WORKSHOP TECHNOLOGY & CONVENTIONS IN DRAWING

1. Difference between cross filing and draw filing.
Ans:

Aspect	Cross Filing	Draw Filing
File Movement	Diagonal or perpendicular to the workpiece	Parallel to the workpiece, along its length
Purpose	Rough shaping, material removal	Fine finishing, smoothing
Speed	Faster material removal	Slower, more controlled process
Surface Finish	Rougher, may leave visible marks	Smoother, finer surface finish
Application	Initial shaping, coarse work	Final finishing, precision work

2. List out the metals used in sheet metal work
Ans: In sheet metal work, several metals are commonly used due to their workability, strength, and various properties that make them suitable for different applications. Here's a list of the most common metals:
Steel, Aluminium, Copper, Brass, Bronze, Titanium, Zinc, Nickel, Lead, Tin

3. What are the properties of moulding sand?
Ans: Moulding sand is a crucial material used in the metal casting process, where molten metal is poured into a mould cavity to form a specific shape. The properties of moulding sand directly affect the quality of the castings produced.

i) **Grain Size:** The size of the individual sand particles plays a significant role in determining the smoothness of the mould surface. Finer sand grains create smoother surfaces, while coarser grains can leave rougher finishes on the cast part

ii) **Shape of Grains:** The shape of the sand particles influences the packing density. Angular or irregular grains tend to have a higher strength because they interlock better than rounded grains, but too angular can reduce flowability

iii) **Clay Content:** Clay acts as a binder, helping the sand particles stick together. The right amount of clay is essential for strength and cohesion, but too much clay can make the sand too sticky or cause cracking during cooling

iv) **Moisture Content:** Moulding sand typically contains moisture (water) to activate the clay and help with compaction. The right moisture content is important: too little water makes the sand dry and weak, while too much can cause steam explosions during casting

v) **Strength:** Moulding sand must be strong enough to withstand the forces exerted by the molten metal without breaking or deforming. The strength of the sand is often enhanced by adding binders or controlling moisture and clay content

vi) **Refractoriness (Heat Resistance):** This property refers to the sand's ability to resist the high temperatures of the molten metal without degrading or altering its shape. Moulding sand needs to maintain its structural integrity during casting, particularly when dealing with metals that have high melting points

vii) **Collapsibility:** After the molten metal has cooled and solidified, the moulding sand must be able to collapse or break away easily to allow the casting to be removed without damaging the product. Proper collapsibility helps in the easy removal of the casting

viii) **Flowability:** he ability of sand to be compacted around the pattern in the mould cavity is important for capturing the pattern details. Flowable sand ensures that the mould fills the entire pattern and produces an accurate casting

ix) **Reusability (Reclamation):** Moulding sand can often be reused multiple times. Its reusability is influenced by how well the sand retains its properties after each use. Proper reclamation techniques can help maintain the sand's quality over several cycles of use

x) **Thermal Expansion:** When exposed to heat, sand expands. This property must be controlled to avoid cracks or deformation in the casting due to uneven expansion

xi) **Binders:** The binder material (like clay or chemical binders) helps hold the sand particles together. The type and quantity of binder significantly influence the sand's strength and plasticity

4. List out the defects in casting.

Ans: Casting defects can occur during the casting process, leading to various issues with the final product. Here are some common types of defects in casting:

I. **Porosity**: Small holes or voids in the casting due to trapped gas or air pockets.
   - **Gas Porosity**: Caused by gas trapped in the molten metal.
   - **Shrinkage Porosity**: Results from the metal shrinking during solidification, leaving voids.

II. **Cold Shut**: Occurs when two streams of molten metal fail to fuse properly during casting, leaving a weak point or crack.

III. **Hot Tear**: Cracks that form in the casting as it cools and solidifies, often due to uneven cooling or internal stresses.

IV. **Inclusion**: Foreign particles (such as slag, sand, or oxides) that become embedded in the casting, weakening the material.

V. **Misrun**: Happens when the molten metal solidifies before it fills the molds completely, leading to an incomplete casting.

VI. **Run-out**: When the molten metal leaks out of the mold before it has fully solidified, causing defects in the casting.

