show rough designs for grain crushers that other people made. These designs are not complete, and there could be problems with them. But there could be useful ideas that you may get from these designs.



DESIGN A



DESIGN B



DESIGN C

DISCUSS THIS TOGETHER AS A CLASS/GROUP BEFORE LEARNERS COMPLETE IT ON THEIR OWN

Examine and evaluate the 3 designs above. List the advantages and disadvantages of each of these designs in the table. Pay attention to the stability of the structure, the strength, and the effectiveness of the mechanisms.

	DESIGN A	DESIGN B	DESIGN C
Advantages			
Disadvantages			

(6)

Were all questions and activities answered in full?

yes	no
-----	----

If No, give back task to be completed.

New date negotiated _____

ACTIVITY 3: DESIGN BRIEF, SPECIFICATIONS AND CONSTRAINTS**(10)**

Read through the scenario again and complete the design brief, specifications and constraints.

DESIGN BRIEF

Write the design brief. A design brief tells you what the problem is and who will benefit from or use the solution.

I am going to design a (what is needed) for (who is it for) (4)
that (what is it for), on/at
..... (where will it be used)

LIST THE SPECIFICATIONS

Answer the following questions to identify the specifications for your design:

(a) Name one mechanism that could make the grain crusher work? (1)

(b) Name two different forces that the structure should be able to withstand? (2)

IDENTIFY THE CONSTRAINTS

(a) How much time do I have to design and make the model? (1)

(b) What materials can I find easily to build the model (name 4 materials)? (1)

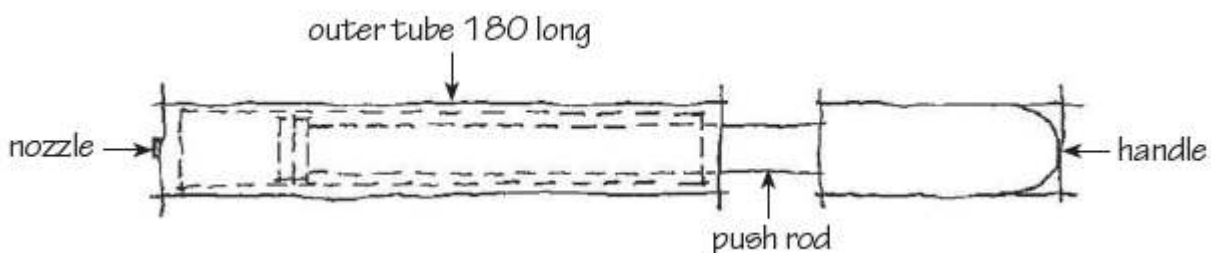
(c) What tools do I already have with which I can make the model (name 3 different tools)? (1)

GRAPHICS**Purpose of graphics**

Sketching and drawing are very important skills in Technology. They allow us to share our ideas, designs, and technical solutions with other people.

For designers and technologists, sketching is like taking notes. It reminds them of their ideas and helps them to share these ideas with others. Sketching is usually done without any instruments. All you need is a pencil and some paper.

See the example below of a sketch of a bicycle pump.



ACTIVITY 4: INITIAL IDEA SKETCH**(10)**

Think about the 3 designs of the grain crusher you evaluated and look at your design brief you wrote down.

- Sketch a **freehand drawing** of your own idea of a grain crusher in the space below.
- Make notes and labels next to the drawing to show your thoughts.
- You may create your own design by taking one of the three designs that you have evaluated and change a part of the design to make the design more rigid, stronger or look or function better.



Marking rubric: Initial Idea	Good	Adequate	Elementary	Poor	Not done
	All aspects are correctly done	Most of the aspects are correctly done	Half of the criteria is met	Less than half of the criteria is met	
	4	3	2	1	0
Freehand sketch drawn neatly. Learner demonstrates good freehand drawing skills.					
Appropriate notes and labels were made					
	Good design 2		Not workable 0		
The design looks workable					
Total	/ 10				



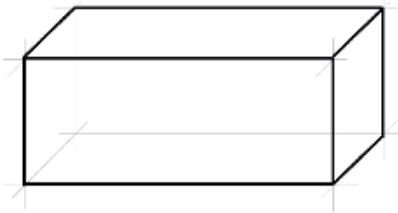
Conventions

Drawing conventions: Just like you use a language such as English to communicate with others, sketches and drawings are a “language”. Just like English, there are rules for drawings to help us understand them better. These rules are known as drawing conventions.

