Generics
AGEN 005 001

005 Drawings
001 Basic Drawings

Assessment Tool

Learner Name:		Signed:	
Telephone No.:		Date:	
Marks:	Maximal total marks		
	Obtained marks		
	Total obtained marks in percentage	%	
Learner Is:	q Competent q Not Yet Competent		
Occupation Safety and Health Considerations	Follow Health, Safety and Environment ACT 2007 of Kenya.		
Instructor Name:		Signed:	

Assignment

Task:	Duration : 15 hours
IAC 026, Element 1: Interpret Schematics, Datasheets and Drawings MEM 002,Element 1 – 6: Read and produce basic sketches and drawings WEL 001, Element 4: Read and Interpret Drawings and Specifications	

Job Statement	Interpret Schematics, Datasheets and Drawings
Performance Criteria	IAC · Importance and function of schematic diagrams is identified and explained · Datasheet compilation and illustration is explained. · Different types of drawings are explained · Oblique and isometric drawings are explained · First and third angle projection is explained MEM · Drawing equipment and materials are identified and selected in line with the requirements of the tasks. · Drawing equipment and materials are handled, used, maintained and stored according to manufacturers' specification and workplace procedures. · Characteristics of different types of geometric forms are identified from specification. · The characteristics and procedures for drawing different geometric forms are identified and applied according to standard. · The freehand sketching and construction of different types of geometric forms is conducted according to standard. · Basic geometrical construction is conducted according to standard. · Different types of angles are measured and bisected using appropriate tools. WEL · Collect working drawing and specification. · Identify portion of working drawing and specification · Identify the terms and abbreviations. · Describe scales, signs, symbols and types of drawings · Interpret the schedules, dimensions and other signs and symbols in the drawing and specification. · Extract material requirements and specifications were from the drawings. · Care for and restore the drawings in a safe place.

Assignment

Resources Required	**List of Recommended Resources** · Text books, websites, manuals · www.instrumentationtoolbox.com · www.us.endress.com/en · Numerous videos, toolbox talks and safety tips and checklists can be found at: www.safety.cat.com · Manufacturers' manuals; Equipment maintenance documentation

Learning Material

Piping and Instrumentation Diagrams:

P&IDs play very important roles in plant maintenance and modification in that they demonstrate the physical sequence of equipment and system as well as how they all connect. During the Design stage they provide the basis for the development of system control schemes, allowing for further safety and operational investigations like HAZOP (Hazards and Operability Study). Piping on a piping and instrumentation diagram (P&ID) is indicated by:

1. Usage: For example, process, drain, nitrogen, blow down, etc.
2. Line Number: The identification number of the line on the plant.
3. Size: Usually in inches.
4. Piping Class: The piping specification, both material and pressure rating
5. The insulation class

The specification is usually given using American standards e.g. American Society of Mechanical Engineers (ASME) or American Petroleum Institute (API). Each installation uses slightly different methods to do this but the end result is the same. The designation here may be a little different from the ones you may come across but the basic components will always be part of the piping designation like above.

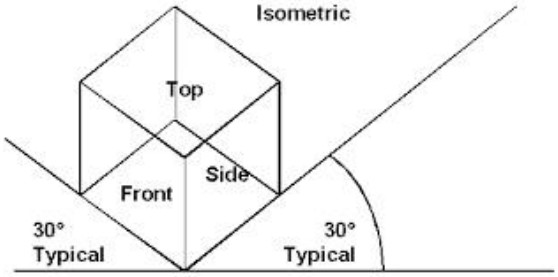
A typical example:

3”-P-12007-A11A-H30

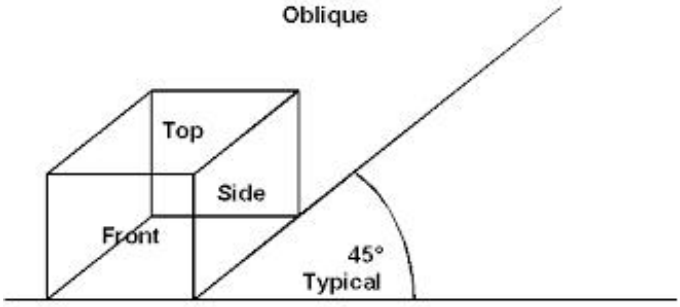
3”	Signifies the line size in inches, i.e. the line size here is 3 inches
P	Signifies fluid service
12007	12 here Signifies unit or facility number while 007 denotes the serial number
A	The flange rating (A11A denotes the piping service class)
11	The piping material
A	A suffix qualifying the piping material
H	The insulation type
30	The insulation thickness

Oblique and Isometric Drawings

Isometric projection is a method for visually representing three-dimensional objects in two dimensions in technical and engineering drawings. It is an axonometric projection in which the three coordinate axes appear equally foreshortened and the angle between any two of them is 120 degrees

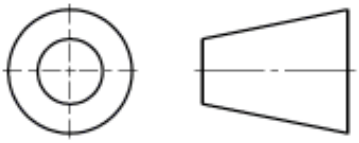


Oblique projection is a simple type of technical drawing of graphical projection used for producing two-dimensional images of three-dimensional objects. The objects are not in perspective, so they do not correspond to any view of an object that can be obtained in practice, but the technique does yield somewhat convincing and useful images.



Differences between oblique sketches and isometric sketches: An oblique sketch puts more focus on the face or front of an object while an isometric sketch puts more focus on the edge of an object. To achieve this, oblique sketches are usually drawn using a 45 degree angle to render the 3rd dimension while isometric sketches are drawn using a 30 degree angle."

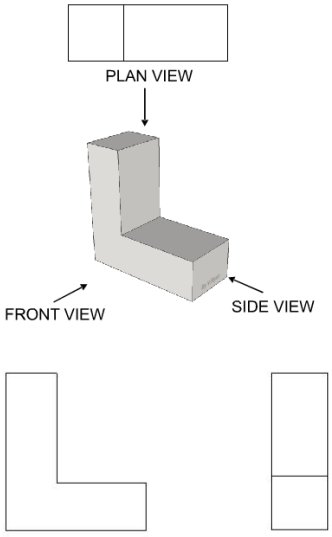
First and third angle projection

First Angle Projection	Third Angle Projection
The object is imagined to be in first quadrant.	The object is imagined to be in third quadrant.
The object is lies between the observer and plane of projection.	The plane of projection lies between the observer and object.
The plane of projection is assumed to be non transparent.	The plane of projection is assumed to be transparent.
When view are drawn in their relative position Top view comes below Front view, Right side view drawn to the left side of elevation.	When view are drawn in their relative position Top view comes above Front view, Right side view drawn to the right side of elevation.
 SYMBOL	 SYMBOL

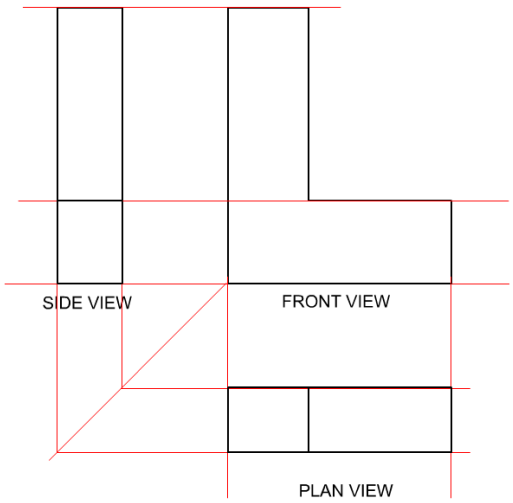
First Angle Projection is used in Europe and most of the world. However America and Australia use a method known as Third Angle Projection.

First angle projection

There are two ways of drawing in orthographic First Angle and Third Angle. They differ only in the position of the plan, front and side views. Below is an example of First Angle projection.



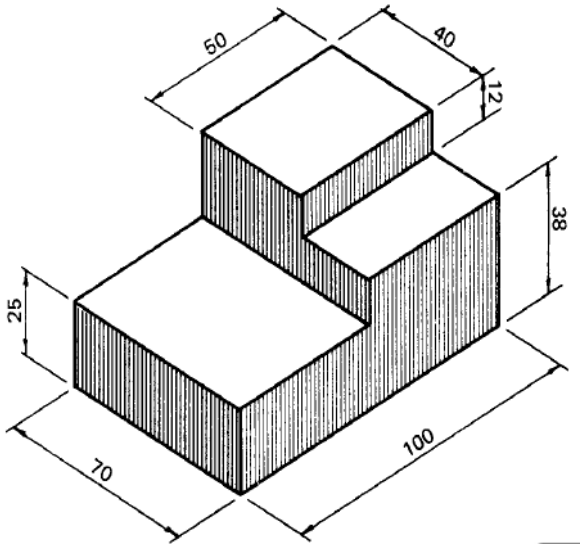
The correct method of presenting the three views, in first angle orthographic projection is shown below. The drawing is composed of a front, side and plan view of the L-shaped object. The first drawing is the front view, the second is a drawing of the L-shape seen from the side, known as side view and last of all a drawing from above known as a plan view. The red lines are faint guidelines and they are drawn to help keep each view in line, level and the same size.



Learning Exercise

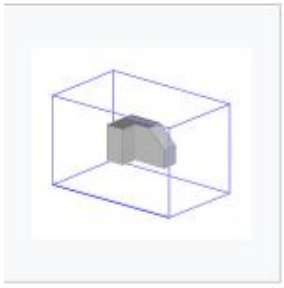
Learner Name:		Signed:	
Class:		Date:	

Sketch the first angle projection of the component below. Clearly show the front, side and plan views and use guidelines to keep them level.

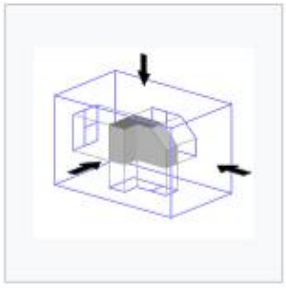


First angle projection and Third Angle Projection

First Angle Projection:
In first-angle projection, the object is conceptually located in quadrant I, i.e. it floats above and before the viewing planes, the planes are opaque, and each view is pushed through the object onto the plane furthest from it. Extending to the 6-sided box, each view of the object is projected in the direction (sense) of sight of the object, onto the (opaque) interior walls of the box; that is, each view of the object is drawn on the opposite side of the box. A two-dimensional representation of the object is then created by "unfolding" the box, to view all of the interior walls. This produces two plans and four elevations.



An image of an object in a box.



The same image, with views of object projected in the direction of sight onto walls using first-angle projection.

Similar image showing the box unfolding from around the object.

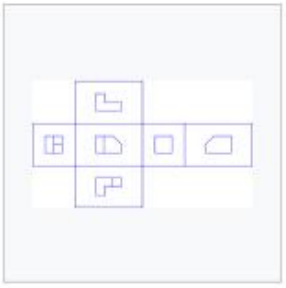
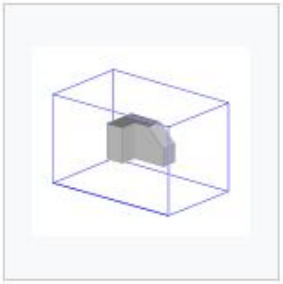
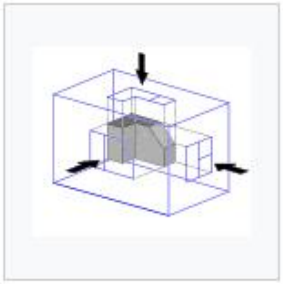


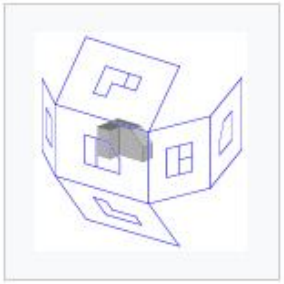
Image showing orthographic views located relative to each other in accordance with first-angle projection.

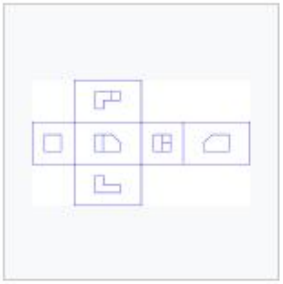
Third Angle Projection

In third-angle projection, the object is conceptually located in quadrant III, i.e. it is positioned below and behind the viewing planes, the planes are transparent, and each view is pulled onto the plane closest to it. Using the 6-sided viewing box, each view of the object is projected opposite to the direction (sense) of sight, onto the (transparent) exterior walls of the box; that is, each view of the object is drawn on the same side of the box. The box is then unfolded to view all of its exterior walls.









Practical Assessment:

Task 1:

Piping and Instrumentation Diagrams: A typical line number or line designation would be as follows:

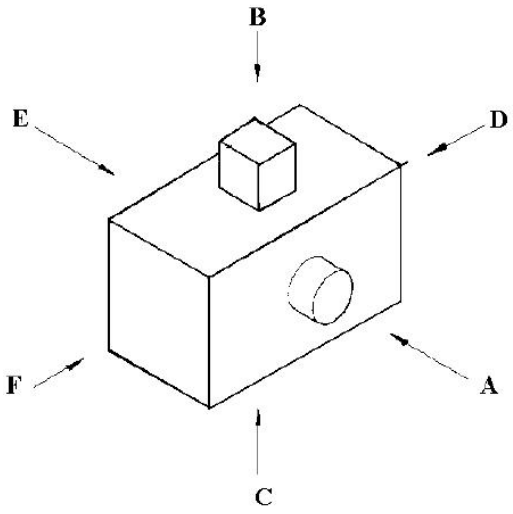
3" PV-500-040-A-2"HC-ST

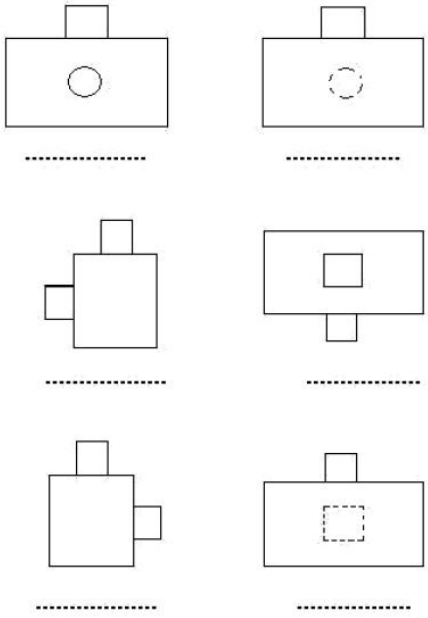
Fill in the table and explain the specifications.

3”	
PV	
500	
040	
A	
2”HC	
ST	

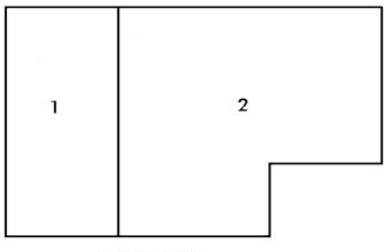
Practical Assessment:

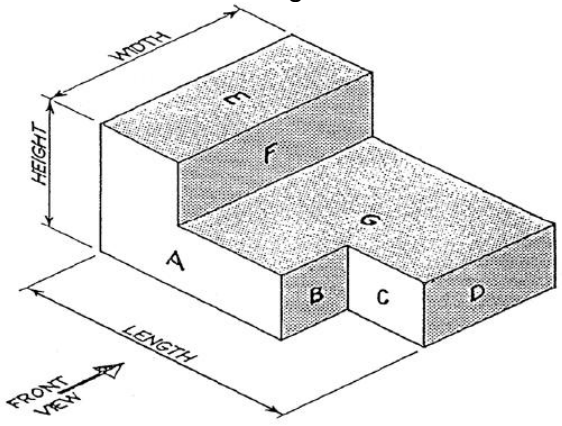
Task 2:
First and third angle projection: In which direction must the object be viewed to produce the views shown opposite, taking 'A' as the FRONT VIEW. Put the appropriate letter under the view.

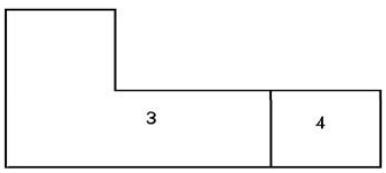




Task 3:
Study the two drawings and complete the table by matching the numbered surfaces of the orthogonal drawing with the lettered surfaces of the isometric drawing.



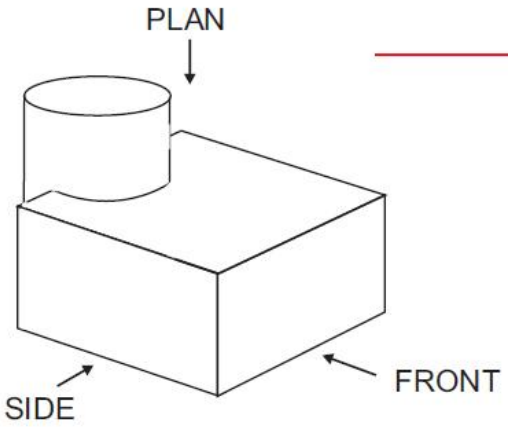




A	B	C	D	E	F	G

Practical Assessment:

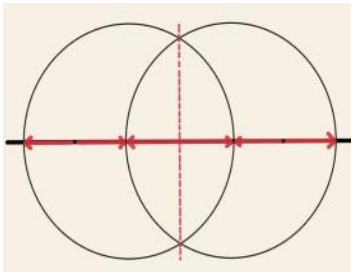
Task 4:
First and third angle projection: Freehand sketching. Sketch, on the space provided the first angle projection of the component below. Clearly show the front, side and plan views and use guidelines to keep them level.



Practical Assessment:

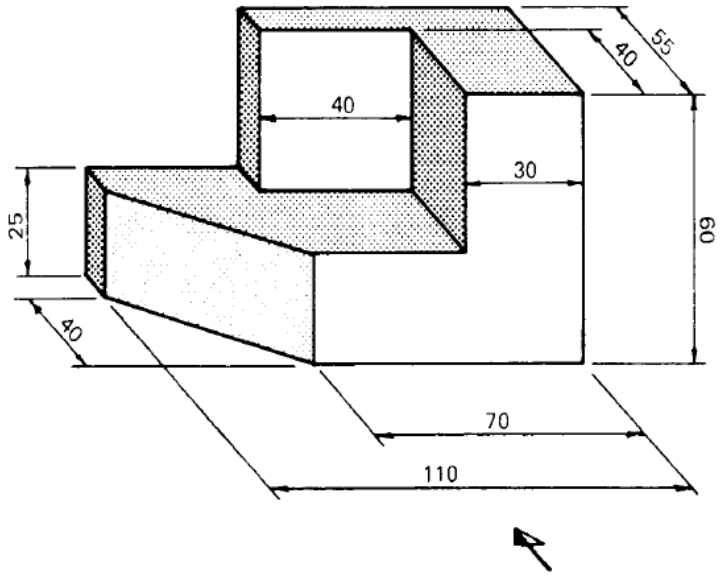
Task 5: Bisecting a Line

1. Use correct drawing tools
2. Bisect a line of with given distance of 80mm.
3. Finish your drawing and ensure all dimensions are correct



Practical Assessment:

Task 6:
First and third angle projection: Freehand sketching. Sketch, on the space provided the third angle projection of the component below.



Practical Assessment:

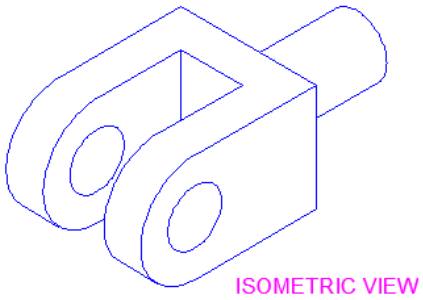
Task 7:
Read and produce isometric and orthographic sketches and drawing, and Read and produce basic pattern drawings.

Sketch ball pain claw hammer and sketch a spring divider

a) Interpret type of drawing correctly
b) Use the correct drawing lines and dimensions and symbols
c) Apply the appropriate drawing views
d) Interpret the sketch and draw.
e) Finish your drawing and ensure all dimensions are correct
f) Clean and store all tools and materials.

Practical Assessment:

Task 8:
Draw the figure below in third angle projection view



Assessment Checklist

Items to be Evaluated	Tolerance	C	NYC
The student understands and explains piping codes, for example 3" PV-500-040-A-2"HC-ST.	**N/A**		
The student reads different types of drawings, for example first and third angle projection or oblique and isometric drawings.	**N/A**		
The student draws first angle sketches under following criteria. · Composition and correctness of perspective · Overall quality of representation · Quality of lines · Lines in parallel · Correctness of relative proportions	**N/A**		
The student is able to draw third angle sketches under following criteria. (Task 6, Task 8) · Composition and correctness of perspective · Overall quality of representation · Quality of lines · Lines in parallel · Correctness of relative proportions	**N/A**		
Bisecting a line (Task 5): · Where drawing tools used effectively? · Was correct paper size used? · Was the title block well done? · Was bisecting a line done correctly?	**N/A**		
Read and produce isometric and orthographic sketches and drawing, and Read and produce basic pattern drawings (Task 7). · Were drawings symbols interpreted correctly? · Were different types of drawing and sketches interpreted appropriately · Were drawing tolerances ±1mm used correctly? · Were drawing and sketches done correctly?	**N/A**		

Sample Answer - Practical Assessment:

Piping and Instrumentation Diagrams: A typical line number or line designation would be as follows.

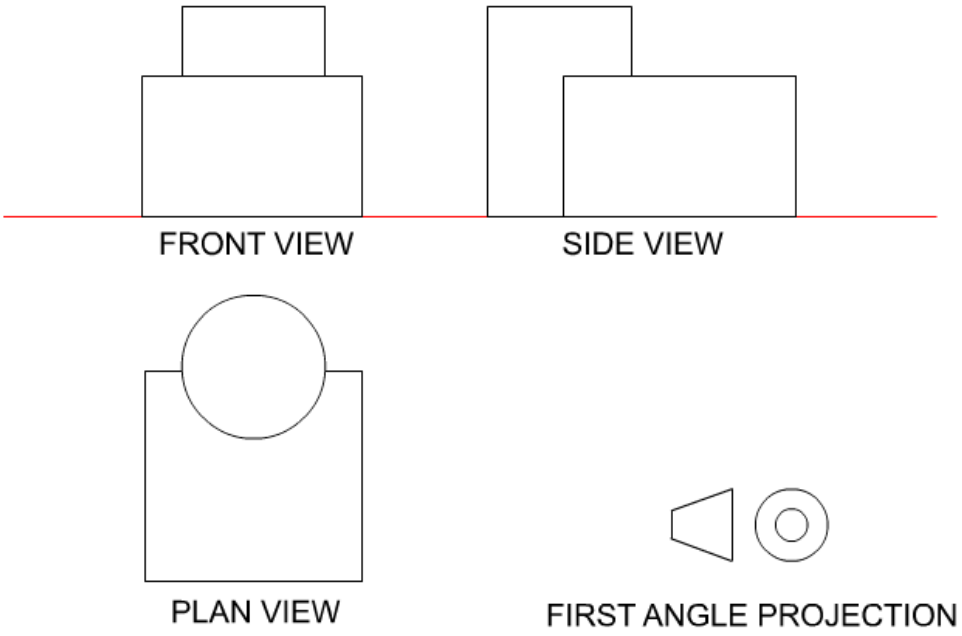
3" PV-500-040-A-2"HC-ST

Fill in the table and explain the specifications.

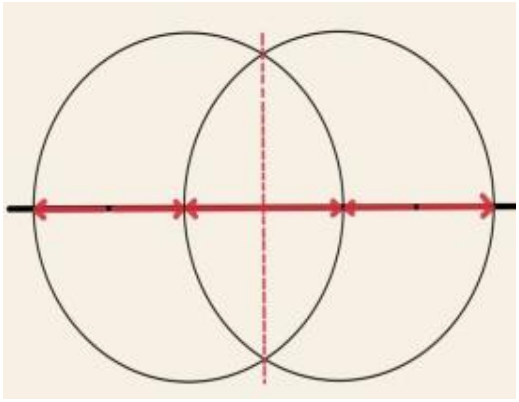
3”	Nominal diameter of the line
PV	Service Classification
500	Line Number
040	Pipe Schedule
A	ANSI Pressure Rating
2”HC	Coating or Insulation thickness and function. This example shows 2" insulation for the purpose of heat conservation. Other examples might be CC for cold conservation, FP for fire protection or PS for personnel safety. Some coatings might be C for cement lined pipe, F for fiberglass, G for galvanized, P for plastic. This is an optional item and is typically left off if there are no entries on it.
ST	Type of heat tracing to be used. This example shows steam tracing as the type of heat tracing. Other examples might be ET for electrical tracing.

Sample Answer - Practical Assessment:

First and third angle projection: Freehand sketching. Sketch, on the space provided the first angle projection of the component below. Clearly show the front, side and plan views and use guidelines to keep them level.



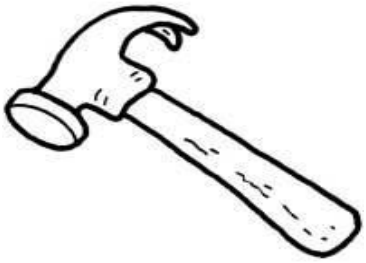
Task 5: Bisecting a Line



Sample Answer - Practical Assessment:

Task 7:
Read and produce isometric and orthographic sketches and drawing, and Read and produce basic pattern drawings.

Sketch of ball pain claw hammer and spring divider



Task 8:
Draw the figure below in third angle projection view