VII. **Sand Burn-In**: Occurs when the mold material reacts with the molten metal, resulting in surface defects like rough spots or discoloration.

VIII. **Scab**: A rough, raised area on the surface of the casting due to mold material adhering to the molten metal.

IX. **Mold Shift**: When parts of the mold shift during the pouring process, leading to misalignment and a defective casting.

X. **Dimensional Deviation**: Casting that does not conform to the desired dimensions due to improper mold design or cooling issues.

XI. **Warping**: Distortion of the casting after it has solidified, often due to uneven cooling rates or internal stresses.

XII. **Laminations**: Layers or weak zones in the casting surface caused by improper cooling or mold filling.

XIII. **Shrinkage**: Reduction in volume as the metal cools and solidifies, leading to internal voids or surface depression.

XIV. **Metallic Flow Lines**: Lines or marks on the surface of the casting caused by the flow of metal during solidification, which may affect the appearance but often do not impact strength.

XV. **Sand Hole:** Small cavities that form on the casting surface when air or gas gets trapped in the mold

5. State the differences between hot working and cold working.

Ans: The main difference between hot working and cold working lies in the temperature at which the metal is processed, which significantly affects the material's properties and the processes used.

i) Temperature

- **Hot Working:** The metal is deformed at a temperature above its recrystallization temperature (typically 60% to 75% of its melting point). This helps prevent the metal from hardening and makes it easier to shape
- **Cold Working:** The metal is deformed at room temperature or slightly above it, below its recrystallization temperature

ii) Effect on Material Properties

- **Hot Working:** The process allows the metal to recrystallize during deformation, reducing internal stresses and improving ductility. This typically results in a refined grain structure
- **Cold Working:** This process increases the material's strength due to strain hardening (also called work hardening), but it can also make the material more brittle

iii) Formability

- **Hot Working:** Easier to form and shape, as the material is softer and more ductile at high temperatures
- **Cold Working:** Requires more force to deform because the material is stronger but less ductile at room temperature

iv) Surface Finish

- **Hot Working:** The surface finish tends to be rougher due to oxidation and scale formation at high temperatures
- **Cold Working:** The surface finish is typically better because oxidation is minimized at lower temperatures

v) Energy Requirements

- **Hot Working:** Requires less force and energy to deform the metal compared to cold working, as the metal is softer when heated
- **Cold Working:** Requires more energy and force, as the material is stronger and less ductile at lower temperatures

vi) Residual Stresses

- **Hot Working:** The metal is generally free from residual stresses because the recrystallization process removes them
- **Cold Working:** The process introduces residual stresses due to strain hardening, which can affect the mechanical properties of the material

vii) Types of Processes

- **Hot Working:** Includes processes like hot rolling, forging, extrusion, and casting
- **Cold Working:** Includes processes like cold rolling, drawing, bending, and cold forging

viii) Dimensional Accuracy

- **Hot Working:** Typically results in less dimensional accuracy due to the difficulty in controlling the cooling rate and temperature

- **Cold Working**: Generally results in better dimensional accuracy, as it's easier to control the material at room temperature

ix) Applications

- **Hot Working**: Used for large deformations and when the material needs to be shaped into complex forms. It's common in producing billets, pipes, and large structural components
- **Cold Working**: Used for producing parts that require fine details, high surface finish, or increased strength, such as thin sheets, wires, and precision components

6. Define the following forging operations (a) swaging and (b) fullering.

Ans: a) Swaging: Swaging is a forging operation where a workpiece is shaped or reduced in size by applying compressive forces using a series of dies or tools. In swaging, the metal is usually hammered or pressed into the desired shape, often by a rotating or reciprocating tool. It is typically used to reduce the diameter of rods, tubes, or wires, or to form tapered ends.

Key features:

- The process involves a die or hammer that strikes the workpiece to shape it.
- It can be performed hot or cold, depending on the material and the desired outcome
- Swaging is commonly used to form parts such as small components, tapered ends, or to reduce the thickness of a material

b) Fullering: Fullering is a forging operation used to shape the metal and reduce its cross-sectional area, especially to form a thinner or narrower portion of a workpiece. A fullering tool, which has a rounded or V-shaped groove, is used to create grooves or indentations along the length of the material. This helps in controlling the flow of metal and directs it to the desired location during the forging process.