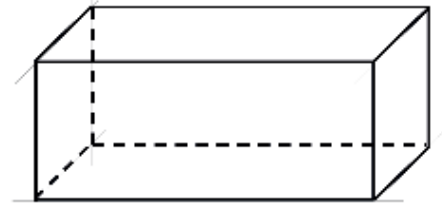
Construction lines are normally drawn to begin to make a drawing. They are feint, thin lines that will later be replaced by the outlines.



Solid lines are used to show the visible edges (outlines) of objects on drawings. These lines are slightly thicker and darker than construction lines.

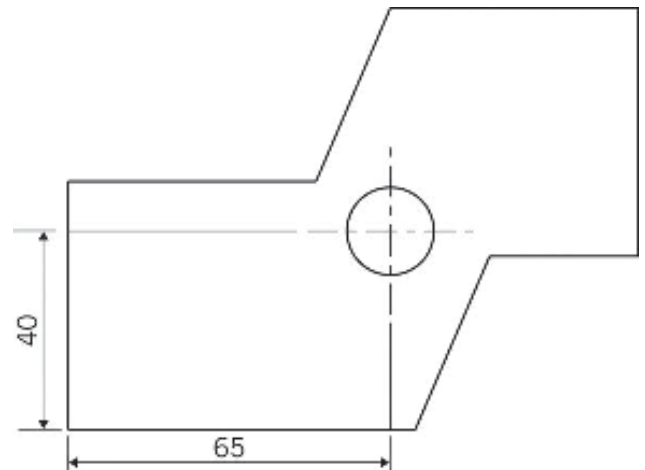


When you want to show something that is behind something else, you should use a dashed line. These lines are also known as **hidden lines**. These are lines you can't see when looking at the object. They are the same thickness as outlines but are broken.



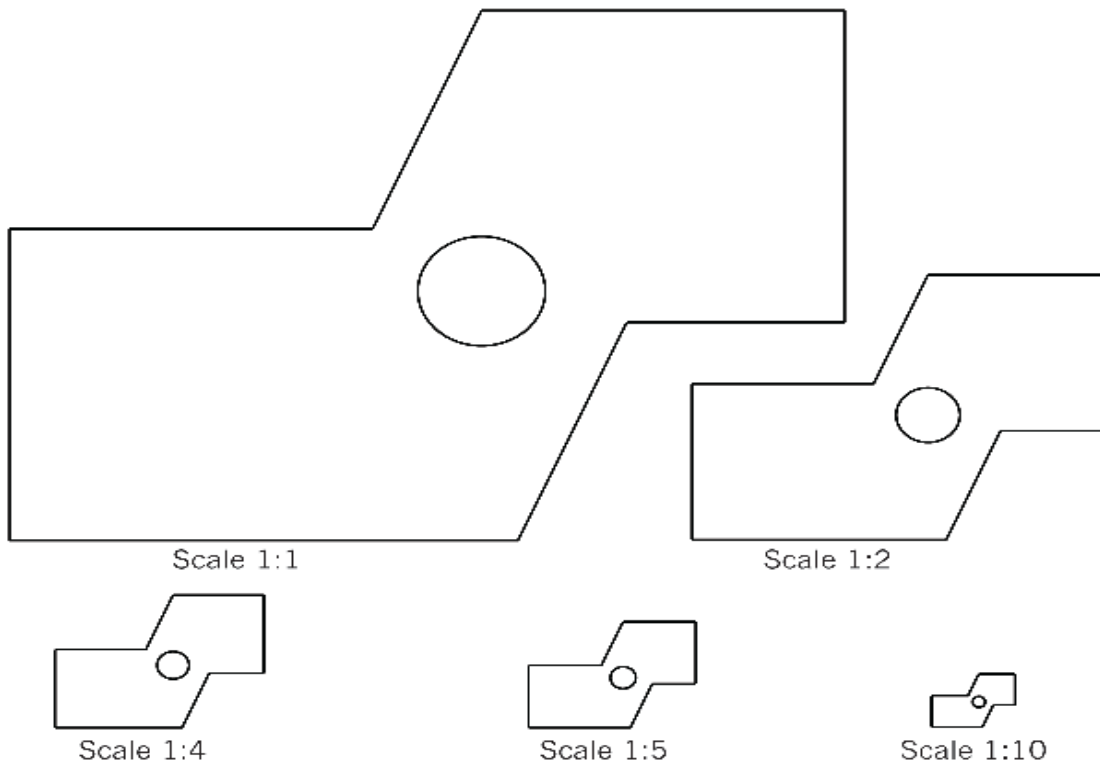
Centre lines show where the centre of a symmetrical object is, for example a circle.

Sizes, which can also be called **dimensions**, are shown with a thin dimension line with arrows at both ends. Dimension lines are drawn a little bit away from objects. Short extension lines, which do not touch objects, show you what is being measured. Dimensions are normally given in mm. So you don't need to write “mm” after the number indicating a dimension on a drawing.



To scale down means to make a drawing **smaller** than the actual object. e.g. **1:2**

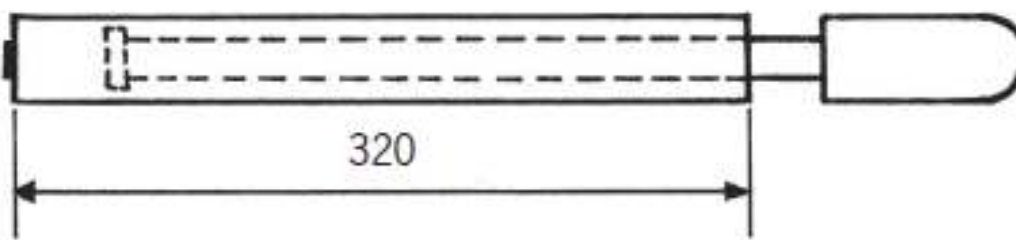
To scale up means to make a drawing **bigger** than the actual object e.g. **2:1**



Working drawings

Working drawings are used to design things according to exact sizes. Designers communicate the exact sizes of each part of an object in working drawings, so that each part fits to make the final product work properly

See the example of a bicycle pump



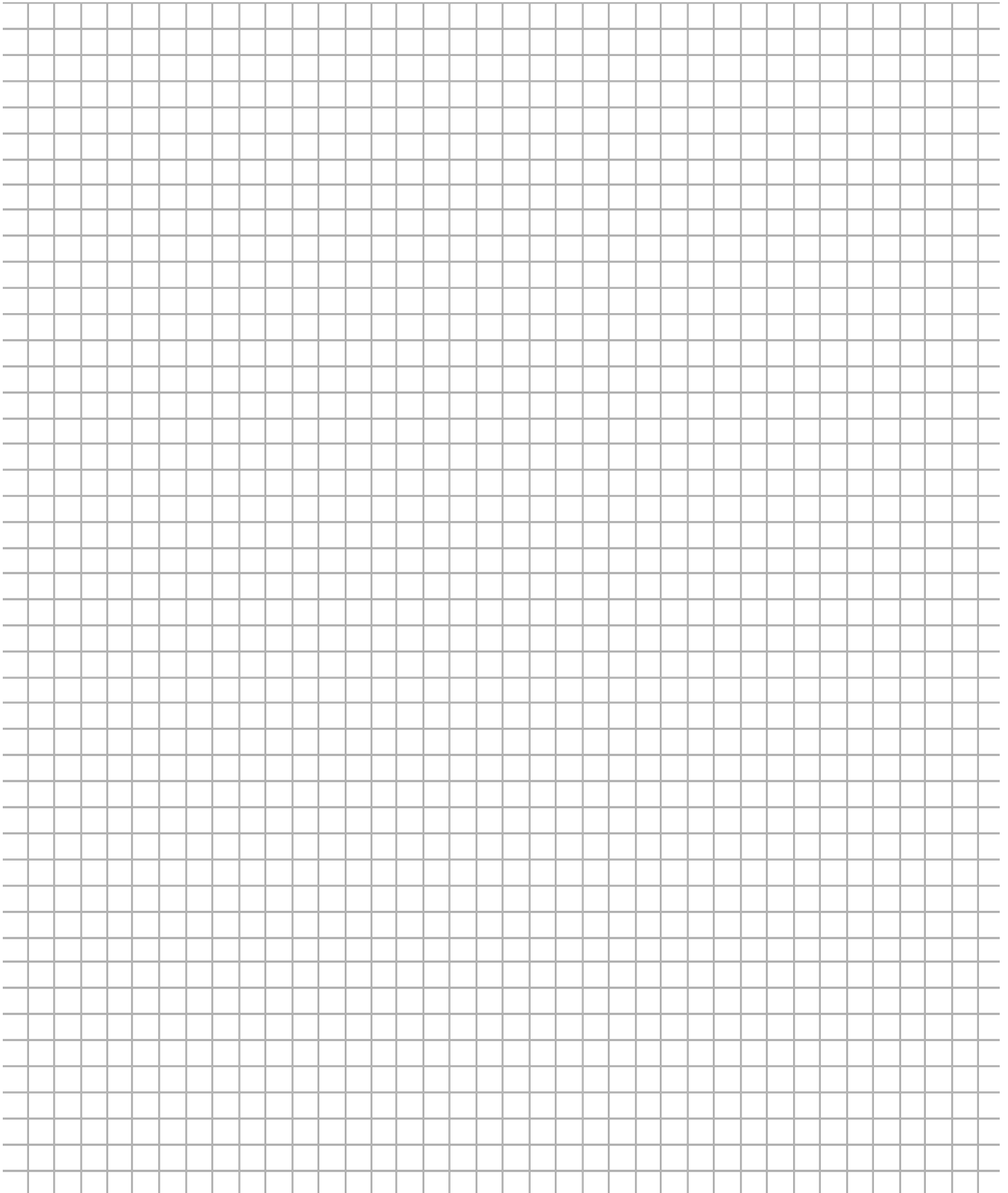
Bicycle pump.
Scale 1:4

ACTIVITY 5: 2D WORKING DRAWING

(15)

Draw a **2D working** drawing of the grain crusher

- Only draw **one face** (view) of your design.
- Draw it to scale and indicate the scale on the drawing.
- Give it a **heading**.
- Indicate **TWO** dimensions.
- Use a pencil and ruler. Draw on the grid below.



Marking rubric: 2D Working drawing	Good	Adequate	Elementary	Poor	Not done
	An accurate design of the crusher	Most of the aspects are correctly done	Half of the criteria is met	Less than half of the criteria is met	
	4	3	2	1	0
Line quality is good (Dark outlines, construction lines are light).					
Lines are consistent and meet at corners.					
	Done adequately		Not done adequately		
Wrote a heading (Title)	1		0		
The scale is correctly indicated and the drawing is correctly in-proportion (accuracy)	2				
2 dimensions indicated neatly and correctly.	2		0		
Neatness of the drawing and drawn with a pencil and ruler.	2		0		
Total	/ 15				

ACTIVITY 6: MAKE**(20)**

You, as a group, now have to build your grain crusher according to your 2D working drawing. The model must be done in class in your group

Possible materials required for this Mini-PAT:

Ruler, geometry sets, big strong, utility knives, scissors, pliers (if the school has), corrugated cardboard from old boxes, nail (1 mm thick and 30-40 mm long), copper wire or galvanized steel wire (1 mm thick and 28 cm long), Prestik/masking tape or glue gun with glue sticks, a sheet of A4 paper

Making rubric: Grain Crusher	Good	Fair	Elementary	Not done
	3	2	1	0
You followed the plans and instructions successfully.				
The model was made in-class and all members participated				
Tools were used correctly and safely				
You made a mechanism to change the rotational movement of the handle into the reciprocating movement of the pestle.				
The parts that turn on axles cannot move sideways.				
Your model is stable. At least one strengthening technique was used				
	Effective		Not effective	
	2		0	
Your model works well.				
Total				20

EVALUATE

As a group evaluate two different group's models and designs. Commend on all aspects and make suggestions how to improve on the design.

Group _____ Names: _____		
Questions	Answers	Suggestions to improve
1. How well does it function?		
2. Does it look good?		
3. Is it strong and stable?		
4. Is it well constructed/assembled?		
5. Is it a cost-effective design?		
Extra notes:		

Group _____ Names: _____		
Questions	Answers	Suggestions
1. How well does it function?		
2. Does it look good?		
3. Is it strong and stable?		
4. Is it well constructed/assembled?		
5. Is it a cost-effective design?		
Extra notes:		

COMMUNICATE

You as a team will now present your plans and model to the class.

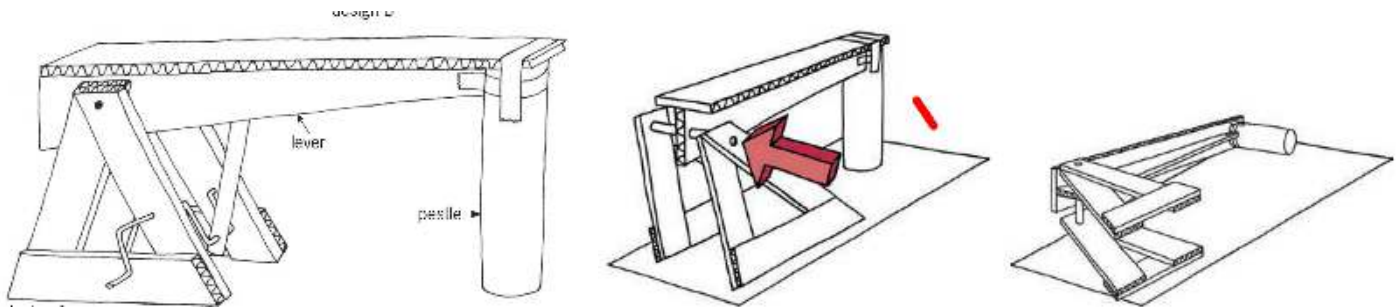
Use the suggestions made by other teams to better your model before you present it.

You will have 5 minutes to present. Everybody of the team must have a chance to talk.

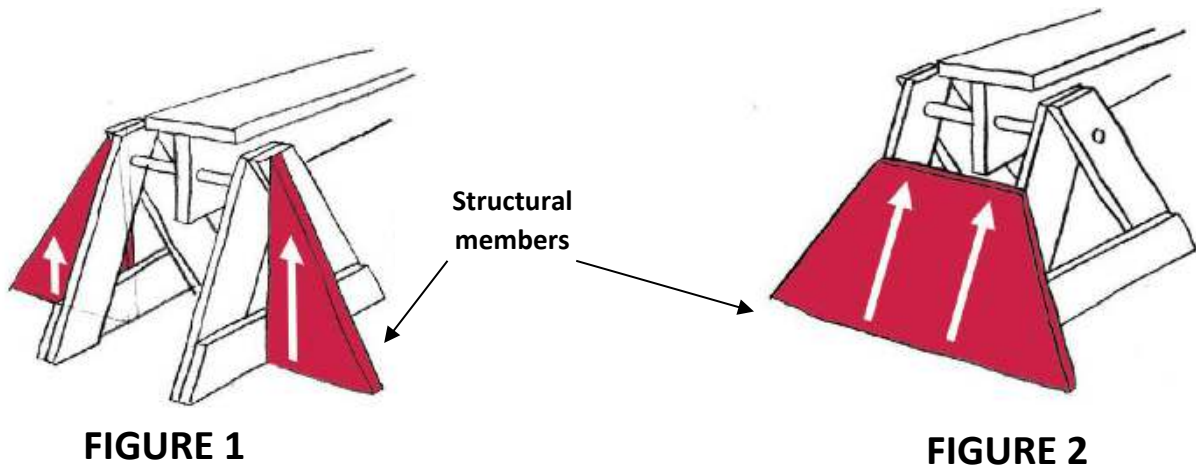
Focus on your designs and the final model. Try to use available resources (computer & projector) to help you to communicate/ present more effectively.

3D Isometric Projection

Below are some models of a grain crusher. It is not very stable and falls over easily.