Key features:

- Fullering is typically used to create grooves or to thin out a section of the material
- It helps in the initial shaping of a workpiece before further forging operations like drawing out or bending
- This operation is often performed at the beginning stages of forging to prepare the material for subsequent processes

7. List important patterns used in foundry.

Ans: i) Solid patterns are simple and cost-effective, while split and cope-drag patterns allow for more complex shapes

ii) Match plate and shell patterns are used for mass production and high-precision castings

iii) Patterns for cores are crucial for parts with internal cavities.

iv) Other specialized patterns, like swept patterns and lost-wax patterns, are used for specific geometries and high-detail castings

8. State the differences between blanking and punching.

Ans:

Aspect	Blanking	Punching
End Product	The blank (desired part)	The hole (opening)

Purpose	To create a specific part (blank)	To create a hole or opening in the material
Tooling	Die designed for the shape of the part	Die designed for cutting a hole
Material Removed	The blank is the product, and the scrap is discarded	The slug (cut-out material) is the scrap
Typical Use	Producing parts from a sheet, like washers or discs	Making holes for fasteners or design purposes

9. List out three marking tools and three measuring tools used in carpentry.

Ans: Marking Tools:

Pencil: A simple and essential tool used to mark measurements and outline cuts on wood. Carpenters often use carpenter's pencils, which have a flat lead, making them less likely to roll off surfaces and easier to use for marking straight lines

Marking Gauge: A tool used to mark a precise line parallel to the edge of a piece of wood. It has a metal or wooden head with a sharp point or scribe that can be adjusted to the required measurement

Combination Square: A versatile tool used for marking right angles, 45-degree angles, and measuring. It consists of a ruler with a sliding head that can be locked in place to mark accurate lines

Measuring Tools:

Tape Measure: A flexible measuring tool, usually made of steel or fiberglass, that can measure long distances with high accuracy. It's commonly used for measuring lengths and widths on large pieces of wood

Calliper: A tool used to measure the thickness, depth, or outside and inside diameters of an object. In carpentry, it's particularly useful for measuring the thickness of boards, dowels, or other small dimensions

Spirit Level: A tool used to check the levelness or vertical alignment of a surface. It contains a liquid-filled vial with an air bubble to indicate whether a surface is perfectly horizontal or vertical

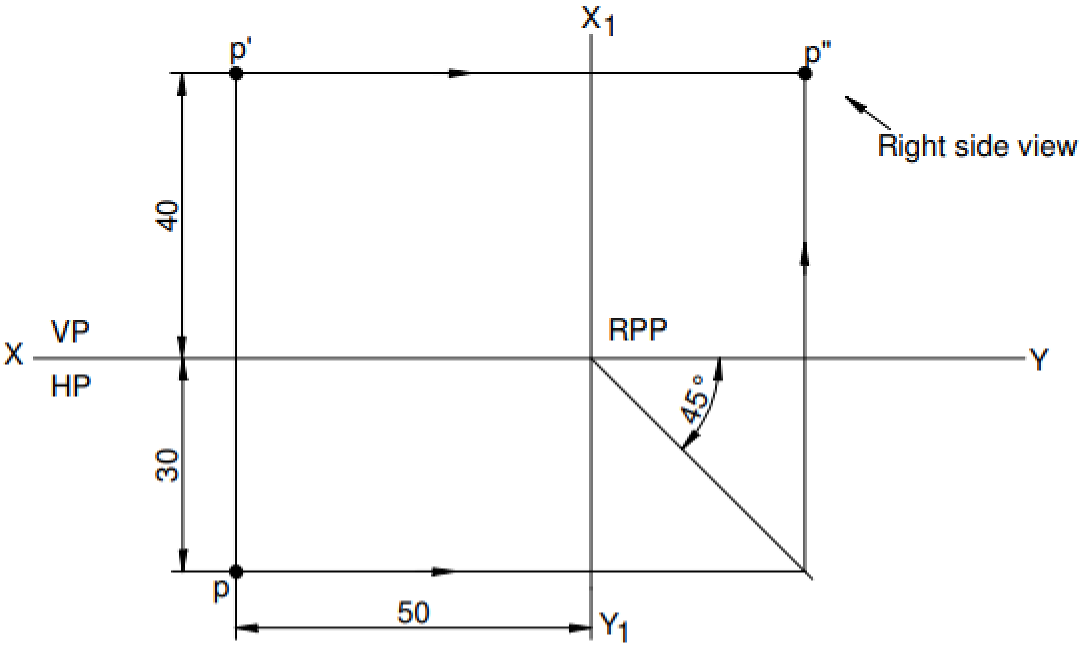
10. Define (a) drilling (b) reaming (c) boring.

Ans: a) Drillimg: Drilling is a cutting process used to create a hole in a workpiece, typically using a drill bit. The drill bit rotates at high speeds and is fed into the material to remove material and form a cylindrical hole. Drilling is often used for creating holes for fasteners, bolts, or other purposes in various materials, including metal, wood, and plastic

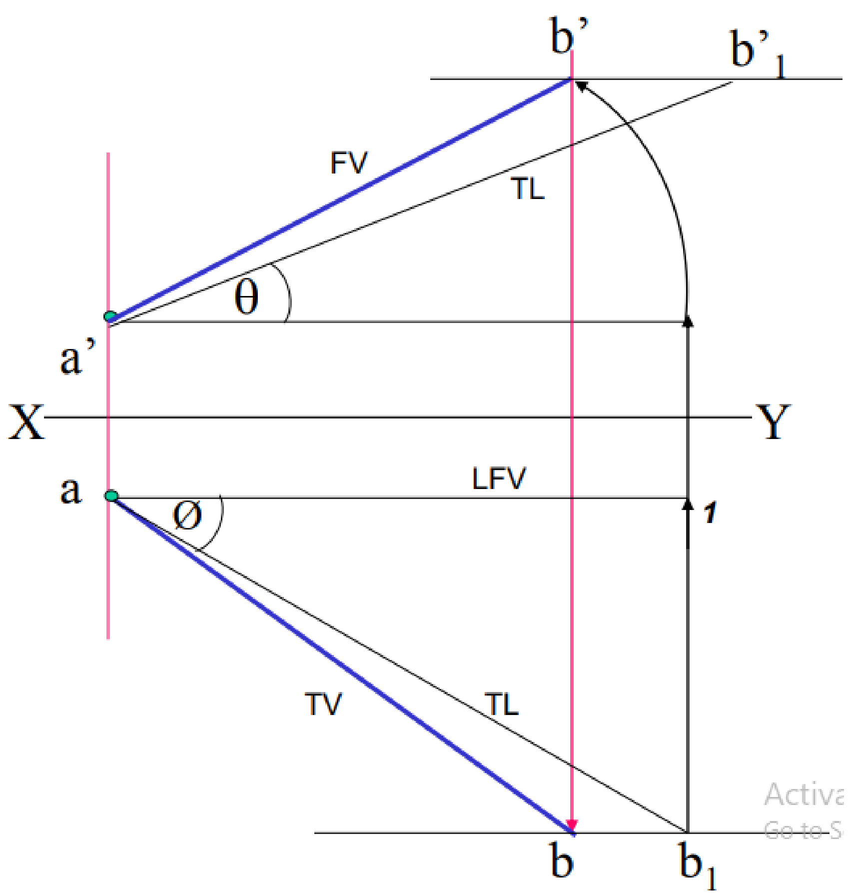
b) Reaming: Reaming is a machining process used to smooth, enlarge, or finish a hole to a more precise diameter after drilling. The process uses a reamer, which is a multi-bladed tool, to refine the hole's surface finish, remove small amounts of material, and achieve a high level of accuracy in terms of size and roundness

c) Boring: Boring is a process used to enlarge or finish an existing hole with high accuracy. Unlike drilling, which creates a hole from scratch, boring works on pre-existing holes (either drilled or cast) and is used to improve hole diameter, finish, or roundness. It can also be used to create larger holes for specific applications, such as in engines or machinery