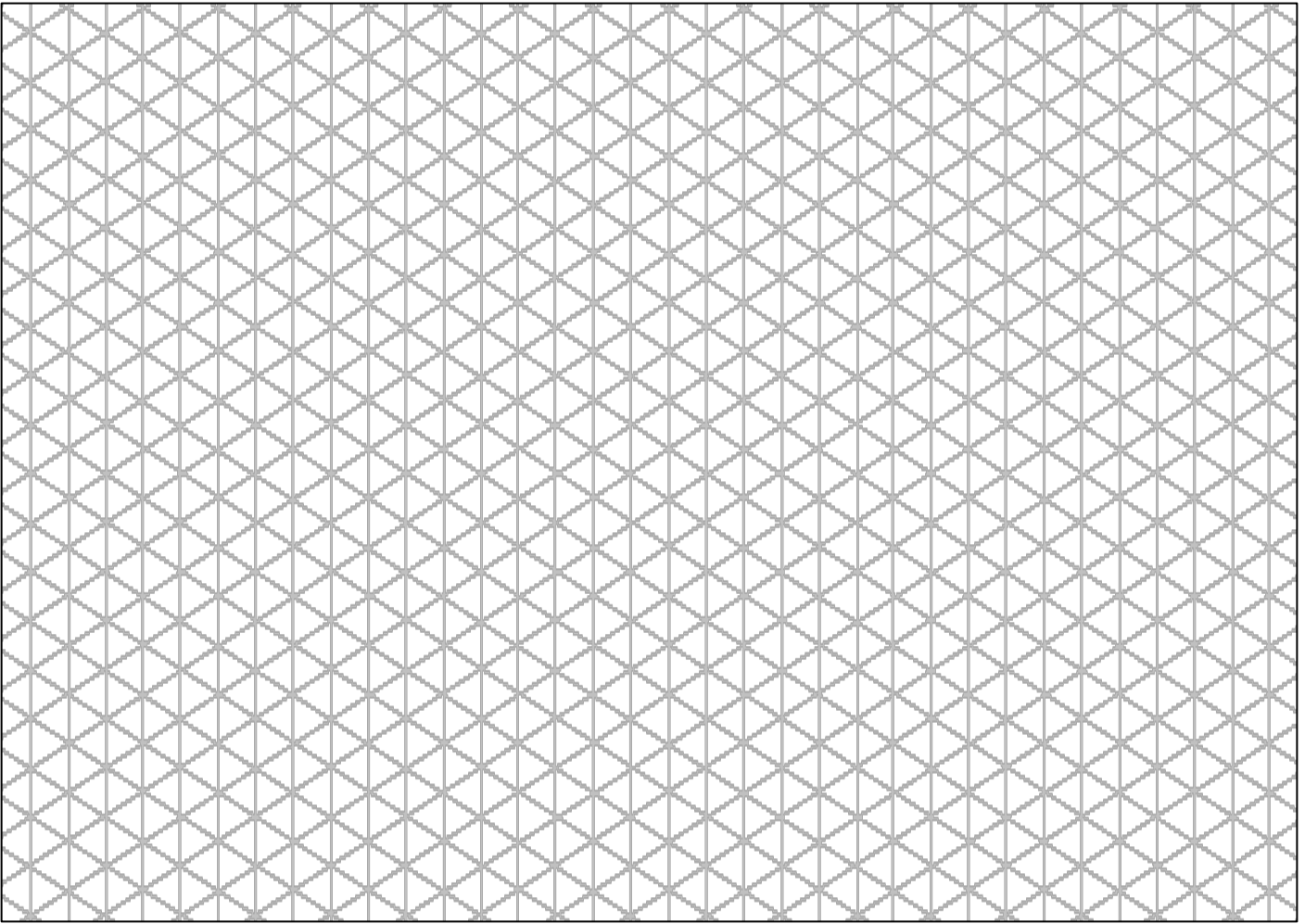
You can make it more stable by adding the following structural member to the structure.



3D ISOMETRIC DRAWING

(To practice 3D isometric drawings)

Draw at least one structural member that will make the above grain crusher sturdy. Draw it on the Isometric



EXTENDED ACTIVITY 7: 3D ISOMETRIC DRAWING

Make an accurate 3D isometric drawing of your grain crusher. Use a ruler. You have to decide on the scale yourself so that the drawing will fit onto a sheet of grid paper.

The drawing does not need to show hidden lines.

Your teacher will look at the following to assess your drawing:

- The drawing accurately shows the design you that sketched
- The drawing shows the dimensions in the correct way
- The drawing is to scale, and the scale is shown
- The drawing has a heading