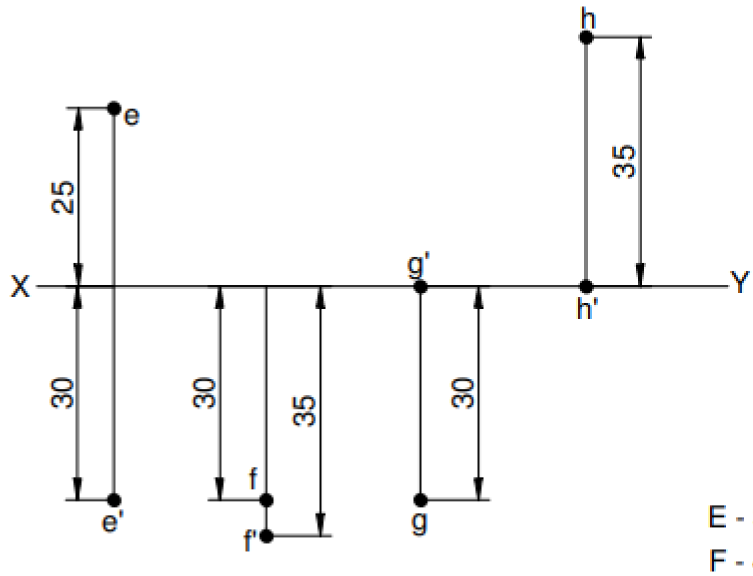
11. A point P is 30 mm infront of VP, 40 mm above HP and 50 mm from RPP. Draw its projections.
Ans:



12. Line AB is 75 mm long and it is 300 & 400 Inclined to Hp & Vp respectively. End A is 12mm above Hp and 10 mm in front of Vp. Draw projections. Line is in 1st quadrant.
Ans:

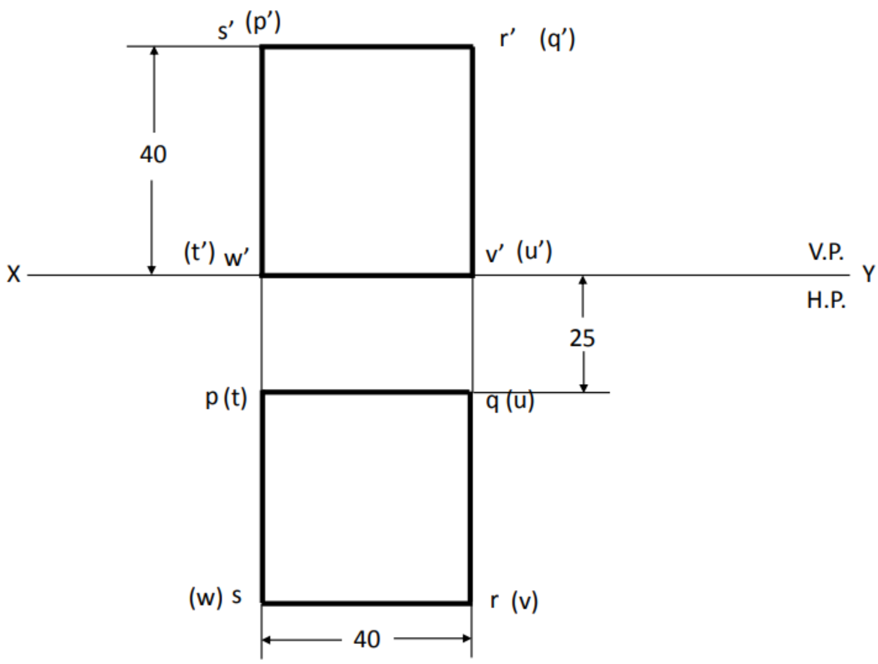


13. Draw the projections of the following points on the same XY line, keeping convenient distance between each projectors. Name the quadrants in which they lie.
E - 30 mm below HP and 25 mm behind VP.
F - 35 mm below HP and 30 mm infront of VP.
G - on HP and 30 mm infront of VP.
H - on HP and 35 mm behind VP.
Ans:



E - 3rd Quadrant
F - 4th Quadrant
G - 1st as well as 4th Quadrant
H - 2nd as well as 3rd Quadrant

14. A cube of side 40 mm rests on the ground with a face parallel to VP and 25 mm in front of VP. Draw the top and front views of the cube.
Ans:



15. Rectangle 30mm and 50mm sides is resting on HP on one small side which is 30^0 inclined to VP,while the surface of the plane makes 45^0 inclination with HP. Draw it's projections.

Ans: