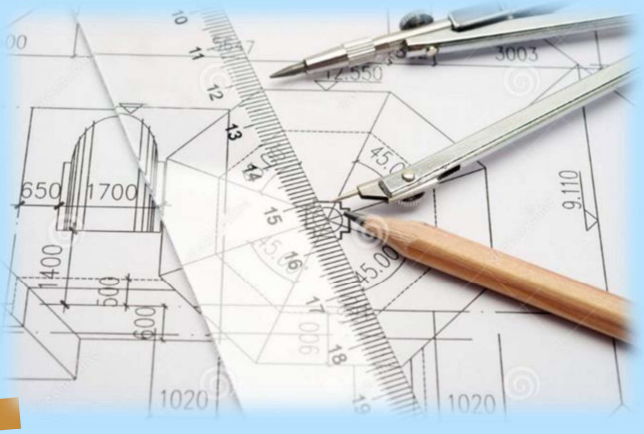
THE UNIVERSITY OF JORDAN

SCHOOL OF ENGINEERING



Engineering Drawing Course

0904131

Practice Sheets

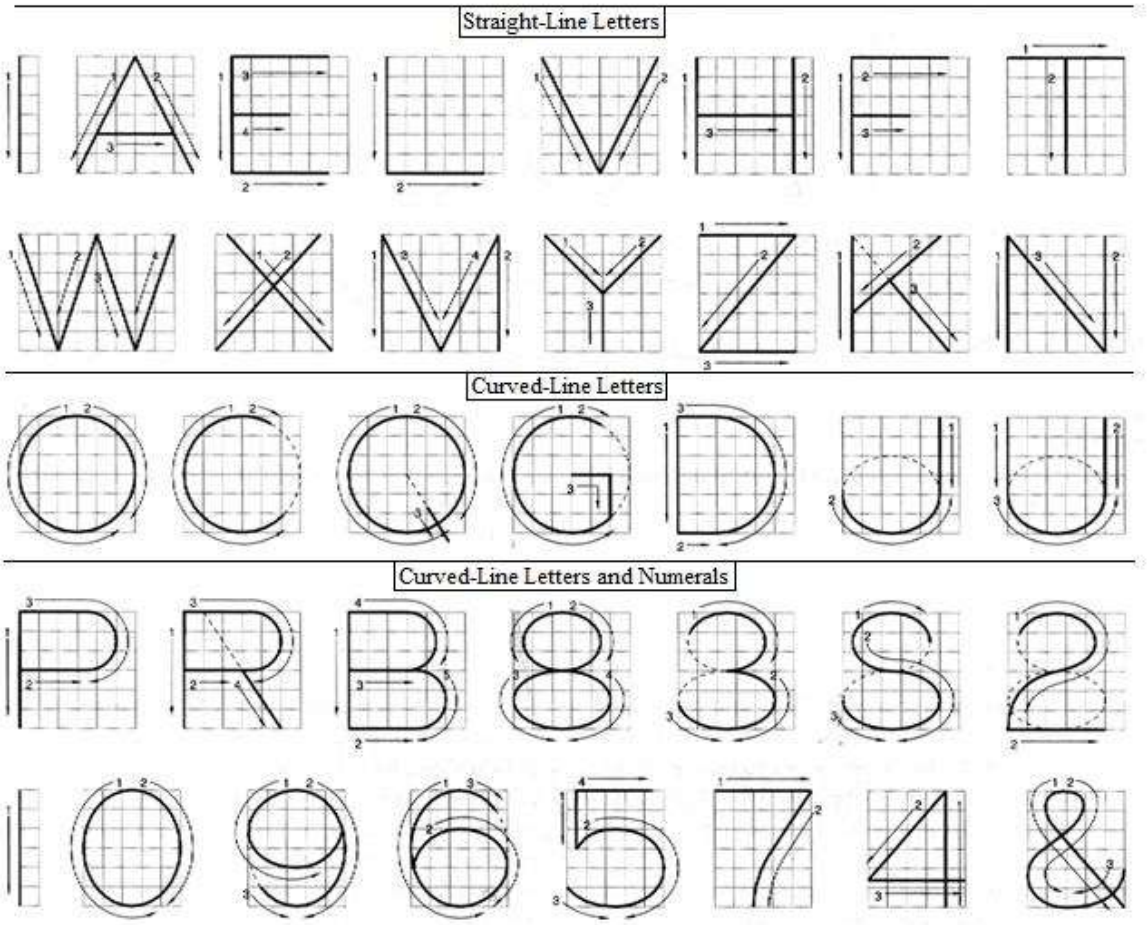
Spring 2020/2021

Topic One: Introduction to Engineering Graphics

ENGINEERING LETTERING

ESSENTIALS OF HAND LETTERING

1. USE THE SINGLE-STROKE, VERTICAL, GOTHIC STYLE OF LETTERING.
2. USE UPPER CASE (CAPITAL) LETTERS ONLY.
3. ALWAYS USE VERY LIGHT GUIDELINES.
4. NORMAL LETTERING IS MADE 3 MM HIGH.
5. TITLES SHOULD BE LETTERED 6 MM HIGH.
6. FRACTIONS ARE LETTERED TWICE THE HEIGHT OF NORMAL LETTERS.
7. FRACTION BARS ALWAYS DRAWN HORIZONTAL.
8. USE MEDIUM (B, HB, OR H) LEAD FOR NORMAL LETTERING.
9. USE A HARD (4H TO 9H) LEAD FOR DRAWING GUIDELINES.



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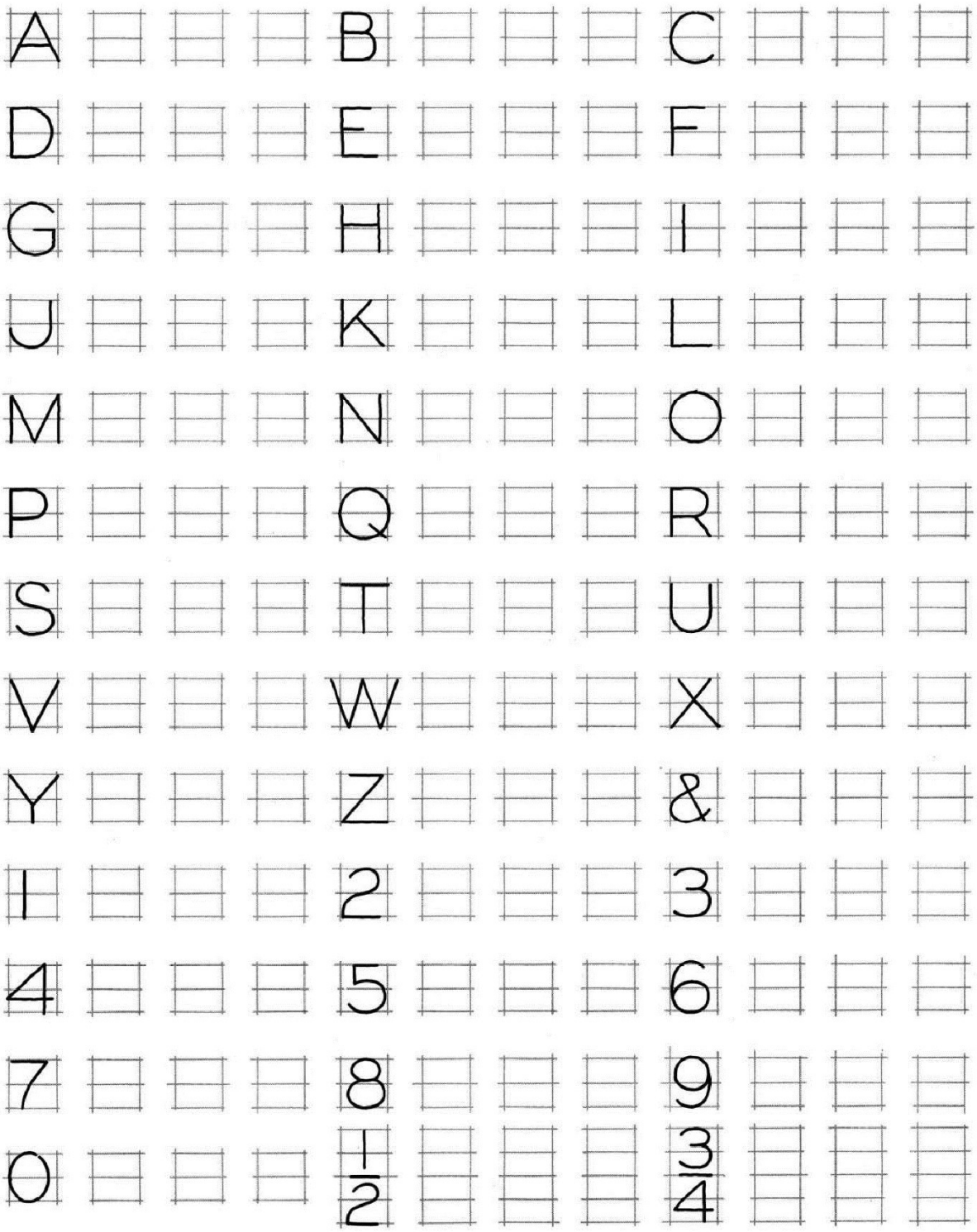
FILE NO.: _____	**DATE:** _____	

Exercise (1): Using **HB** pencil with a slightly rounded point, construct each letter in the spaces provided. Observe the form and the proportion of each letter in order for you to improve your lettering when done smaller.



NAME: _____	**SECTION NO.:** _____	**2**
FILE NO.: _____	**DATE:** _____	

SCALING

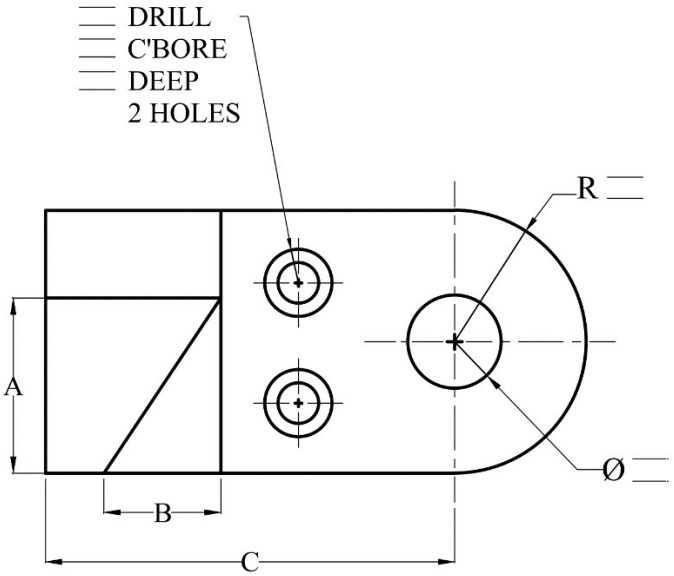
Exercise (2):

A: Use the **metric** scale and measure the dimensions to the nearest whole millimeter from A through H in the two-view below. **Letter** the answer in the guidelines provided for the units indicated.

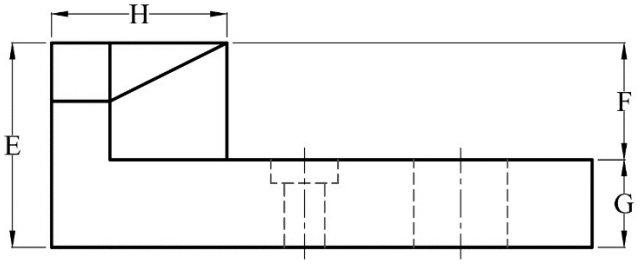
Scale	Dimensions (mm)						
	A	B	C	E	F	G	H
1:1							
1:5							
1:50							
1:200							
2:1							
100:1							

B: Measure the missing dimensions to the nearest whole millimeter. **(Scale 1:1)**

Top View



Front View



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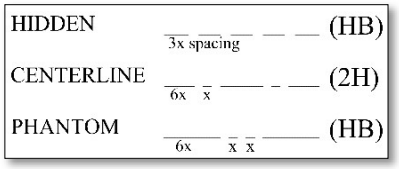
FILE NO.: _____	**DATE:** _____	

TYPES OF LINES



Exercise (3):

a. Draw horizontal lines (8 mm apart) in the following order: **visible (HB), hidden (HB), and centerline (2H)**. Start from the top and repeat until the square is filled.

b. Draw vertical lines (8 mm apart) in the following order: **visible (HB), hidden (HB), and centerline (2H)**. Start from the left and repeat until the square is filled.

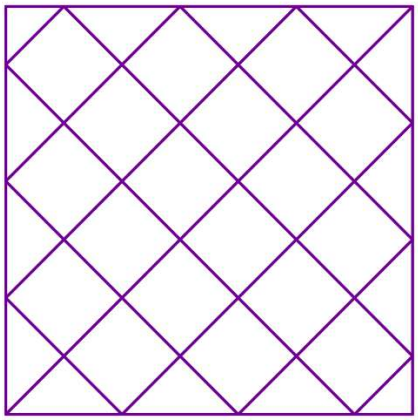
c. Draw **hatch lines (2H)** at (45º) until the square is filled (Space 3mm – 5mm).

d. Divide the given square into **16 equal squares. Show the construction lines.**

NAME: _____	**SECTION NO.:** _____	**4**
FILE NO.: _____	**DATE:** _____	

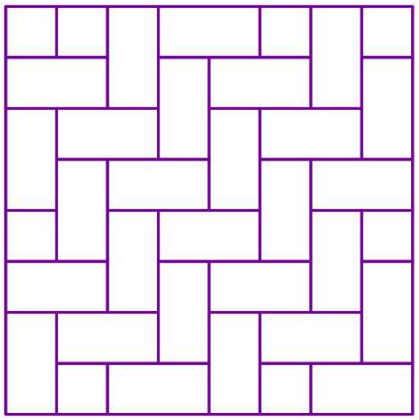
Exercise (4): Draw a copy for the given paving patterns using the two given squares using the procedure in **Exercise 3 (d)**. Show the construction lines.

Diamond



(a)

Herrinbone



(b)

NAME: _____	**SECTION NO.:** _____	**5**
FILE NO.: _____	**DATE:** _____	

Topic Two: Basic Drawing Skills

DRAWING GEOMETERY

1. Constructing a perpendicular bisector for a given line.
2. Dividing a given line into **(n)** equal parts.
3. Drawing a line parallel to a given line at a certain distance.
4. Cases of Tangency:

   Drawing an arc or circle with a given radius **(R)** that is:

   a. Passing through three points.

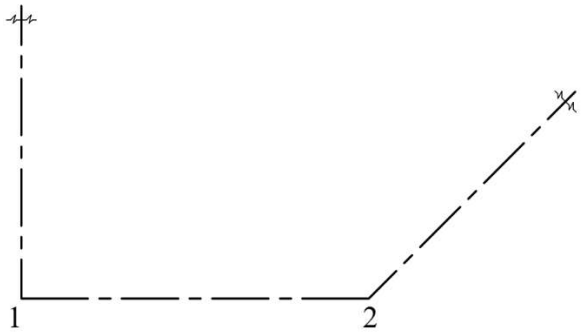
   b. Tangent to two given lines.

   c. Tangent to an arc and a line (concave and convex).

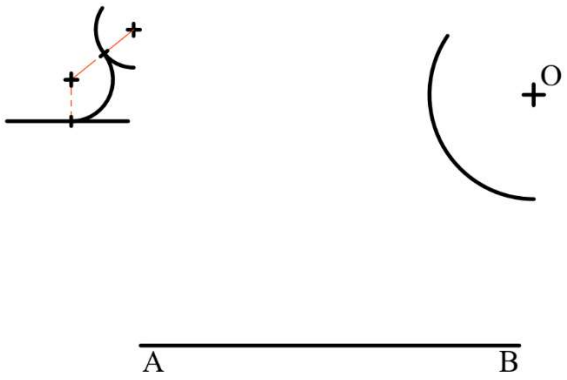
   d. Tangent to two arcs (concave and convex).
5. Constructing a regular, **Polygon** (inscribed in a circle and circumscribed about circle).

Draw the arcs as required in questions from (1) to (6). Mark tangent points and show constructions.

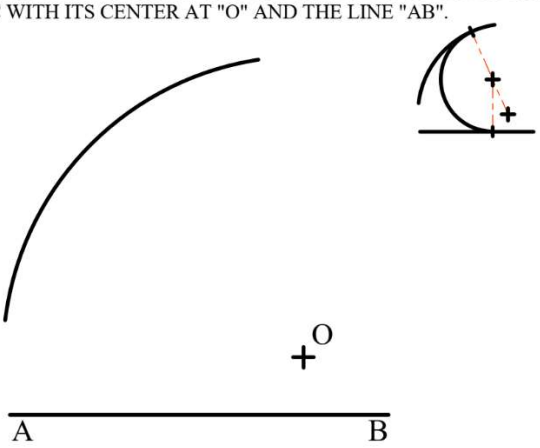
1: CONSTRUCT TWO ARCS OF 28 mm CENTERLINE RADIUS TANGENT TO ANGLES **1** AND **2** IN THE ROADWAY.



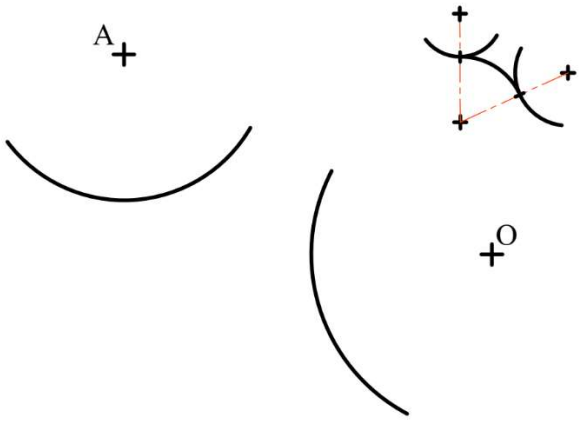
2: DRAW AN ARC OF 19 mm RADIUS TANGENT TO THE GIVEN ARC WITH ITS CENTER AT "O" AND THE STRAIGHT LINE "AB".



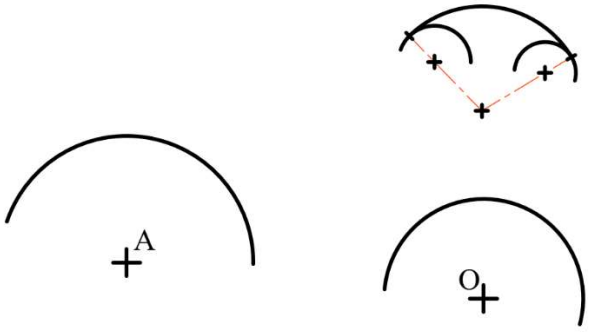
3: DRAW AN ARC OF 20 mm RADIUS TANGENT TO THE GIVEN ARC WITH ITS CENTER AT "O" AND THE LINE "AB".



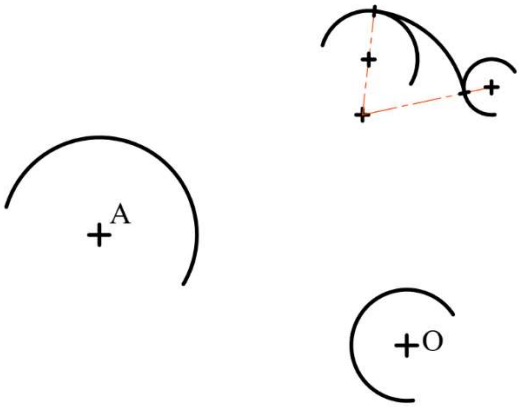
4: DRAW A CIRCULAR ARC OF 32 mm RADIUS TANGENT TO THE TWO GIVEN ARCS WITH CENTERS AT "A" AND "O".



5: DRAW AN ARC OF 48 mm RADIUS THAT IS TANGENT TO THE GIVEN ARCS WITH CENTERS AT "A" AND "O".



6: DRAW AN ARC OF 37 mm RADIUS THAT IS TANGENT TO THE GIVEN ARCS WITH CENTERS AT "A" AND "O".



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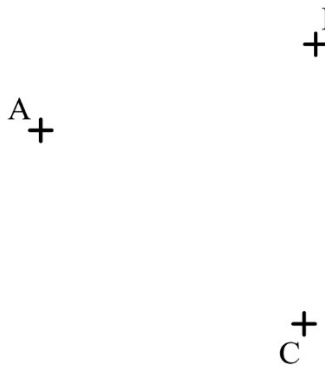
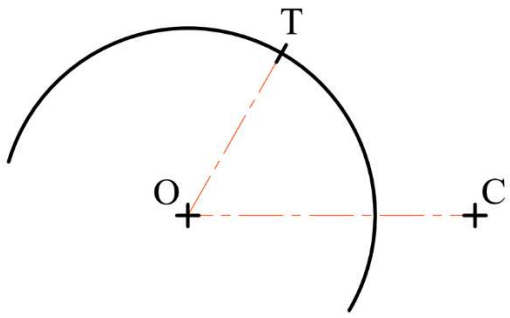
FILE NO.: _____	**DATE:** _____	

7: CONSTRUCT A CIRCLE THAT PASSES THROUGH POINTS "A", "B", AND "C". SHOW CONSTRUCTIONS.



8: FIND THE RADIUS OF THE ARC (TC) THAT PASSES THROUGH POINT (C) AND TANGENT TO THE CIRCLE AT THE POINT (T). DRAW THE TANGENT ARC (TC). SHOW CONSTRUCTIONS.

R = _____ MM



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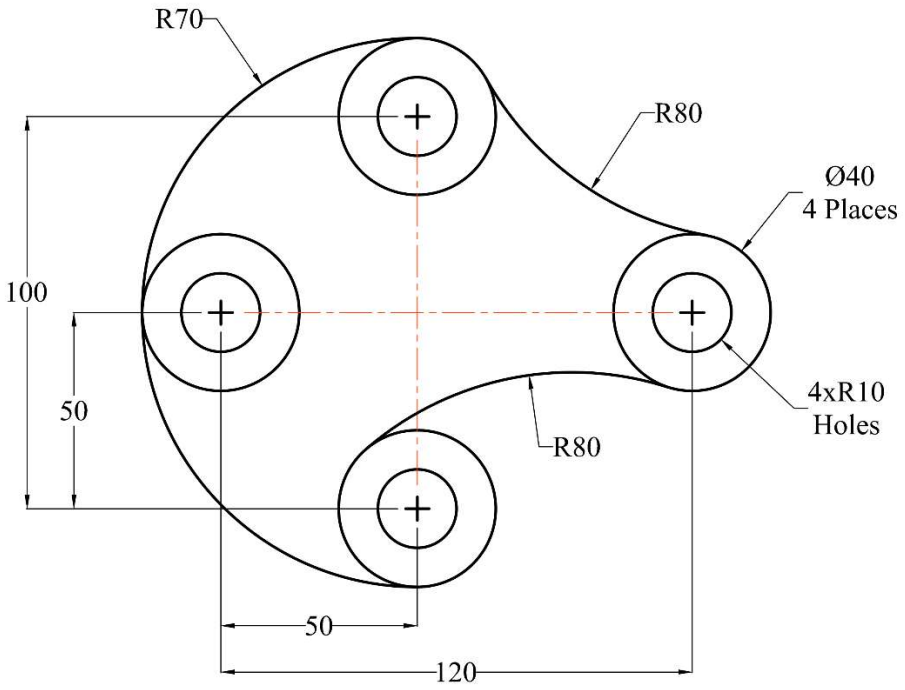
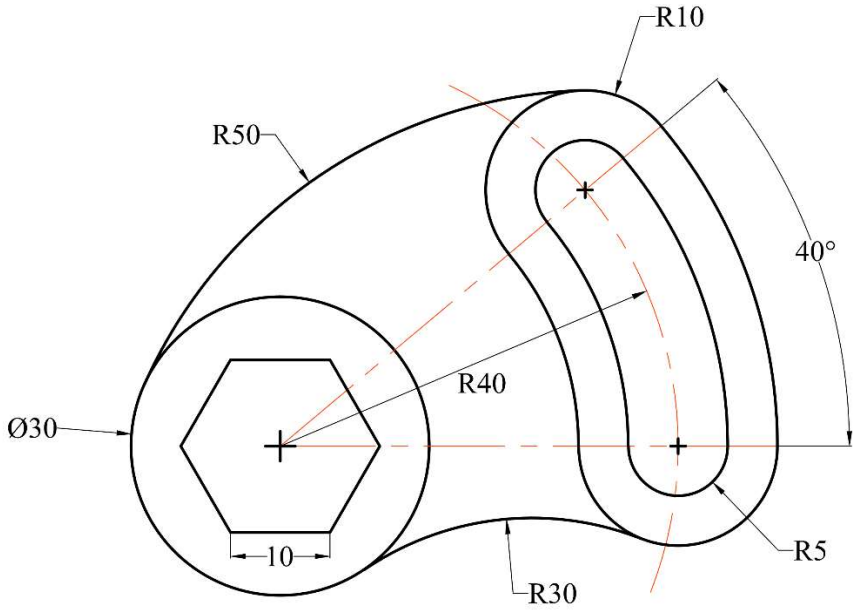
Draw the figures from **(a)** to **(d)** to the indicated scale. Show outlines in **HB** and construction lines in light and thin **2H**. Mark all tangent points with **3 mm dash HB**. **Do not erase construction lines**. Dimensions are in millimeters.



(a): Use Scale 1:1



(b): Use Scale 2:1 (Double size).

Note: The angle does not change by

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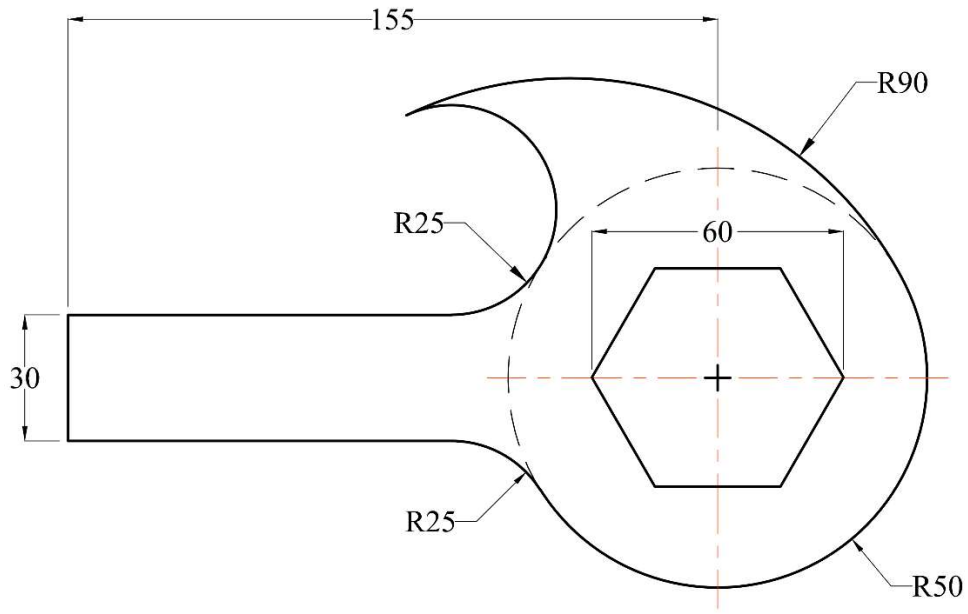
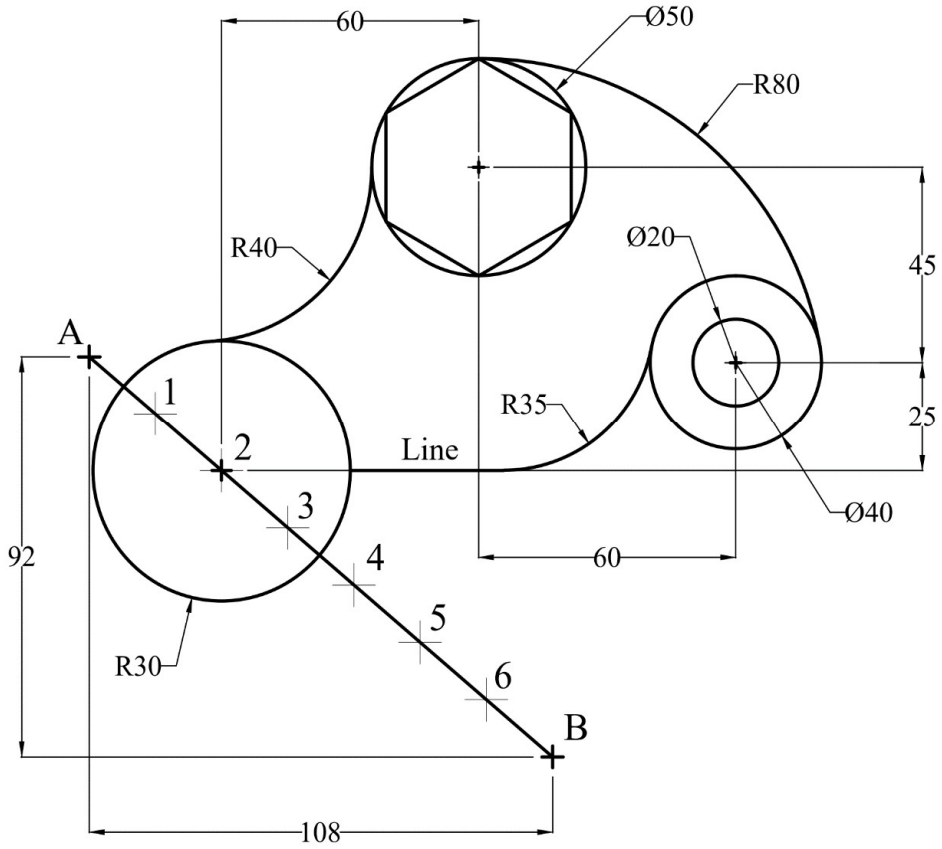


(c): Use Scale 1:1

(d): From point (A) and divide the given line (AB) into 7 equal parts, **(as described in Sheet 4 Ex. 4)**. Use point (2) to start drawing the given shape.



(d): Use Scale 1:1

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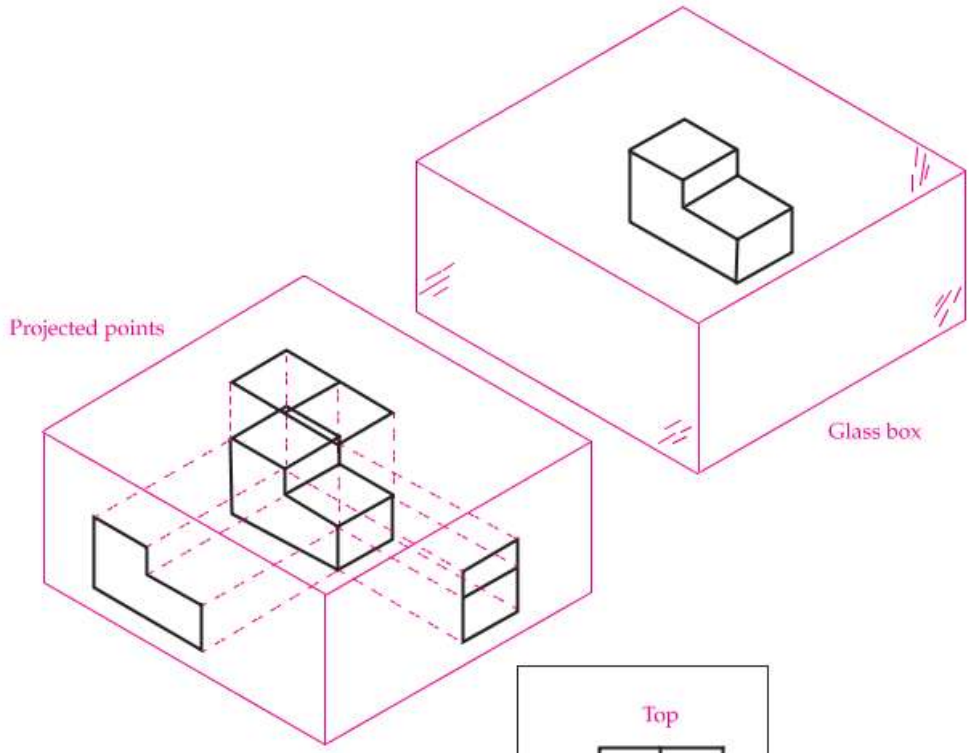
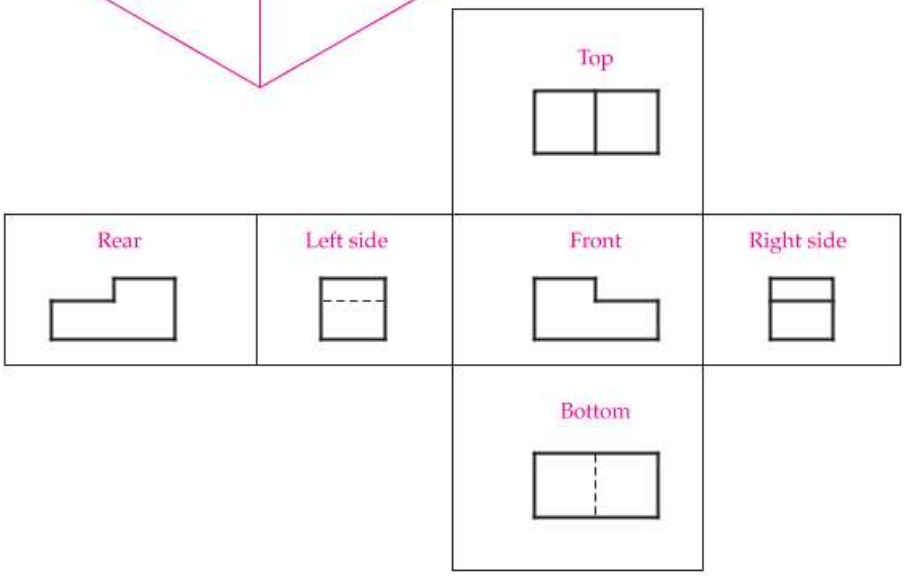
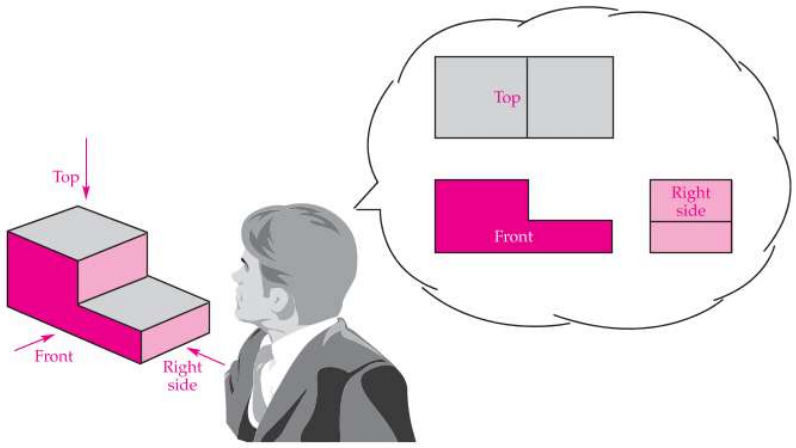
FILE NO.: _____	**DATE:** _____	

Topic Three: Multi-view Orthographic Projection







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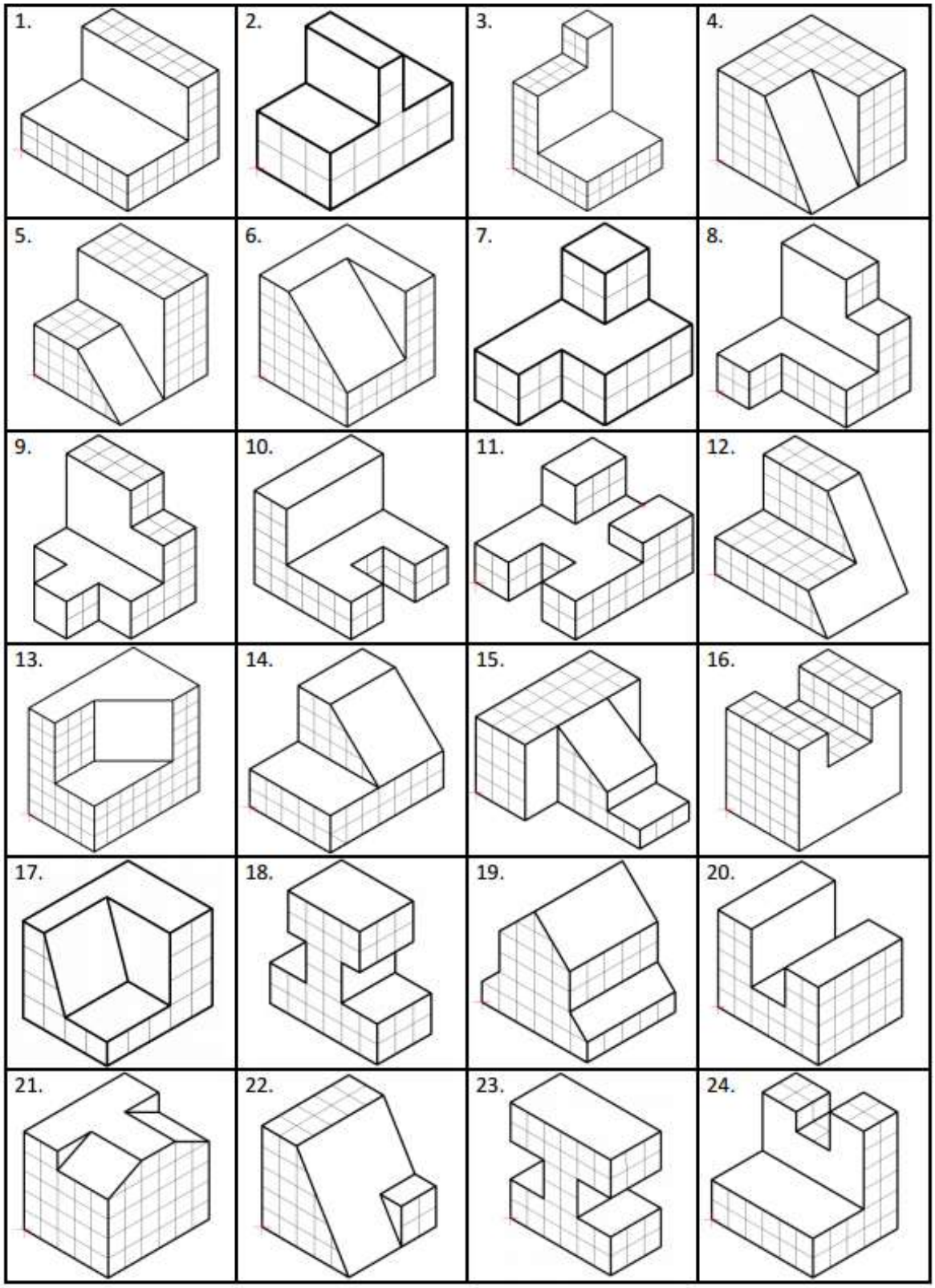
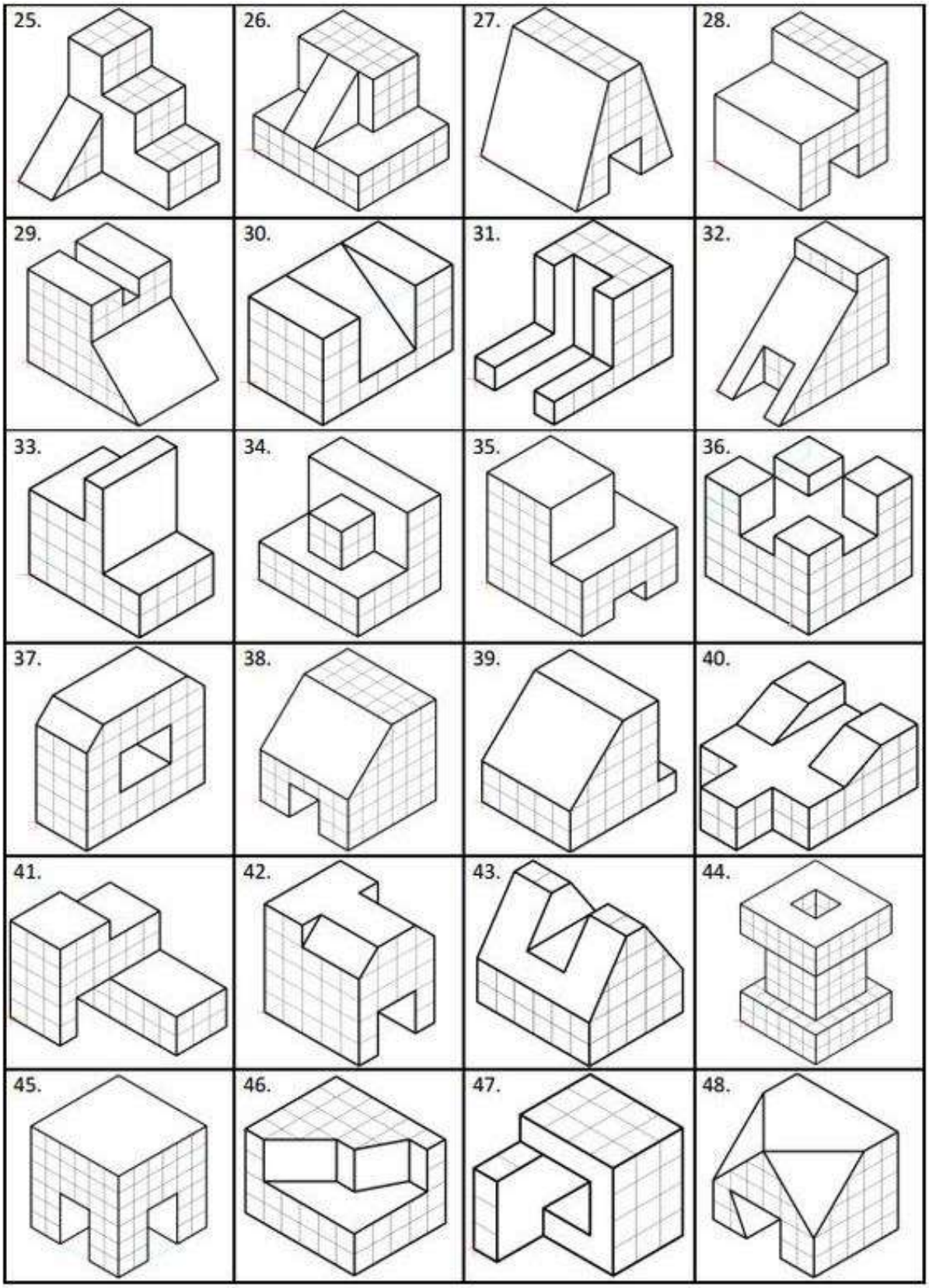
FILE NO.: _____	**DATE:** _____	

Exercise (1): Sketch using freehand, the orthographic projections for all solids.



Exercise (2): Sketch using freehand, the orthographic projections for all solids.



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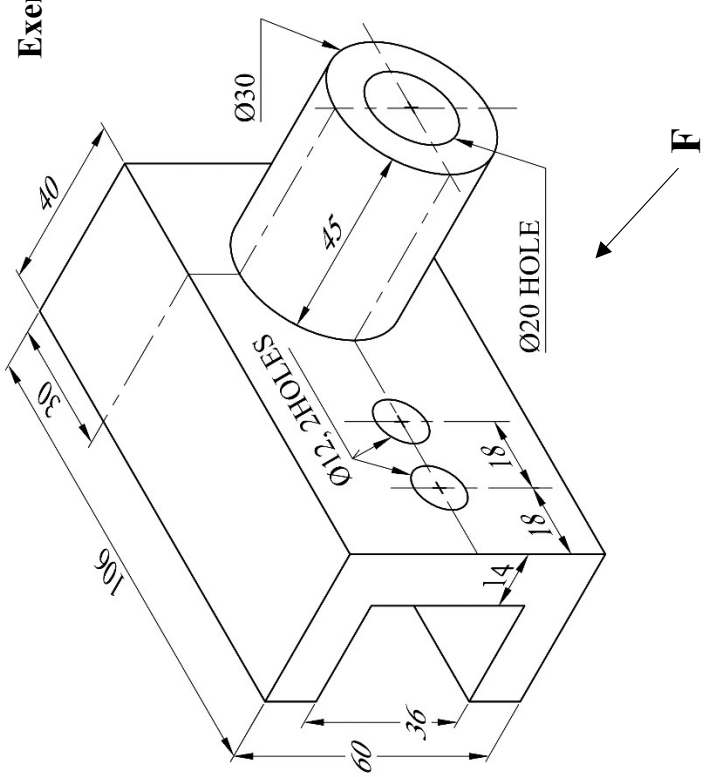
FILE NO.: _____	**DATE:** _____	

Exercise (3): For the given solid, draw the top view, front, and left side view.



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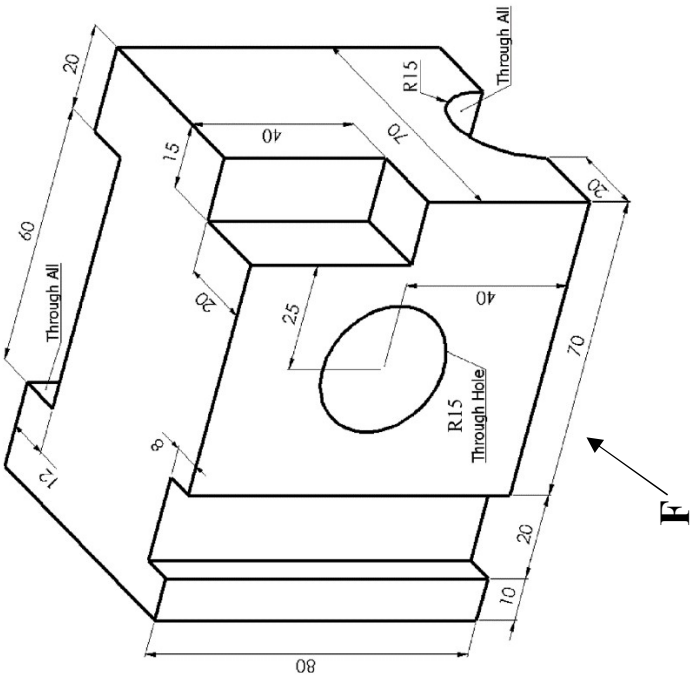

Exercise (4): For the given solid, draw the top view, front, and right side view.

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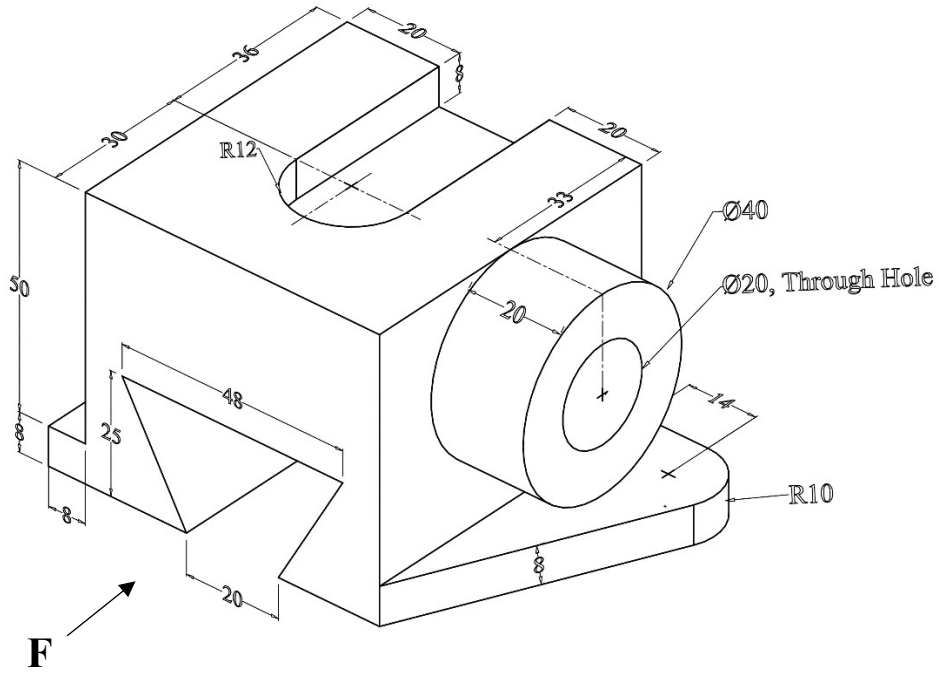
FILE NO.: _____	**DATE:** _____	

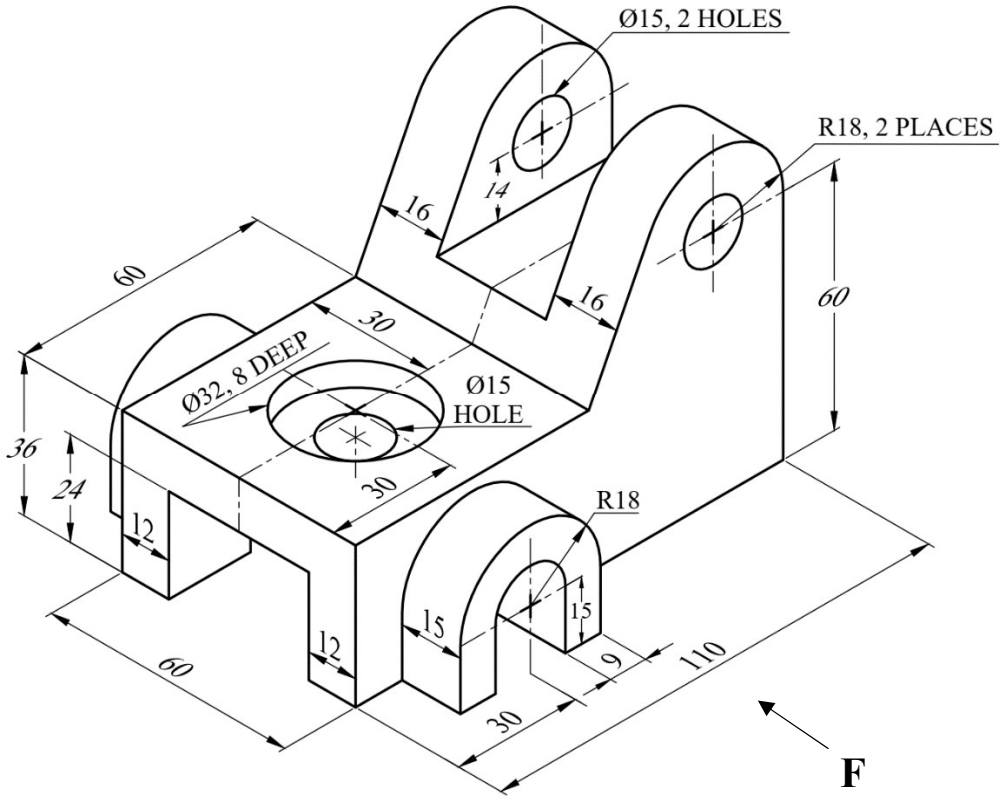
Exercise (5): For the given solids, draw the top view, front, and the side views.

Note: All holes are through.

(A)



(B)



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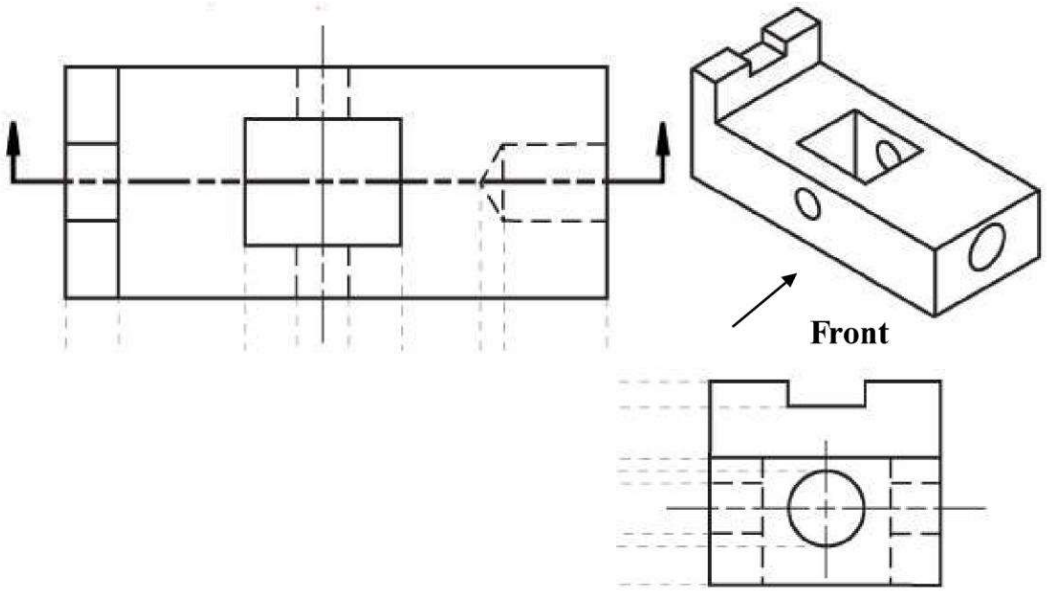
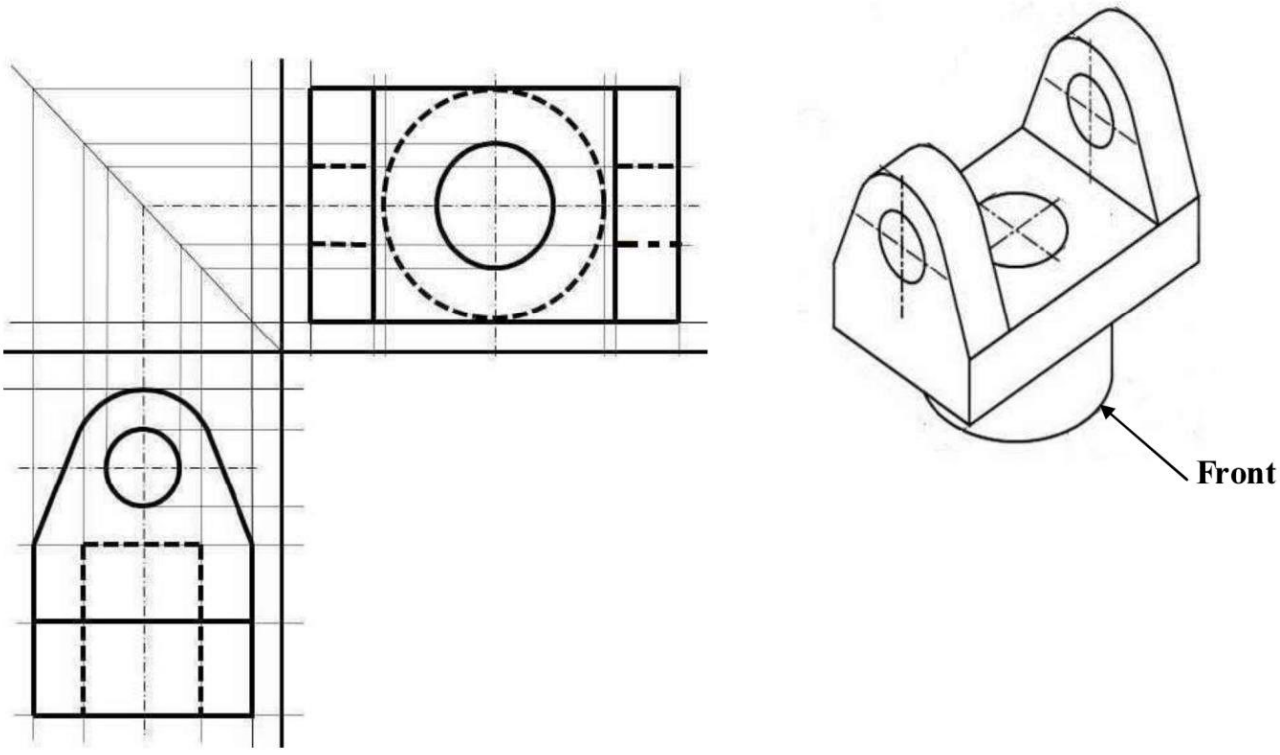
FILE NO.: _____	**DATE:** _____	

Topic Four: Sectioning in Engineering Drawing

Exercise (1): Given the top and the side views, sketch the front view as a full section. Noting that the solid material is mild steel.



(a)

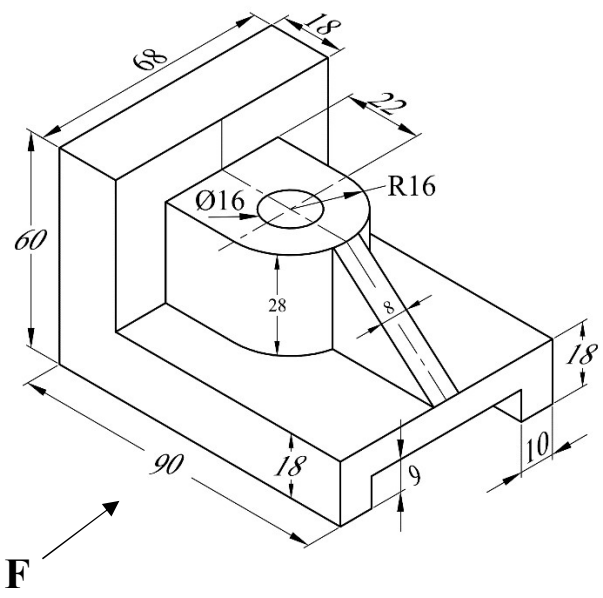


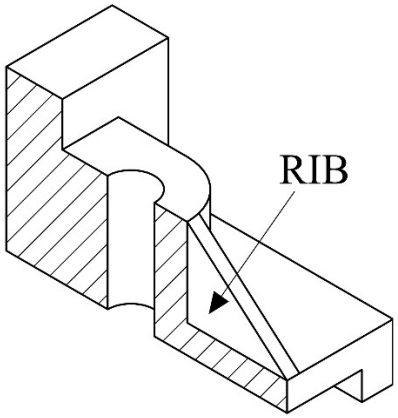
(b)

NAME: _____	**SECTION NO.:** _____	**17**
FILE NO.: _____	**DATE:** _____	

Exercise (2): Draw the full sectional front, top, and the right side views.

Note: All holes are through.





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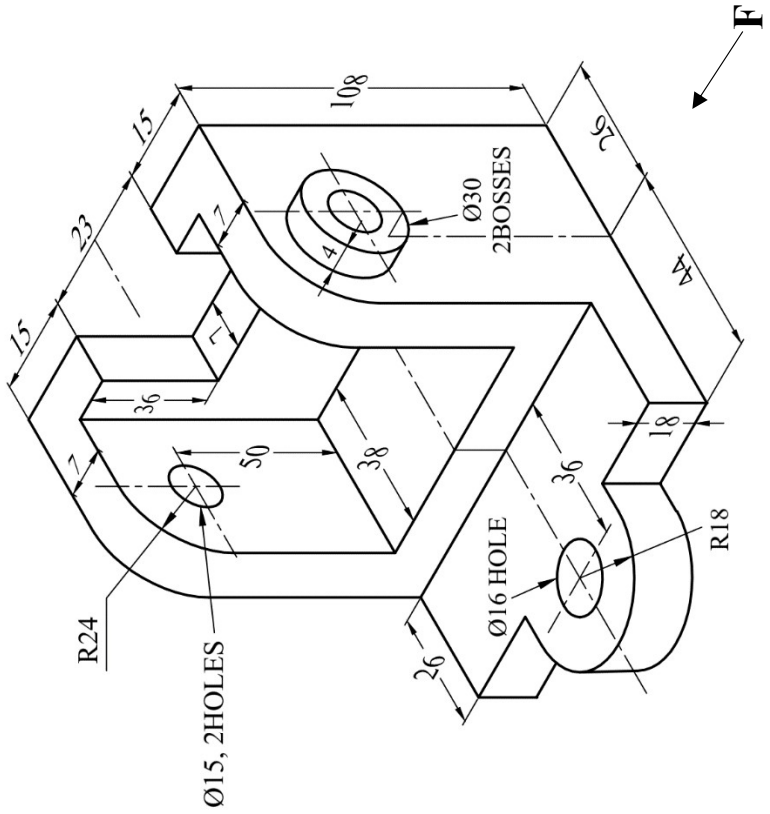
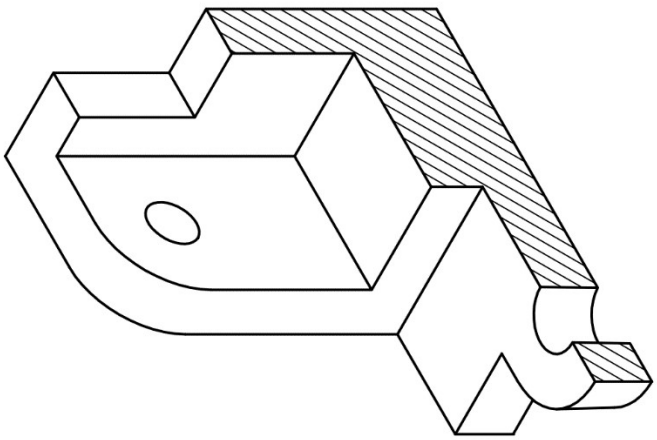
FILE NO.: _____	**DATE:** _____	





Exercise (3): Draw the full sectional front, top, and the left side views.

Note: All holes are through.

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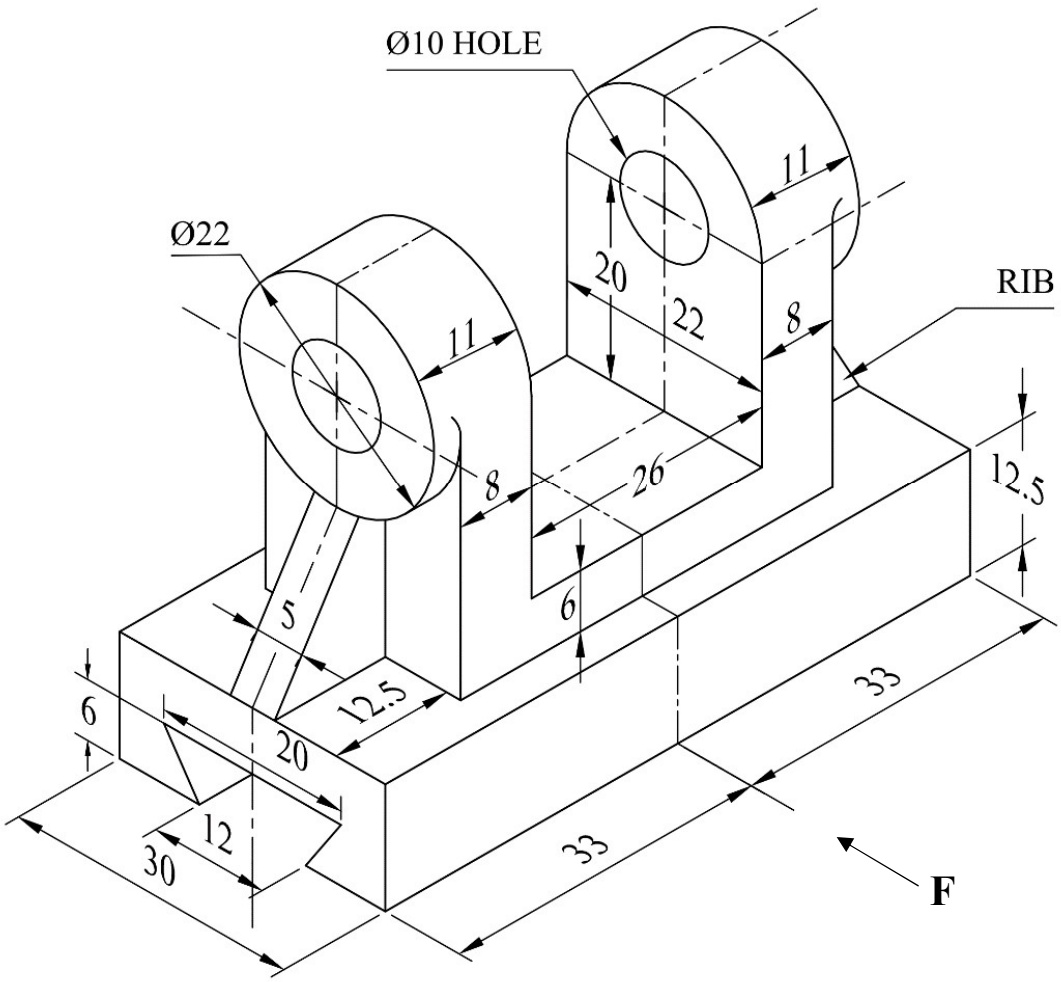
Exercise (4): Draw the full sectional front, top, and the left side views.

Note: All holes are through.



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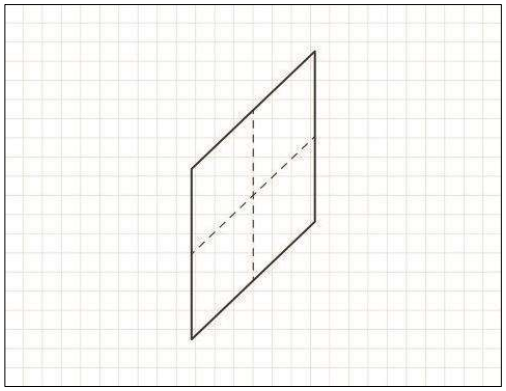
Topic Five: Pictorial Drawing (Oblique and Isometric)

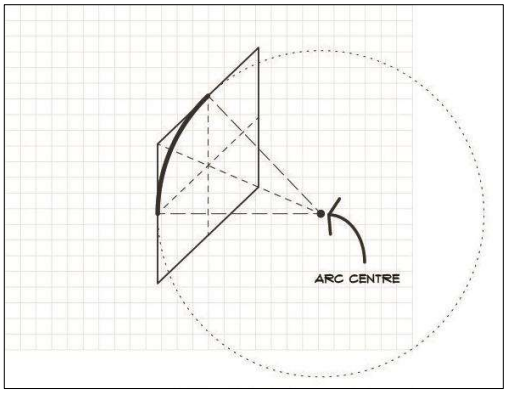
HOW TO DRAW A CIRCLE IN OBLIQUE AND ISOMETRIC VIEWS USING "FOUR CENTER" METHOD

OBLIQUE CIRCLE *

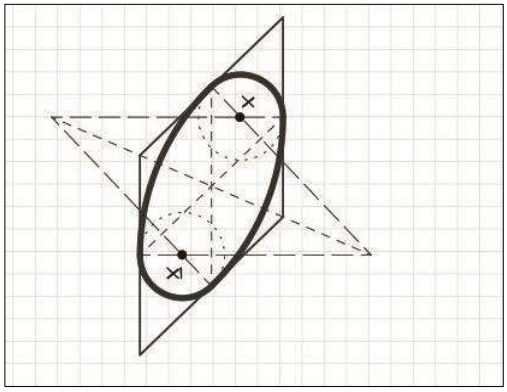
Step 1: Draw an oblique square with the sides equal to the diameter of the circle.



Step 2: Find adjacent side midpoints and construct intersecting perpendiculars. Repeat the process on the opposite side.



Step 3: using points (x) and (x_1) complete the smaller arcs to accomplish the total circle.



* Reference: https://archilibs.org/how-to-construct-a-paraline-circle-at-45/.

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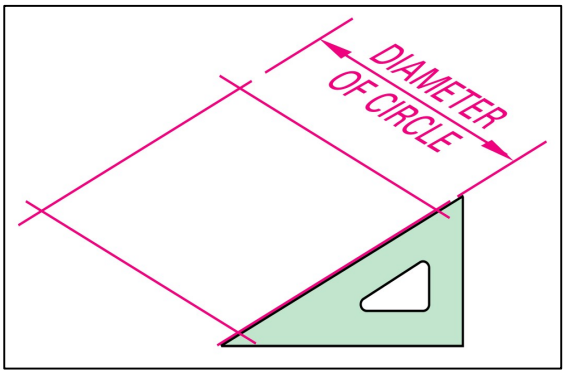
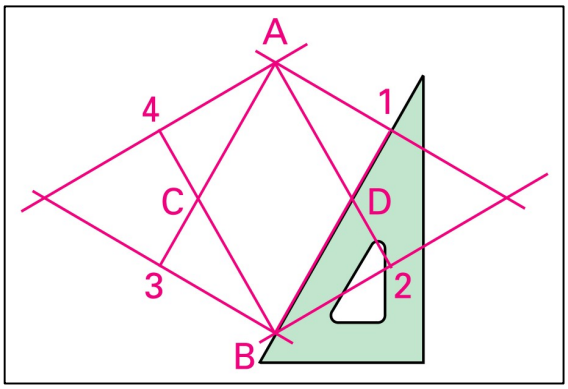
ISOMETRIC CIRCLE *

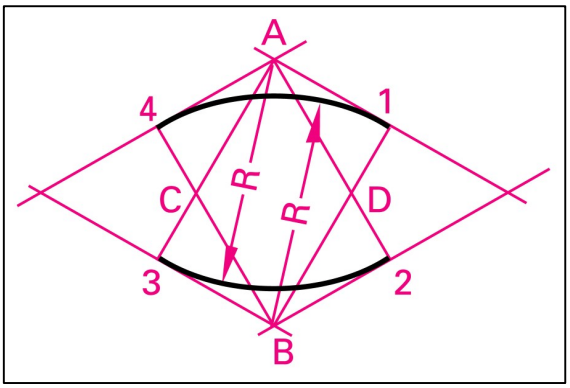
Step 1: Draw an isometric square with the sides equal to the diameter of the circle.



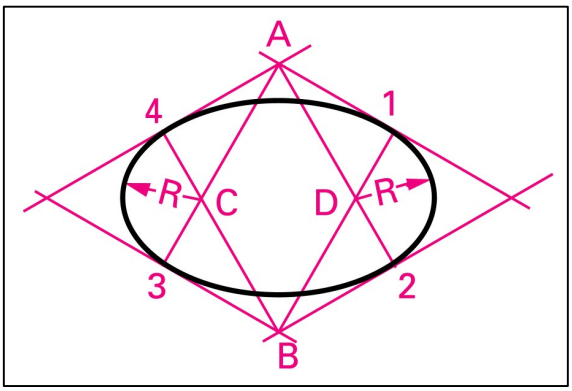
Step 2: Use a 30°-60° triangle to locate points (A), (B), (C), (D), and (1), (2), (3), (4).



Step 3: With (A) and (B) as centers and a radius equal to (A2) draw arcs as shown.



Step 4: With (C) and (D) as centers and a radius equal to (C4), draw arcs to complete the isometric circle (ellipse).

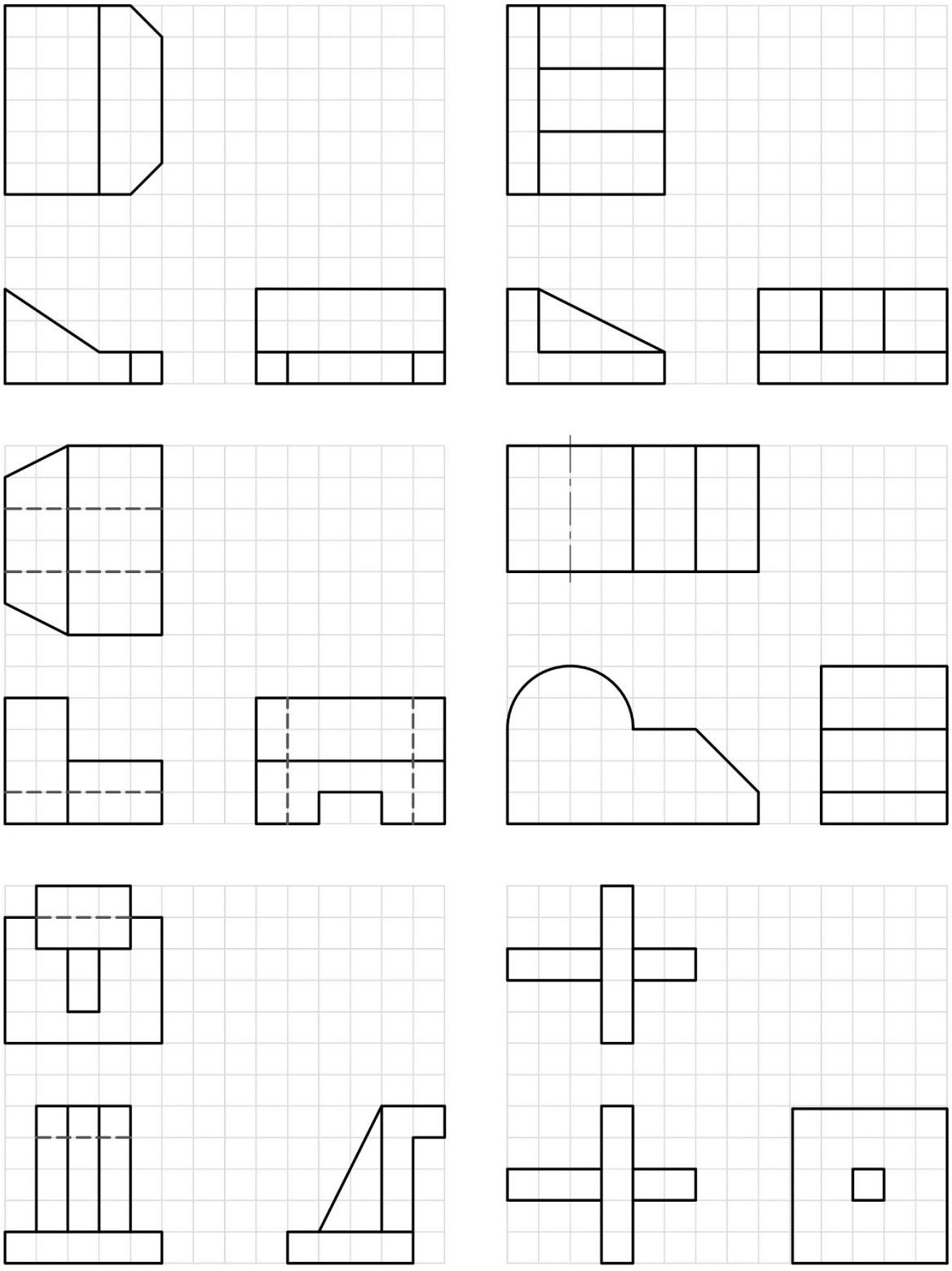


* Reference: Glencoe/McGraw-Hill (2003).

NAME: _____	**SECTION NO.:** _____	**22**
FILE NO.: _____	**DATE:** _____	

OBLIQUE DRAWINGS

Exercise (1): Using freehand sketch, make an oblique drawing for the following views.

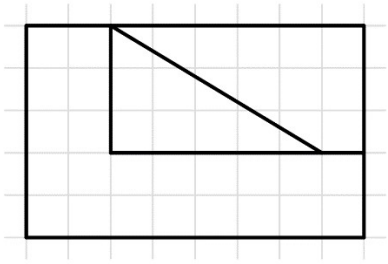


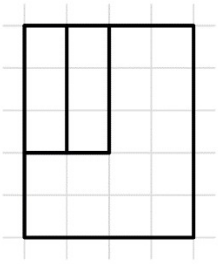
NAME: _____	**SECTION NO.:** _____	**23**
FILE NO.: _____	**DATE:** _____	

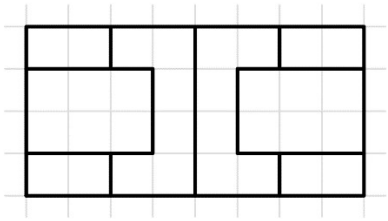
Oblique Grid Paper (Answer of Exercise 1):

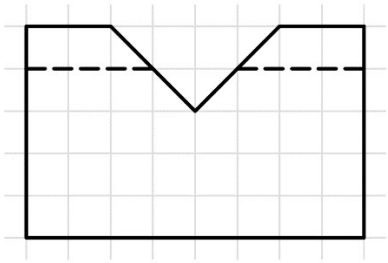
NAME: _____	**SECTION NO.:** _____	**24**
FILE NO.: _____	**DATE:** _____	

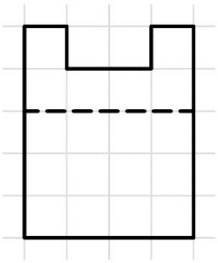
Exercise (2): Using freehand sketch, make an oblique drawing for the following views.

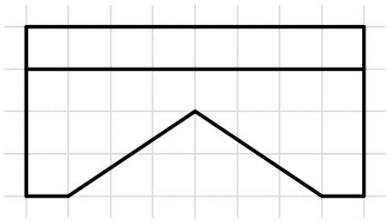


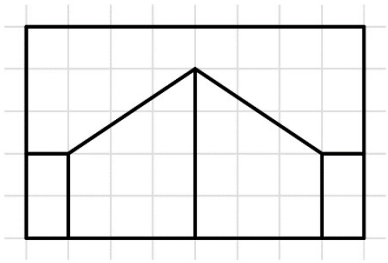


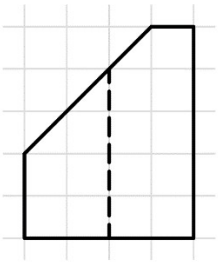










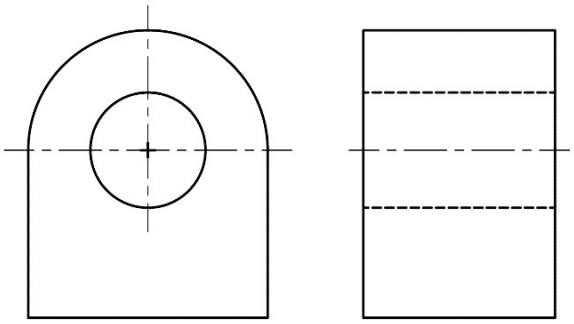


NAME: _____	**SECTION NO.:** _____	**25**
FILE NO.: _____	**DATE:** _____	

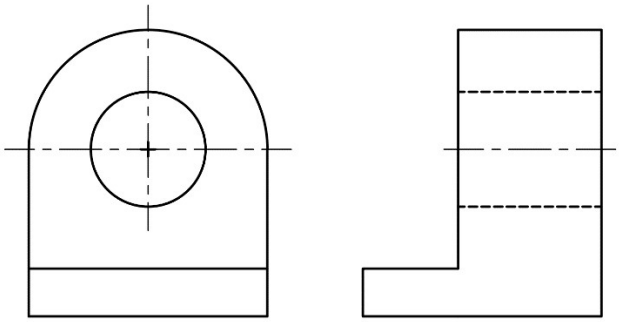
OBLIQUE DRAWINGS: CAVALIER AND CABINET

NOTE: CAVALIER IS THE FULL DEPTH AND CABINET IS THE HALF DEPTH.

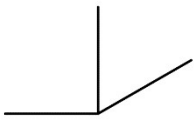
Exercise (3): For the given orthographic views, draw cavalier and cabinet oblique drawings.



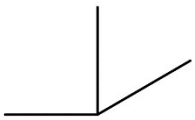
Front



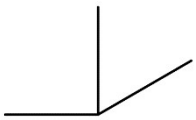
Front



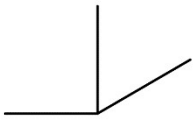
CAVALIER



CAVALIER



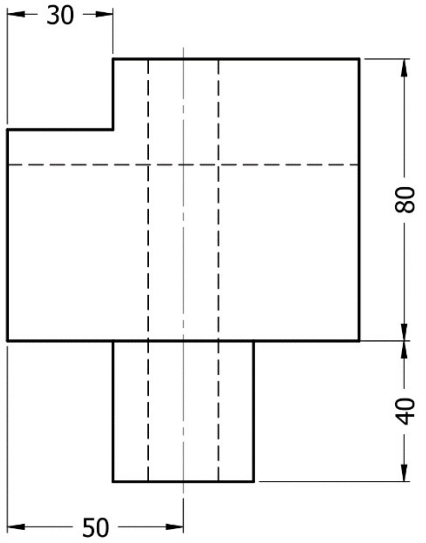
CABINET



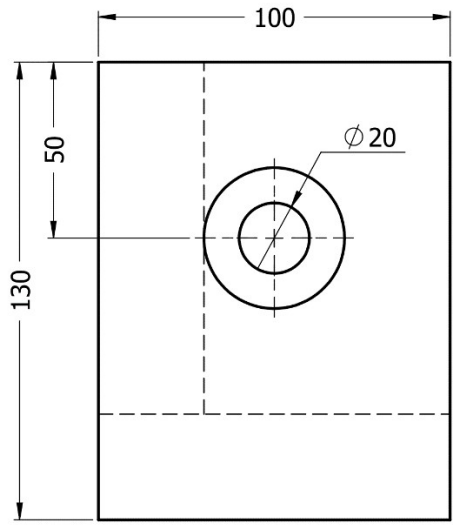
CABINET

NAME: _____	**SECTION NO.:** _____	**26**
FILE NO.: _____	**DATE:** _____	

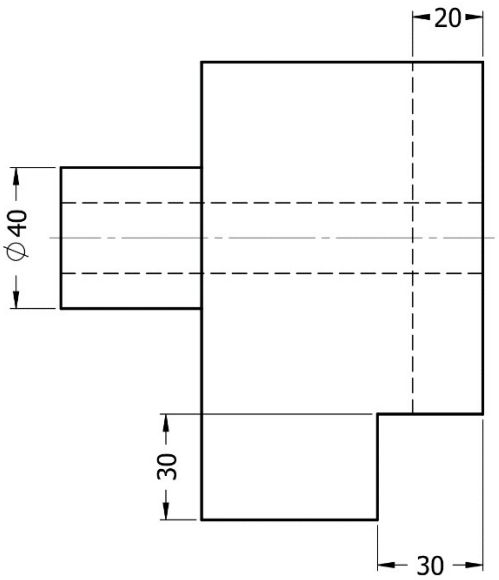
Exercise (4): For the given orthographic views, draw an oblique drawing.



T.V.



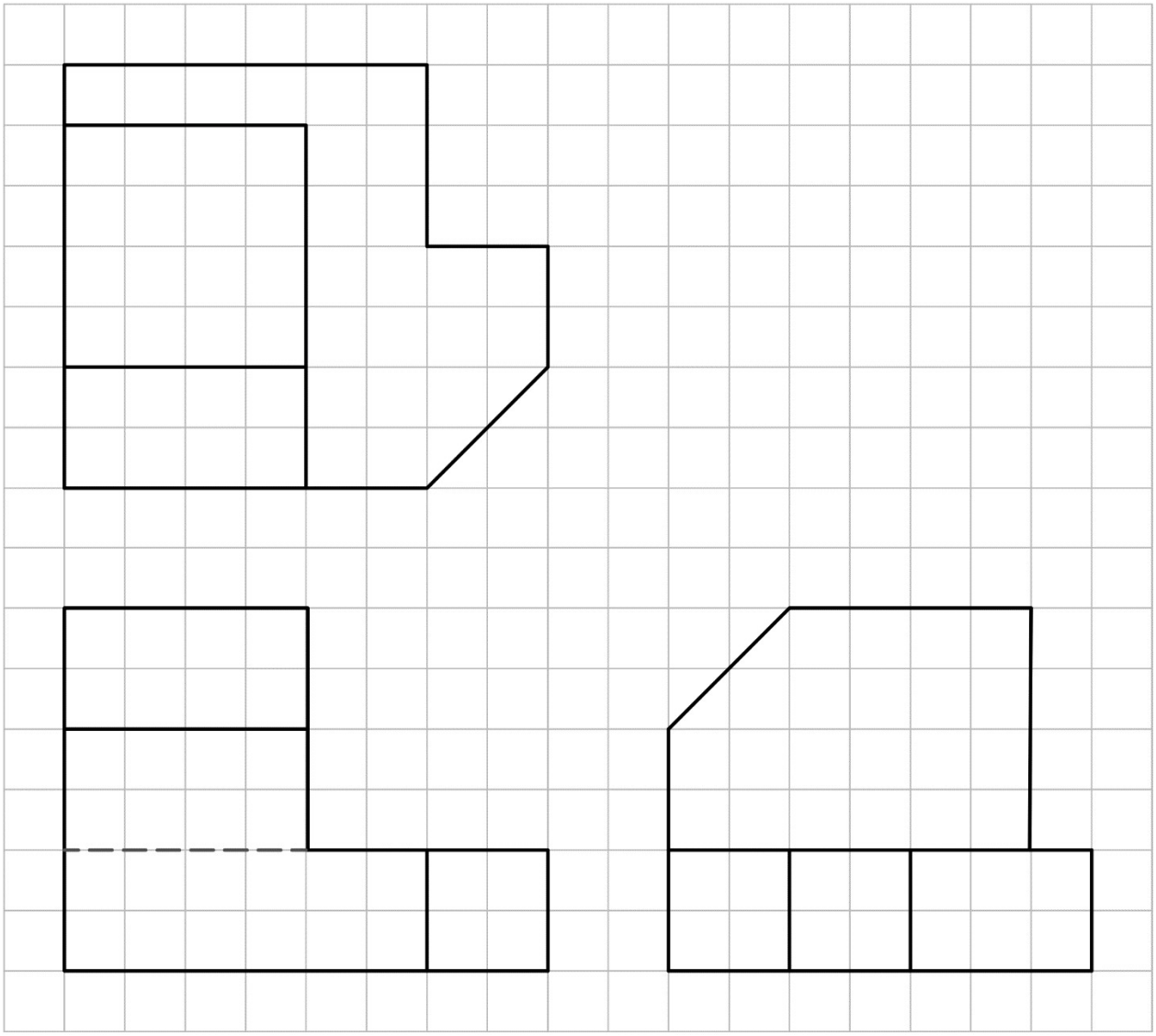
F.V.



S.V.

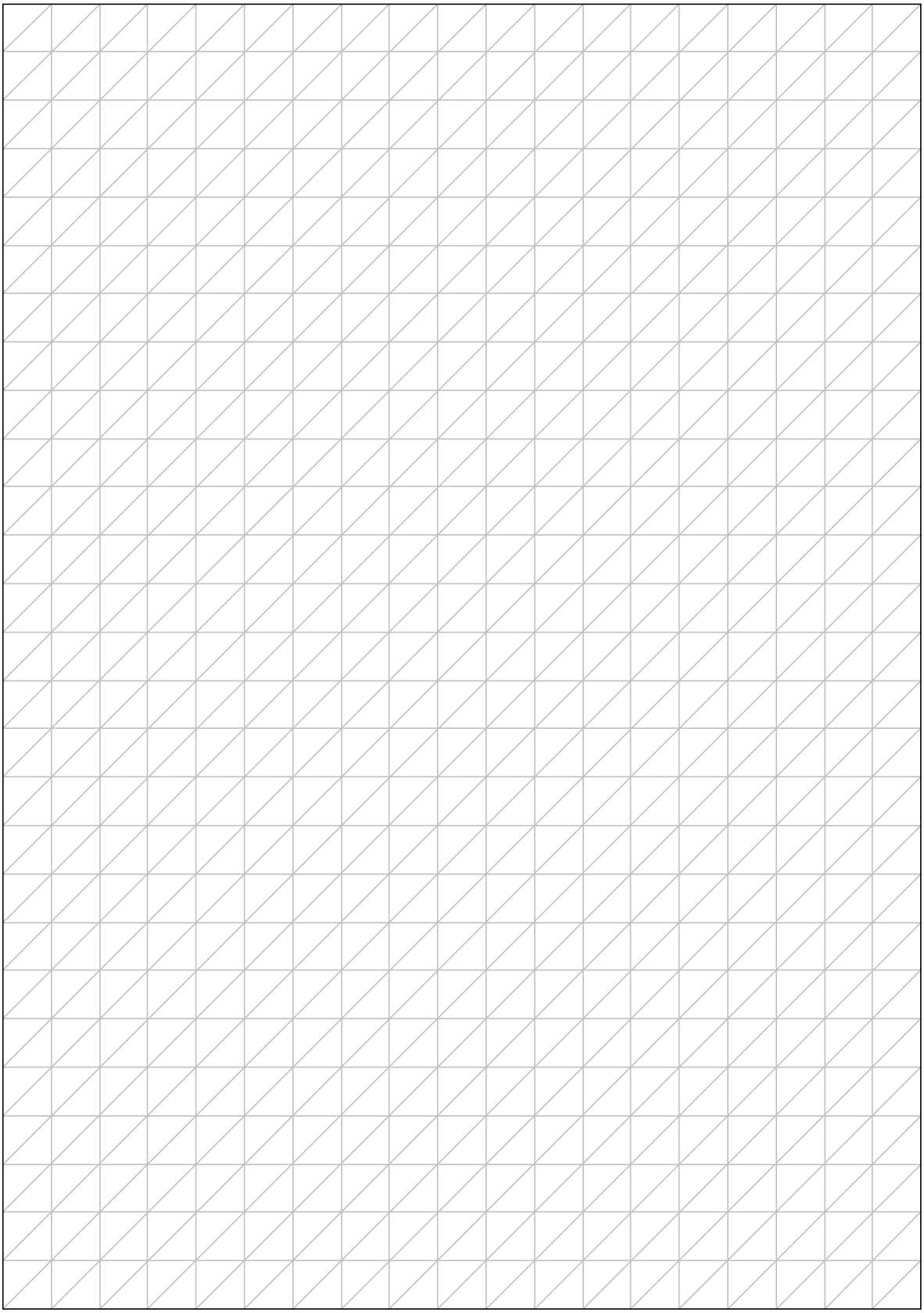
NAME: _____	**SECTION NO.:** _____	**27**
FILE NO.: _____	**DATE:** _____	

Exercise (5): For the given orthographic views, draw an oblique drawing using the "**Grid Paper**".



NAME: _____	**SECTION NO.:** _____	**28**
FILE NO.: _____	**DATE:** _____	

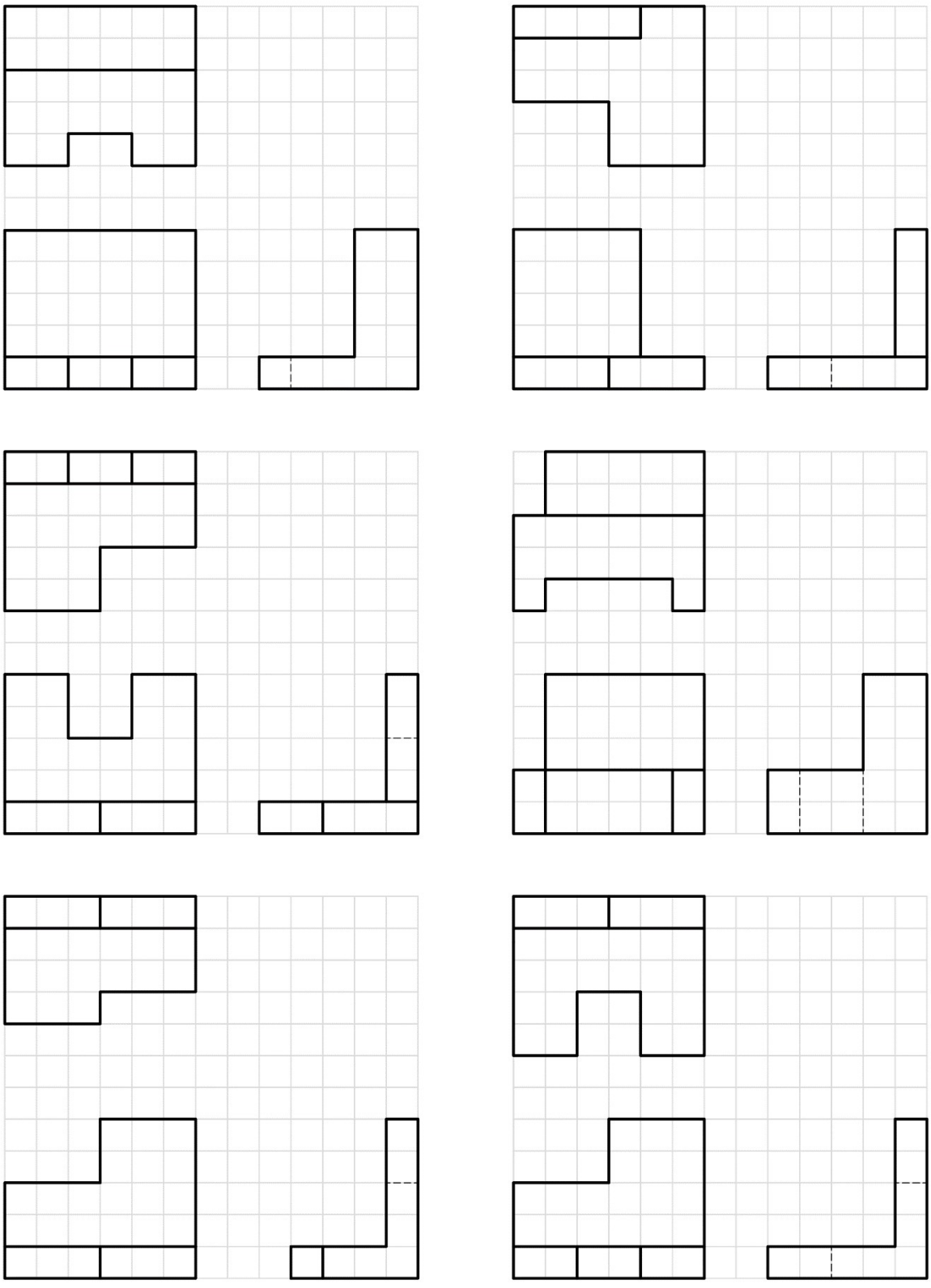
Oblique Grid Paper with (1 unit) (Answer of Exercise 5):



NAME: _____	**SECTION NO.:** _____	**29**
FILE NO.: _____	**DATE:** _____	

ISOMETRIC DRAWINGS

Exercise (1): Using freehand sketch, make an isometric drawing for the following views.

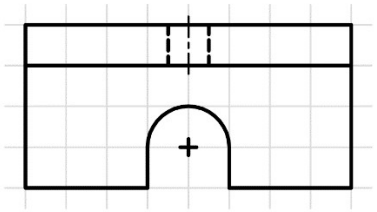


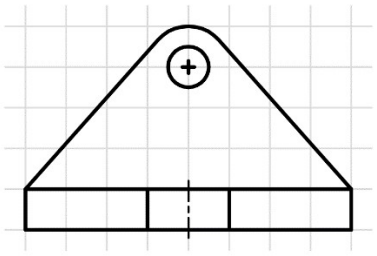
NAME: _____	**SECTION NO.:** _____	**30**
FILE NO.: _____	**DATE:** _____	

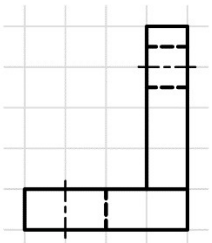
Isometric Grid Paper (Answer of Exercise 1):

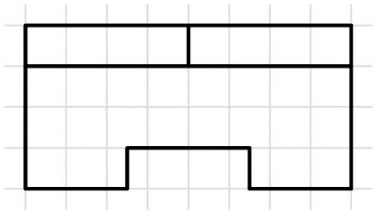
NAME: _____	**SECTION NO.:** _____	**31**
FILE NO.: _____	**DATE:** _____	

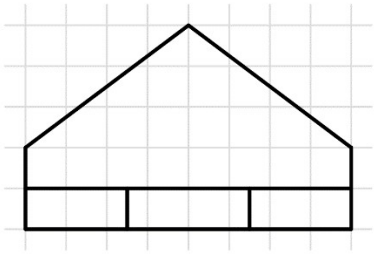
Exercise (2): Using freehand sketch, make an isometric drawing for the following views.

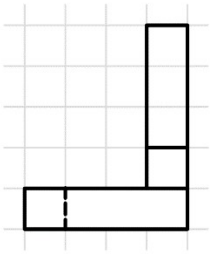


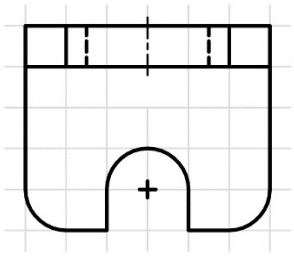


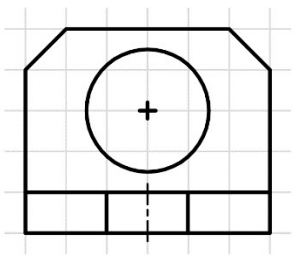


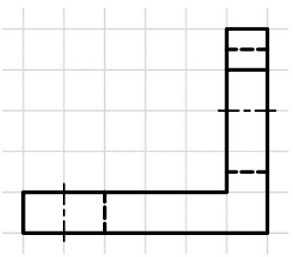






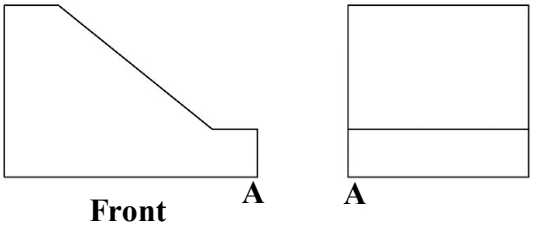




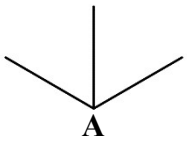


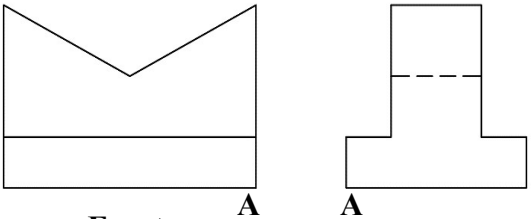
NAME: _____	**SECTION NO.:** _____	**32**
FILE NO.: _____	**DATE:** _____	

Exercise (3): For the given orthographic views, draw isometric drawings. **Double the dimensions**.

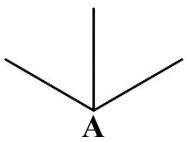


Front



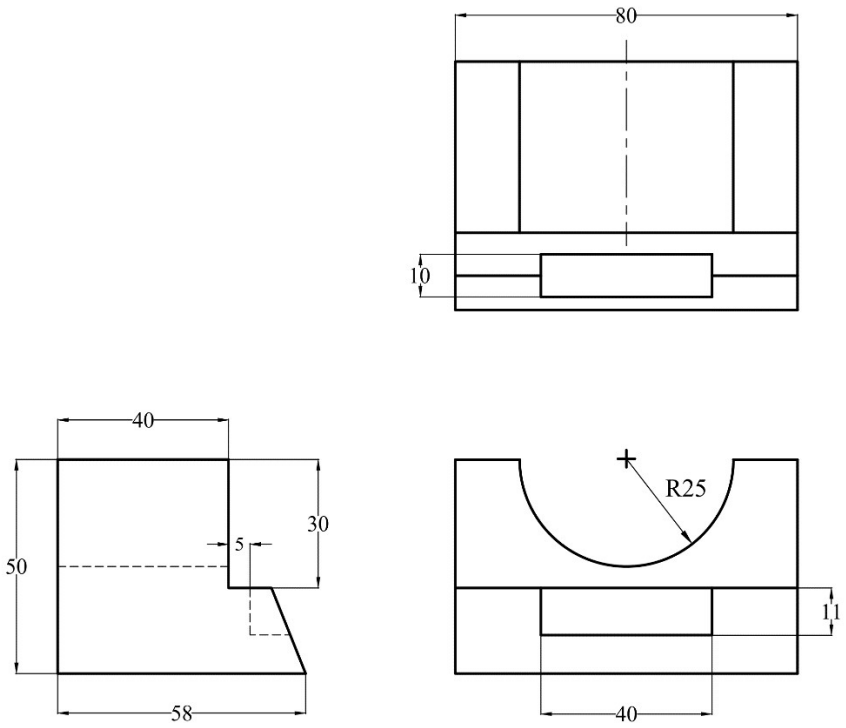


Front

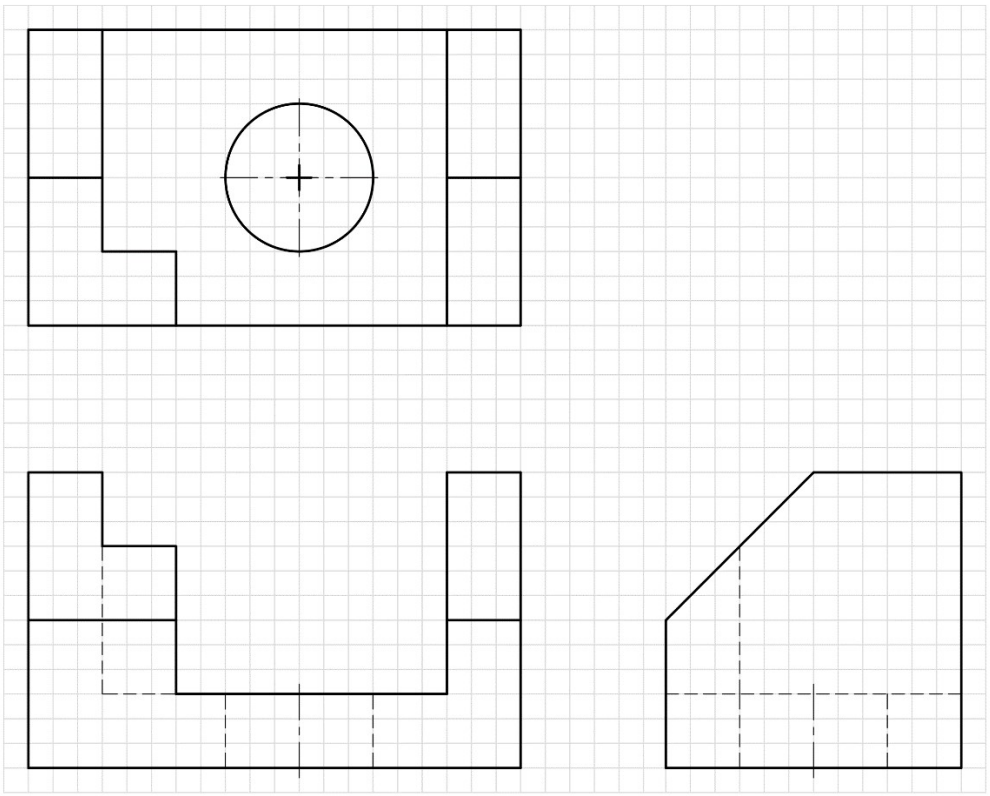


NAME: _____	**SECTION NO.:** _____	**33**
FILE NO.: _____	**DATE:** _____	

Exercise (4): For the given orthographic views, draw an isometric drawing.

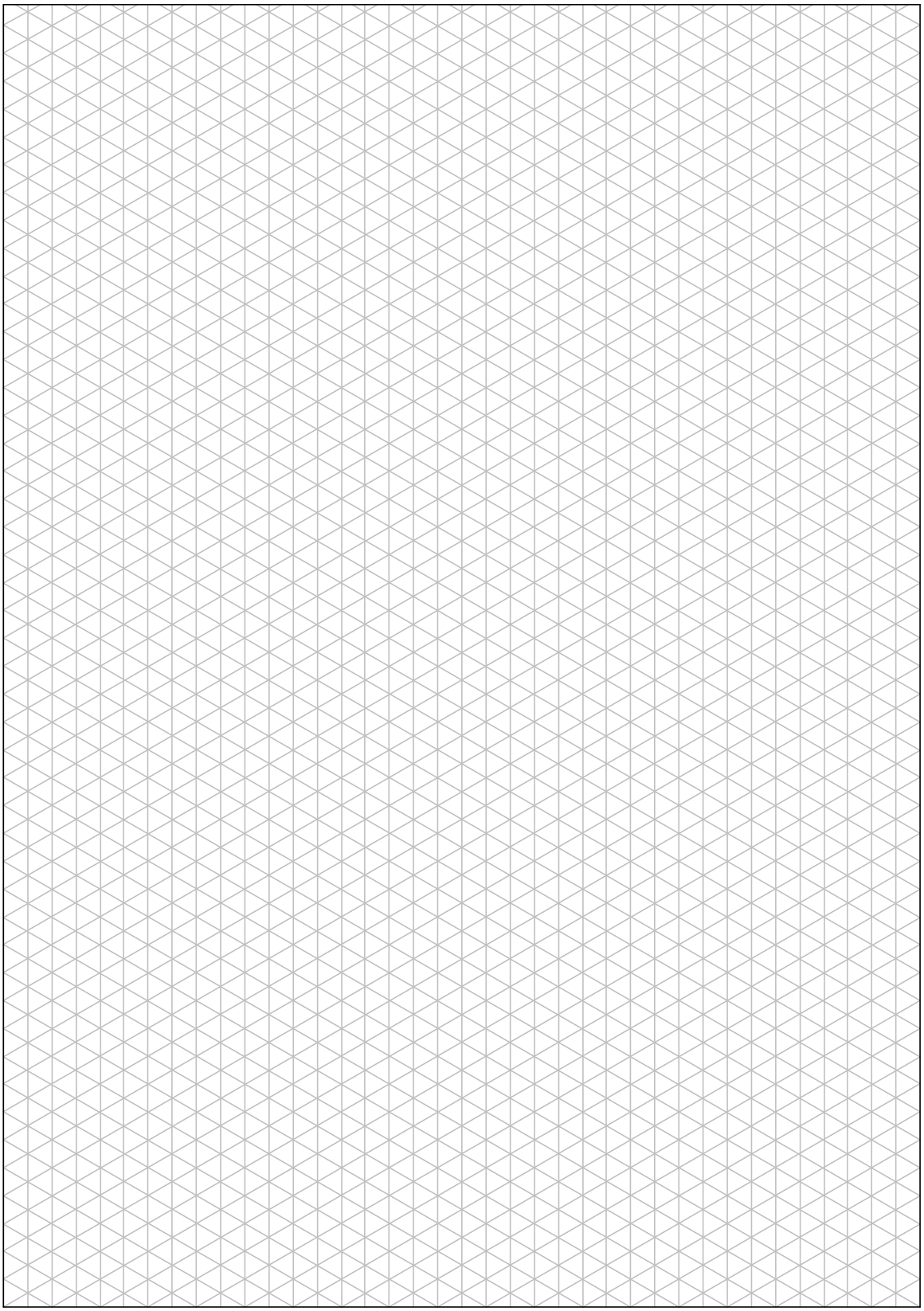


Exercise (5): For the given orthographic views, draw an isometric drawing using the **"Grid Paper"**.



NAME: _____	**SECTION NO.:** _____	**34**
FILE NO.: _____	**DATE:** _____	

Isometric Grid Paper with (0.5 unit) (Answer of Exercise 5):



NAME: _____	**SECTION NO.:** _____	**35**
FILE NO.: _____	**DATE:** _____	

Topic Six: Basic Dimensioning

DIMENSIONING RULES

A. Dimension Placement

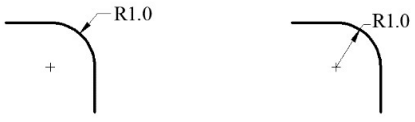
- Place dimensions on the most descriptive views.
- Take dimensions from visible lines not from hidden lines.
- Organize and align dimensions for ease of reading.
- The dimensions are normally positioned to maintain a minimum of 3/8" (9.52mm) open space around the object.
- Do not repeat dimensions.
- Dimensions should not cross other lines (unless necessary).
- Extension lines may cross other extension lines or object lines if necessary.
- Arrowheads are long and narrow (3 to 1 ratio).
- Do not place dimensions within views (unless necessary).
- Give an overall dimension and omit one of the chain dimensions.
- Shorter dimensions are placed inside longer ones.
- Angles may be dimensioned either by coordinates or angular measurements in degrees.
- Place angular dimensions outside the angle.
- Dimension cylinders in their rectangualr views with diameter.

B. Dimensioning for Holes

- Dimension holes in the circular view.

C. Dimensioning for Fillets, Rounds, and Arcs

- **Rounds** are dimensioned either by a leader pointing toward the center of the arc or the arrow may be placed inside (if space permits).



- A very slightly rounded corners may be denoted by: Break Corner.
- **Fillets** (inside rounded corners) are dimensioned by the same rules as rounds.
- If all fillets and rounds haveequal radii, the note "All Fillets and Rounds 1.0R" may be used instead of dimensioning each sperately.
- **Arcs** are dimensioned with a radius. Small arcs are dimensioned as they were fillets and rounds.

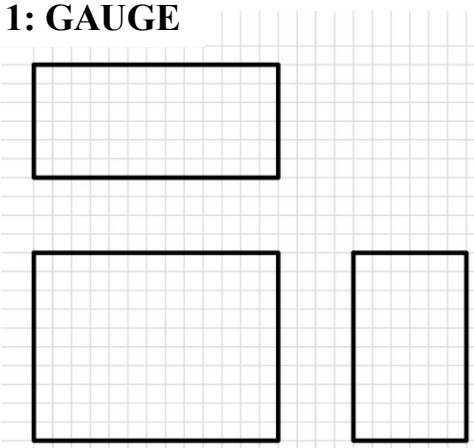
BASIC DIMENSIONING: FREEHAND

FOLLOW INSTRUCTIONS **A** OR **B** AS ASSIGNED. COUNT THE GRID TO DETERMINE DIMENSIONS. SCALE: FULL SIZE.

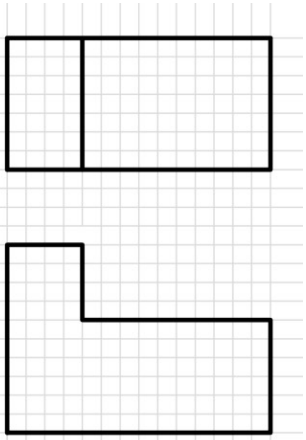
A: DIMENSION COMPLETELY OMITTING NUMERALS.

B: DIMENSION COMPLETELY WITH NUMERALS.

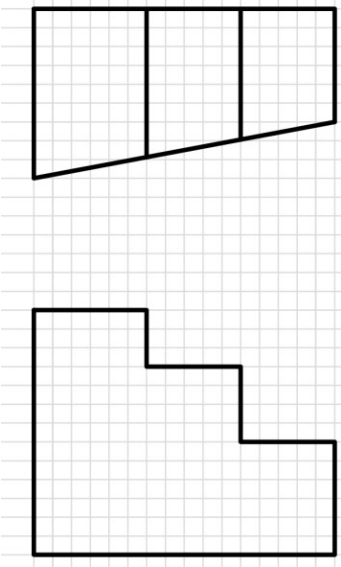
1: GAUGE



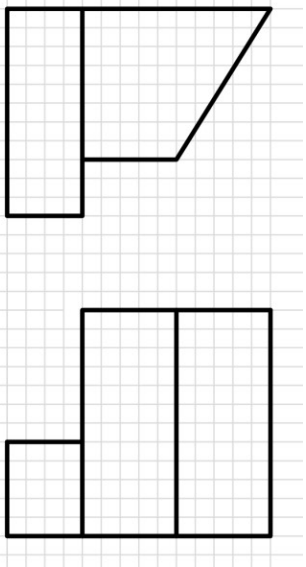
2: STOP



3: LOCK

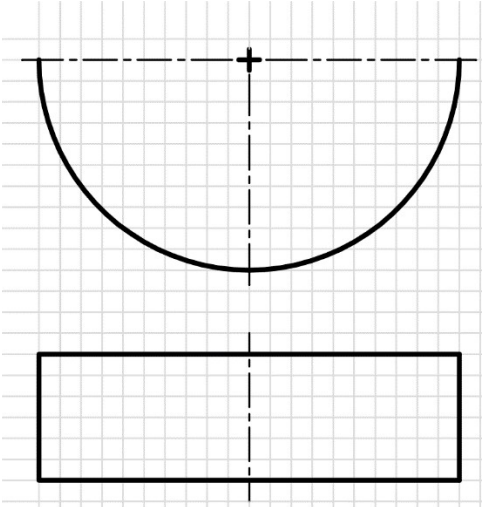


4: MOUNT

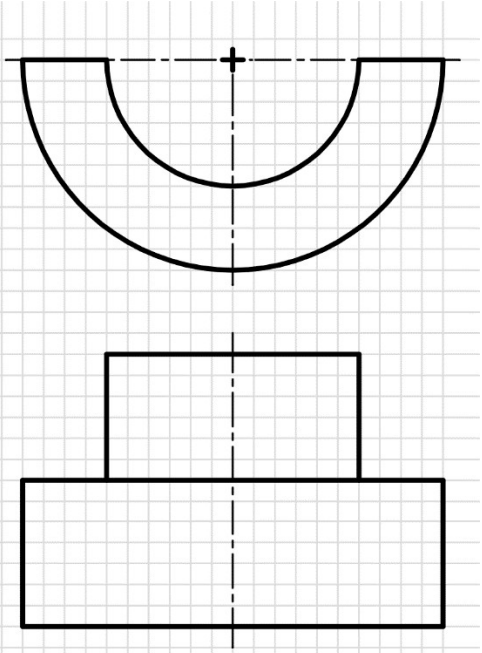


NAME: _____	**SECTION NO.:** _____	**37**
FILE NO.: _____	**DATE:** _____	

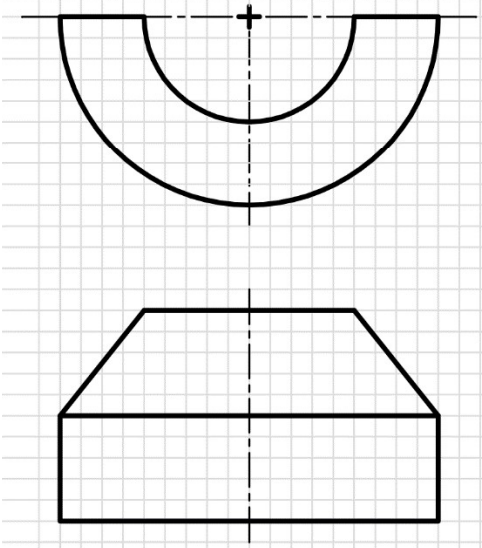
5: SPACER



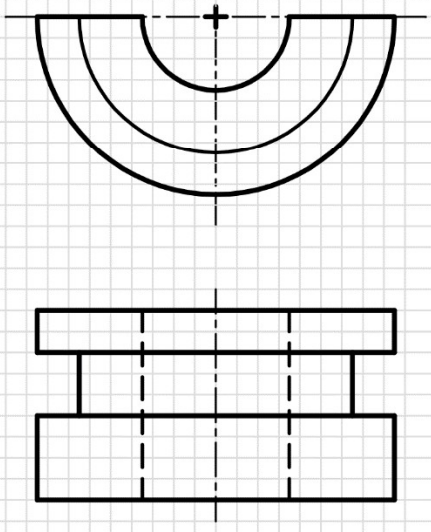
6: PULLEY BLANK



7: DUST GUARD

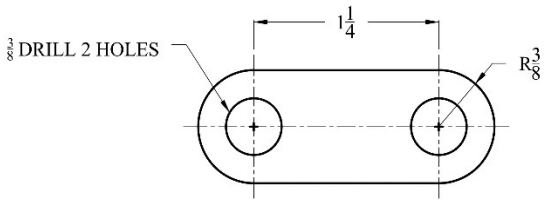


8: SLEEVE



NAME: _____	**SECTION NO.:** _____	**38**
FILE NO.: _____	**DATE:** _____	

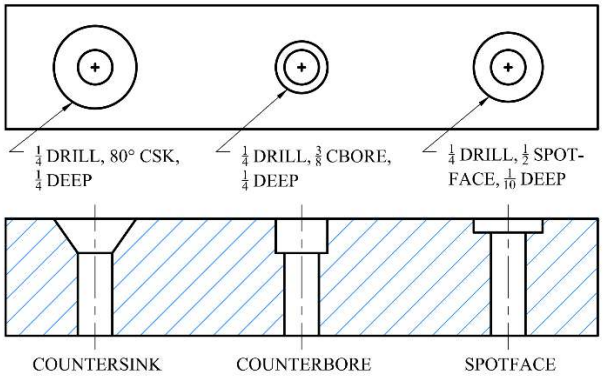
DIMENSIONING: NOTES FOR HOLES



HOLE NOTES:

CYLINDRICAL HOLES ARE USUALLY DIMENSIONED BY NOTES SPECIFYING THE MACHINE OPERATION WITH A LEADER IN THE CIRCULAR VIEW.

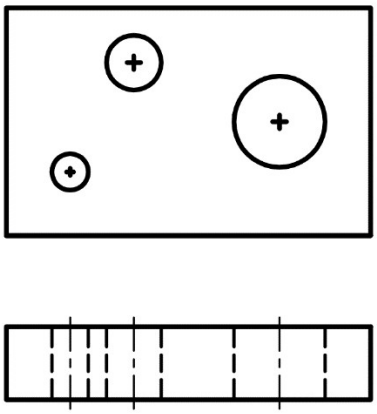
NOTE: THE LINK ABOVE NEEDS NO OVERALL DIMENSION SINCE OBJECT HAS CIRCULAR ENDS.



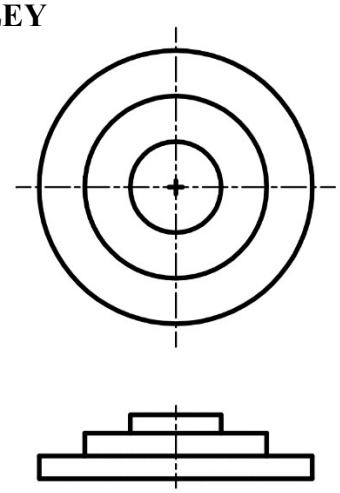
THE NOTES ABOVE ARE TYPICAL TO THE MORE COMMON TYPES OF MACHINED HOLES. LEADERS POINT TOWARD THE CENTERS OF THE HOLES. LEADERS ARE DRAWN IN THE CIRCULAR VIEWS.

DIMENSION THE OBJECTS BELOW. SCALE: FULL SIZE.

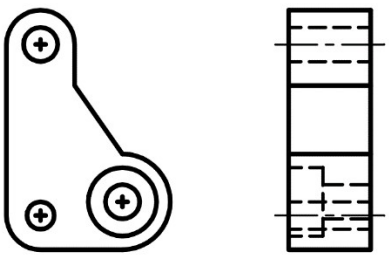
1: DRILL FIXTURE



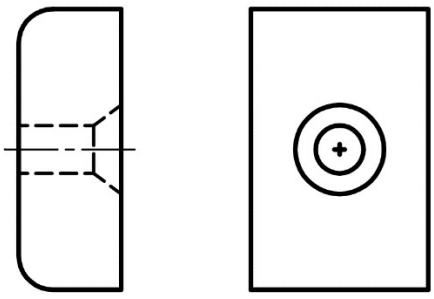
2: PULLEY



3: LEVER LINK



4: CLAMP



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FILE NO.: _____	**DATE:** _____	

Topic Seven: Descriptive Geometry (Auxiliary Projection)

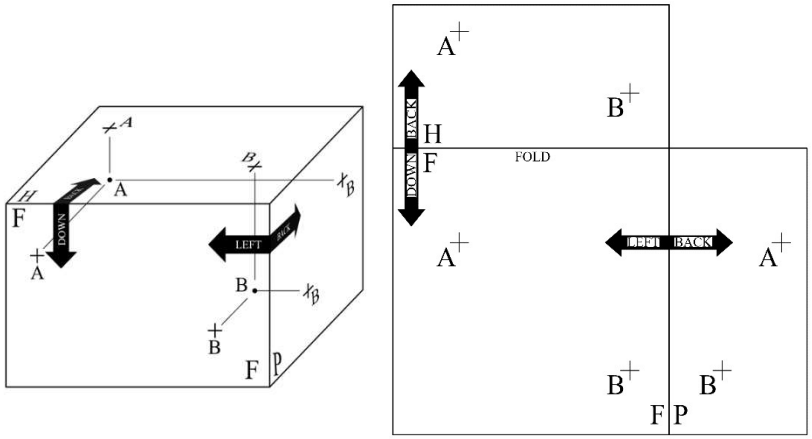
TOPICS

1. Tracing of points, lines and planes.
2. True Length.
3. True Shape.
4. Constructing the **Shortest Distance (Perpendicularity):**
    a. From a point to a given line.
    b. From a point to a given plane.
5. The true **Angle** of intersection using plane method.
    a. Between two lines.
    b. Between line and a plane.
    c. Between two planes **(The Dihedral Angle)**.

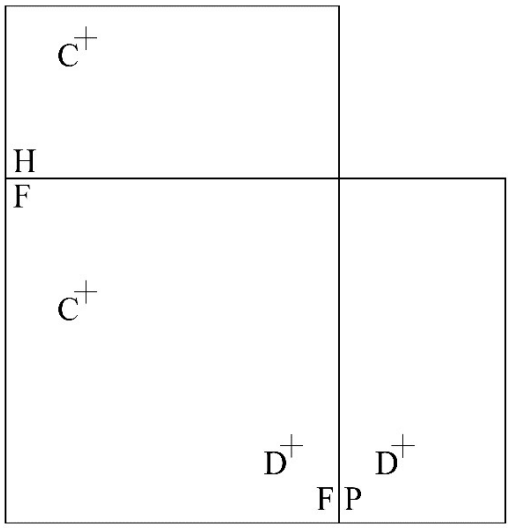
POINT

THE EXAMPLES AT THE RIGHT SHOW THE OBLIQUE AND ORTHOGRAPHIC PROJECTIONS OF POINTS A AND B.

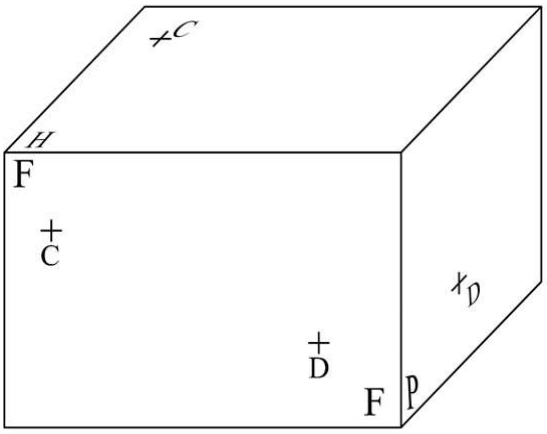
IT SHOW THE DIRECTIONAL RELATIONSHIPS AS WELL. CUT OUT THE ORTHOGRAPHIC DRAWING AND FOLD AS INDICATED TO PRODUCE A MODEL.



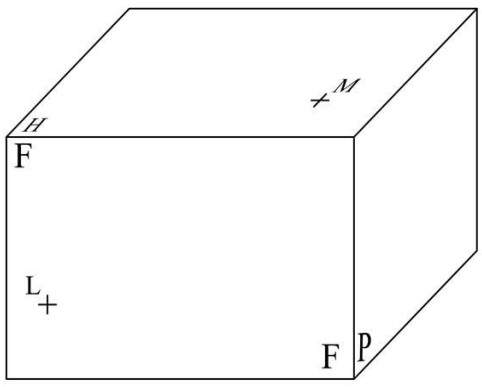
1. DRAW THE MISSING ORTHOGRAPHIC PROJECTIONS OF POINTS **C** AND **D**.



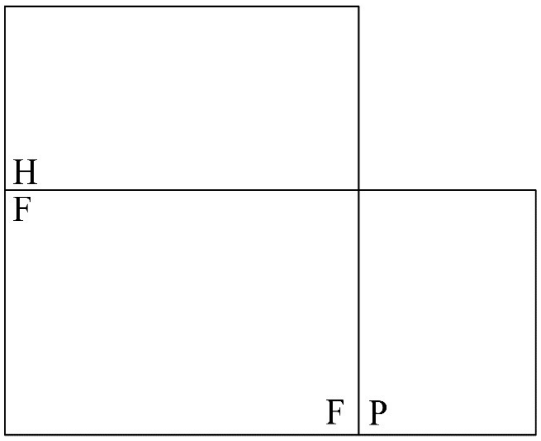
2. DRAW THE OBLIQUE PROJECTIONS OF POINTS **C** AND **D**. DRAW THE POSITIONS OF THESE IN SPACE.



3. POSITION **L** IS 20mm BEHIND THE FRONTAL PLANE AND POINT **M** IS 13mm BELOW THE HORIZONTAL PLANE. DRAW THE OBLIQUE PROJECTIONS OF POINTS **L** AND **M** AND THEIR POSITION IN SPACE.



4. DRAW THE OBLIQUE PROJECTIONS OF POINTS **L** AND **M** AS LOCATED IN PROBLEM (3).



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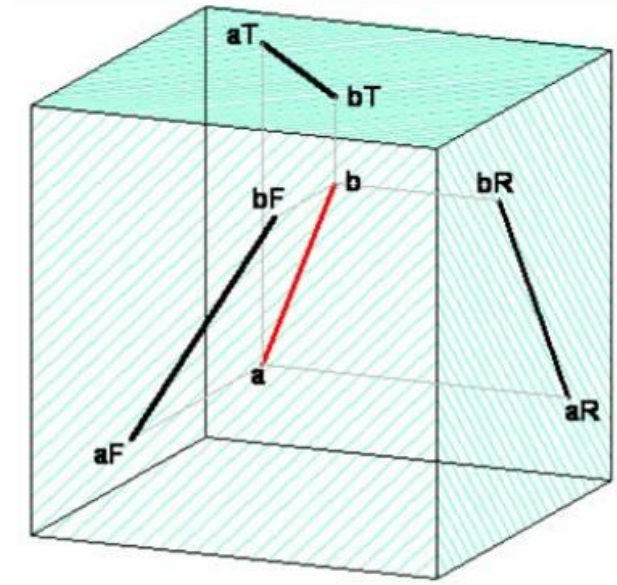
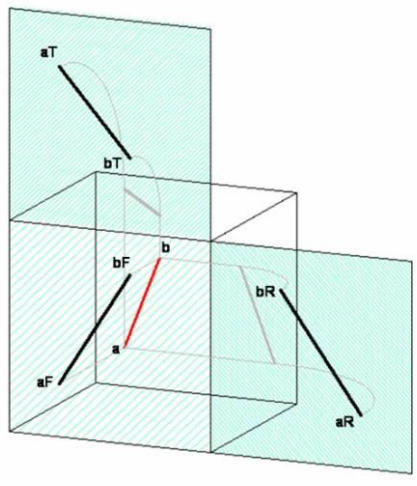
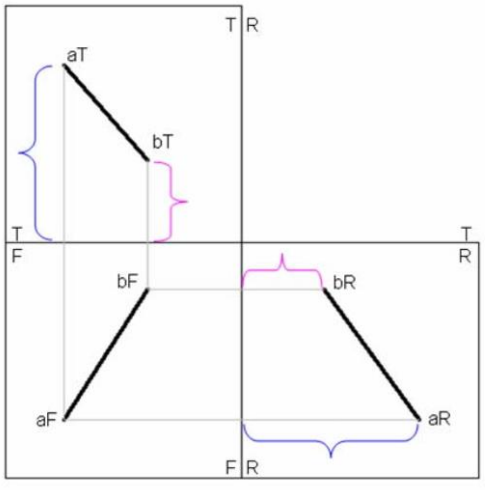
LINE PROJECTION



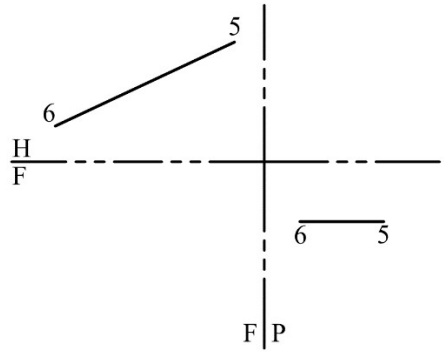




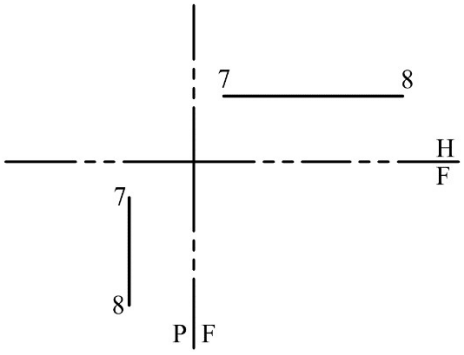
LINE PROJECTION

DRAW THE MISSING VIEWS OF EACH LINE AND INDICATE WHAT TYPE OF LINE EACH IS. LABEL TRUE LENGTH LINES **TL**.

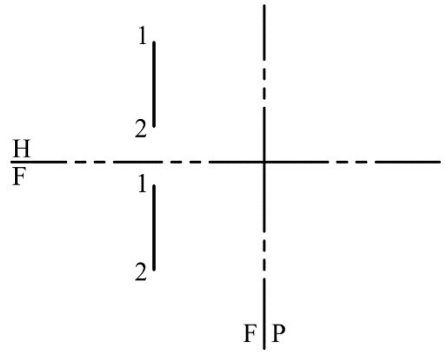
1 TYPE:_____



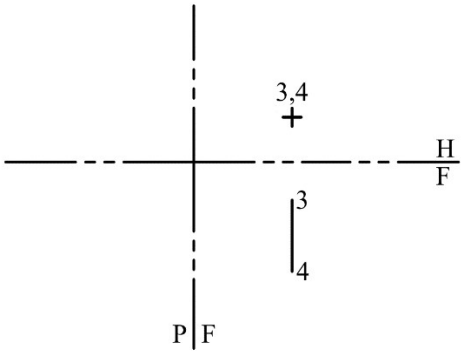
2 TYPE:_____



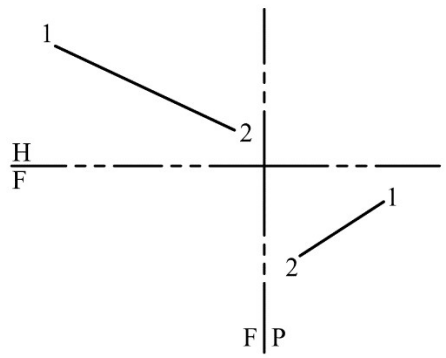
3 TYPE:_____



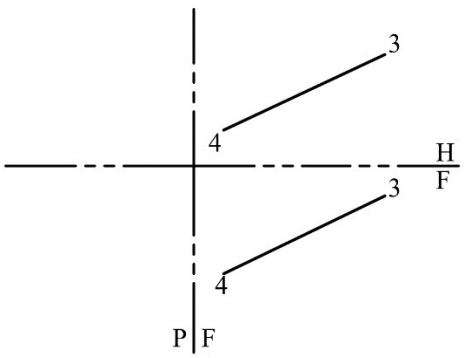
4 TYPE:_____



5 TYPE:_____



6 TYPE:_____



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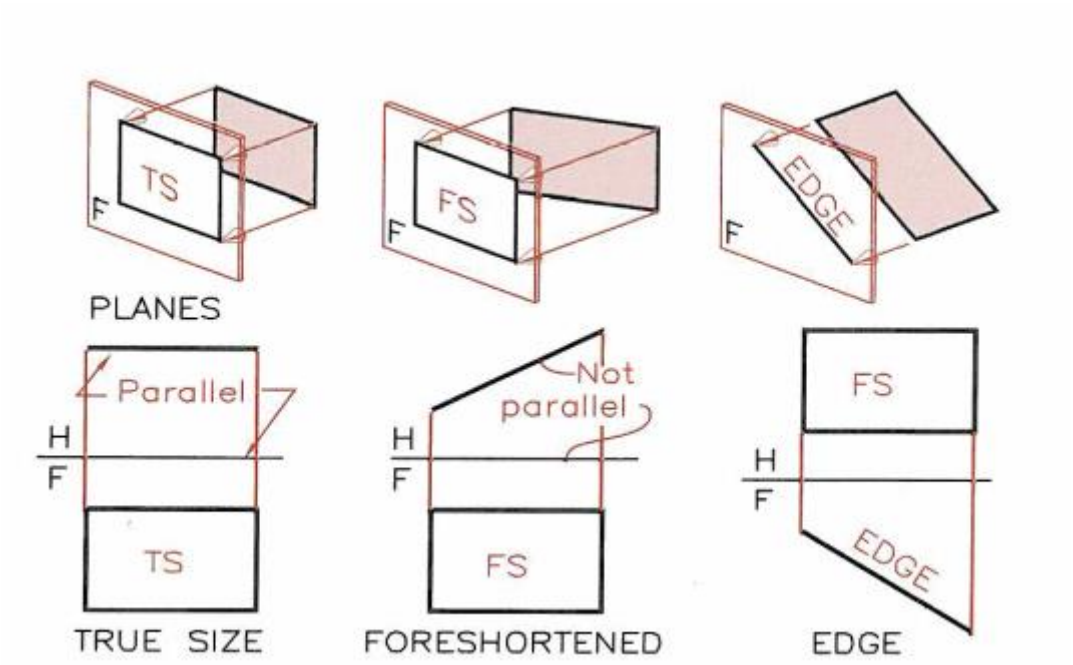
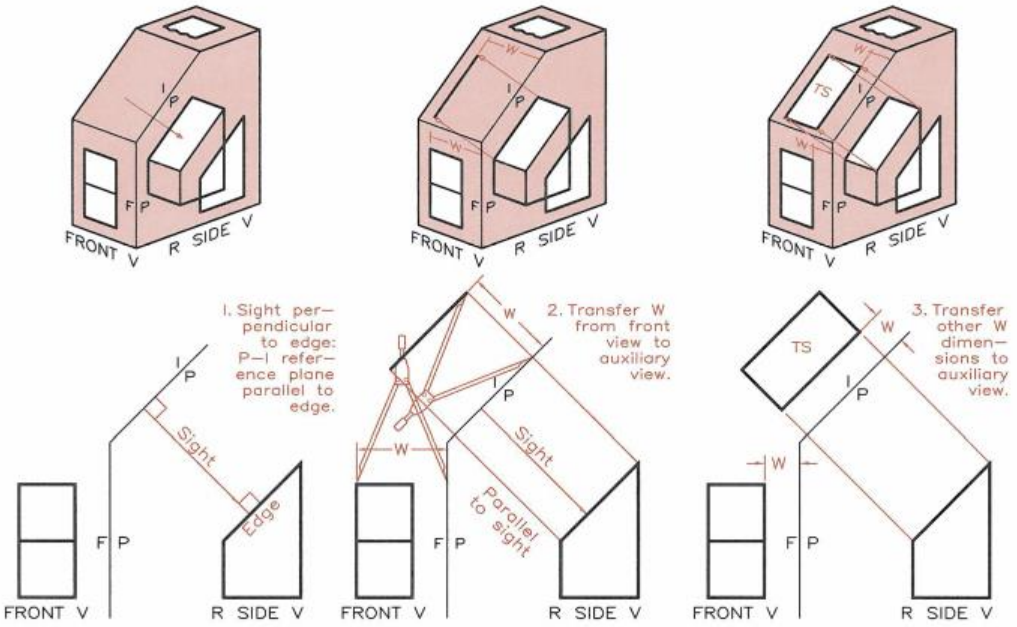
PLANE PROJECTION





15.22 From the side: Folding-line method:

Step 1 Draw a line of sight perpendicular to the edge of the inclined surface. Draw the P-1 fold line parallel to the edge view, and draw the F-P fold line between the given views.

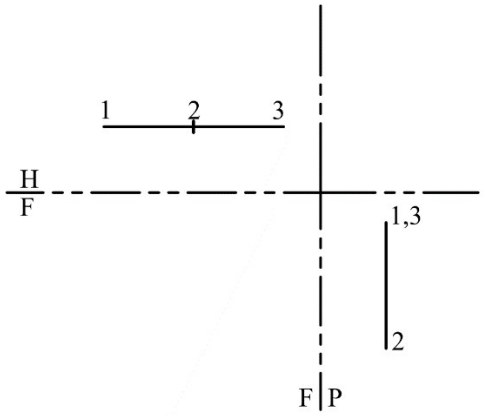
Step 2 Project the corners of the edge view parallel to the line of sight. Transfer the width dimensions (W) from the front view to locate a line in the auxiliary view.

Step 3 Find the other corners of the inclined surface by projecting to the auxiliary view. Locate the points by transferring the width dimensions (W) from the front view to the auxiliary view.

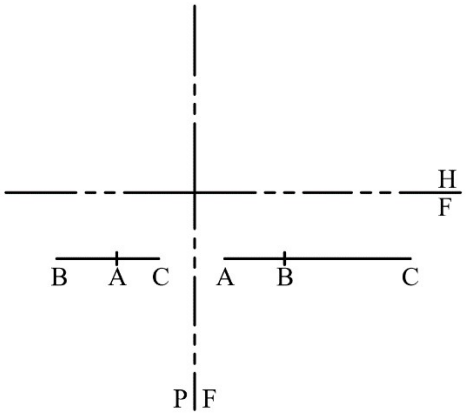
PLANE PROJECTION

DRAW THE MISSING VIEWS OF EACH PLANE. SPECIFY THE TYPE OF PLANE AND WHERE THE PLANE APPEARS TRUE SHAPE. LABEL THAT VIEW AS **TS**.

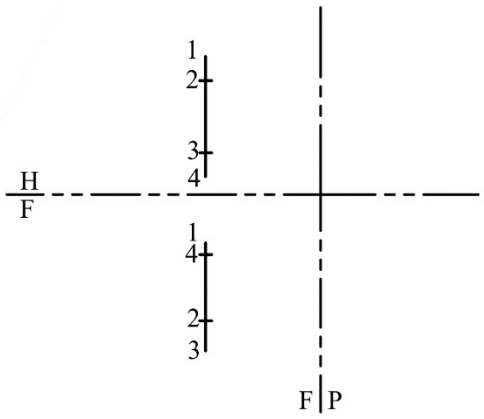
1 TYPE:_____



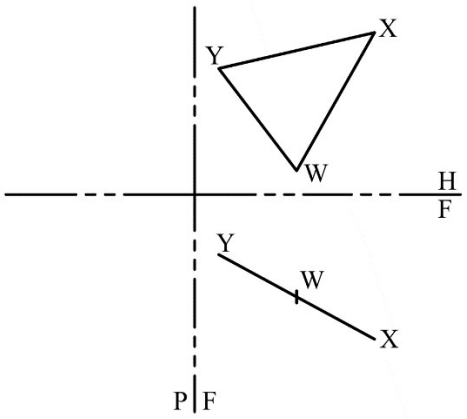
2 TYPE:_____



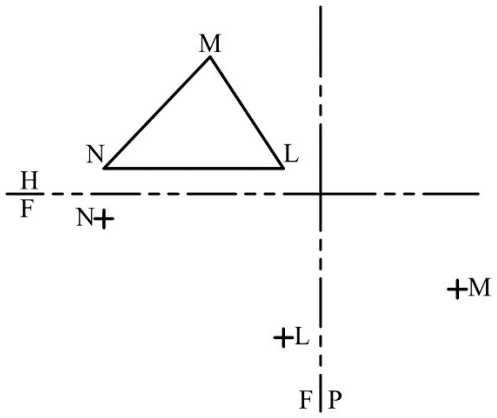
3 TYPE:_____



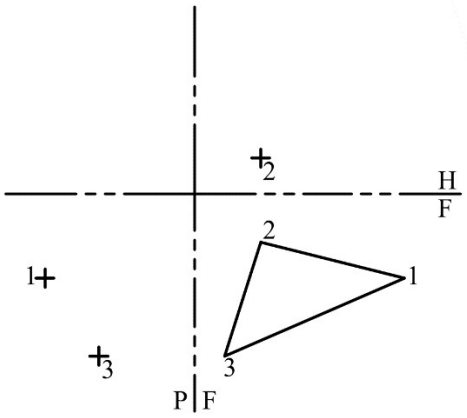
4 TYPE:_____



5 TYPE:_____



6 TYPE:_____



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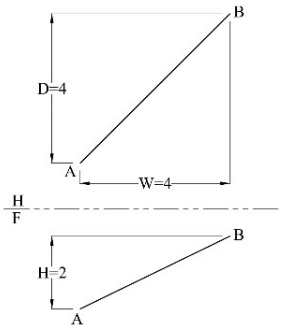
TRUE LENGTH OF A LINE



W = WIDTH

D = DEPTH

H = HEIGHT

MATHEMATICAL EXAMPLE (PYTHAGOREAN THEORY)

$TL = \sqrt{W^2 + D^2 + H^2}$

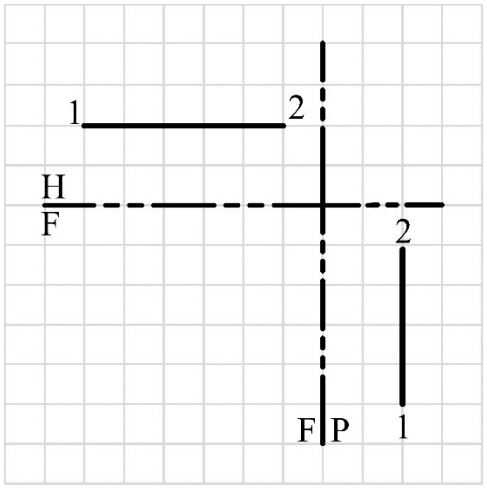
$W^2 = 16$

$D^2 = 16$

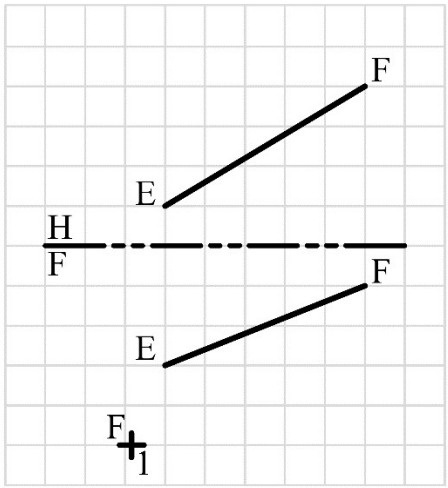
$H^2 = 4$

REDRAW THE FOLLOWING EXERCISES ON THE GIVEN **"GRID PAPER"**, THEN DETERMINE THE TRUE LENGTHS OF EACH LINE USING GRAPHICAL METHOD.

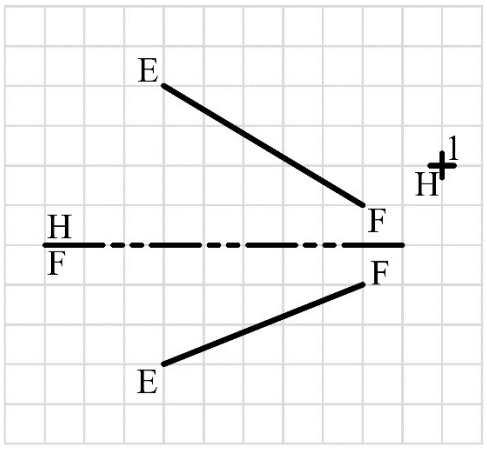
1 METRIC SCALE 1:600, **TL** = _____



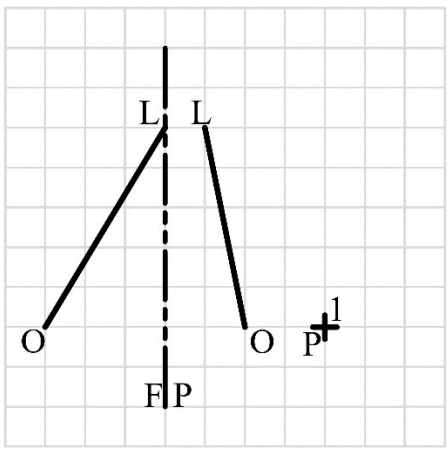
2 METRIC SCALE 1:30, **TL** = _____



3 METRIC SCALE 1:60, **TL** = _____



4 METRIC SCALE 1:40, **TL** = _____



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ANSWER SHEET OF TRUE LINE

NAME: _____	**SECTION NO.:** _____	**45**
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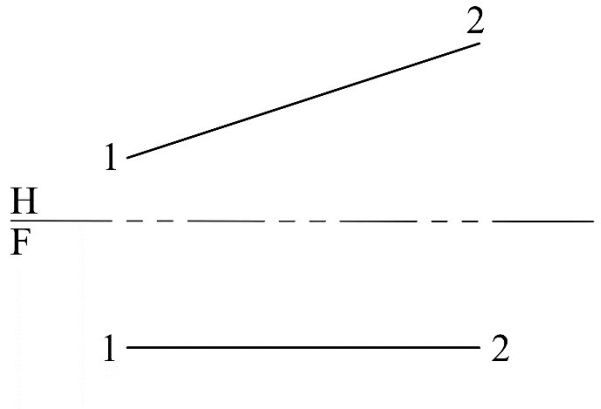
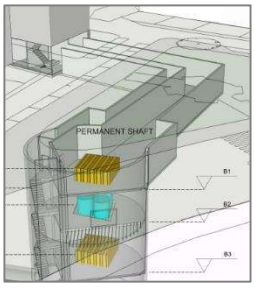
POINT VIEW

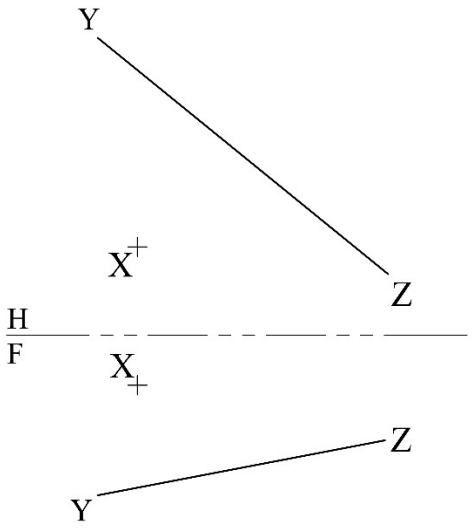
1 OBTAIN A POINT VIEW OF LINE 1-2.



2 GIVEN HORIZONTAL AND FRONT VIEWS OF A TUNNEL, WHERE **YZ** IS THE CENTERLINE OF A TUNNEL AND **X** IS A POINT ON THE EARTH'S SURFACE. DETERMINE THE **SHORTEST DISTANCE** FOR A VENTILATION SHAFT TO BE DUG FROM POINT **(X)** TO **(YZ)**. THEN FIND THE **TRUE LENGTH** OF THE **VENTILATION SHAFT**.

NOTE: START PROJECTION FROM **TOP**.





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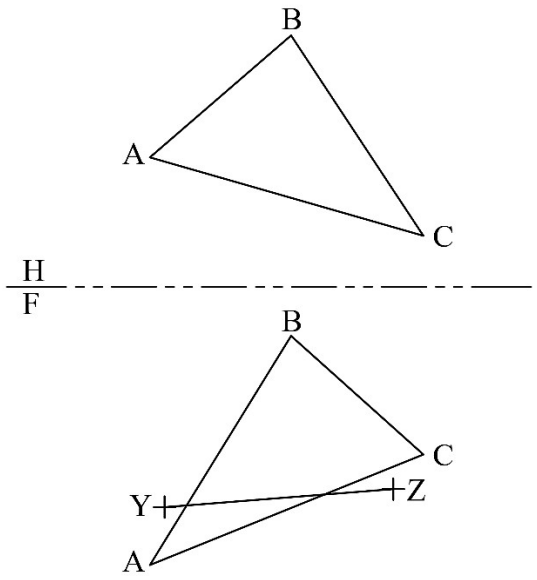
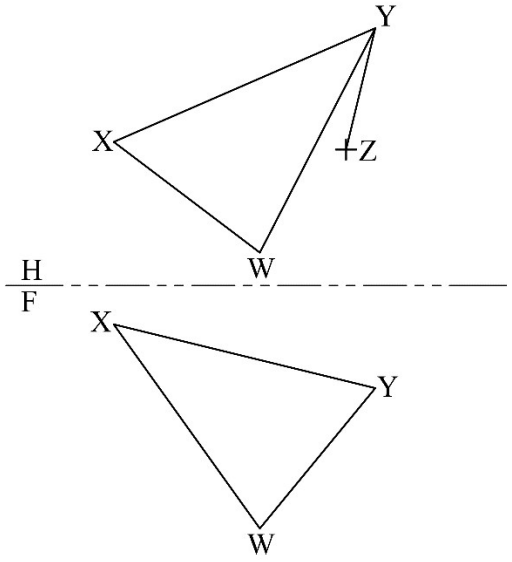
PROJECTION OF A LINE ONTO A PLANE

IN PROBLEMS 1 AND 2, DRAW THE MISSING PROJECTION OF LINE **YZ**, WHICH LIES IN THE PLANE IN EACH PROBLEM.

1

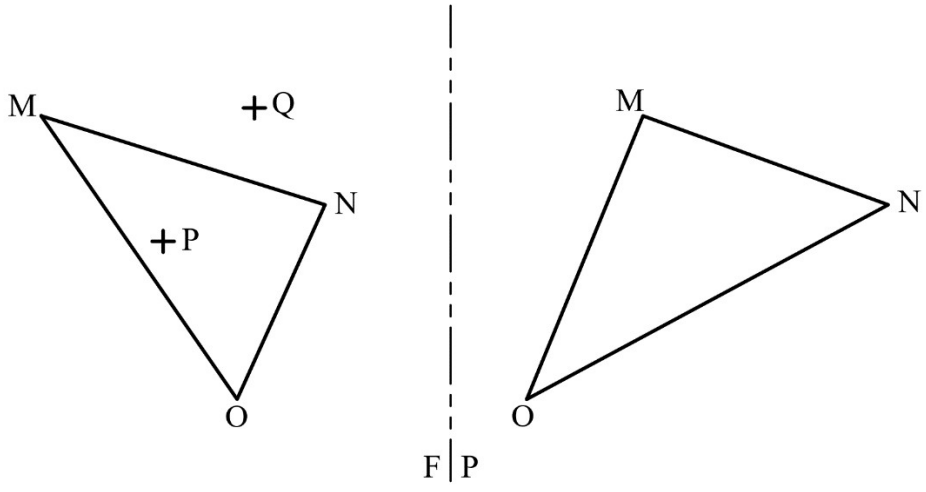


2



DRAW THE RIGHT SIDE PROJECTIONS OF POINTS **P** AND **Q**, WHICH LIE IN THE PLANE BELOW.

3



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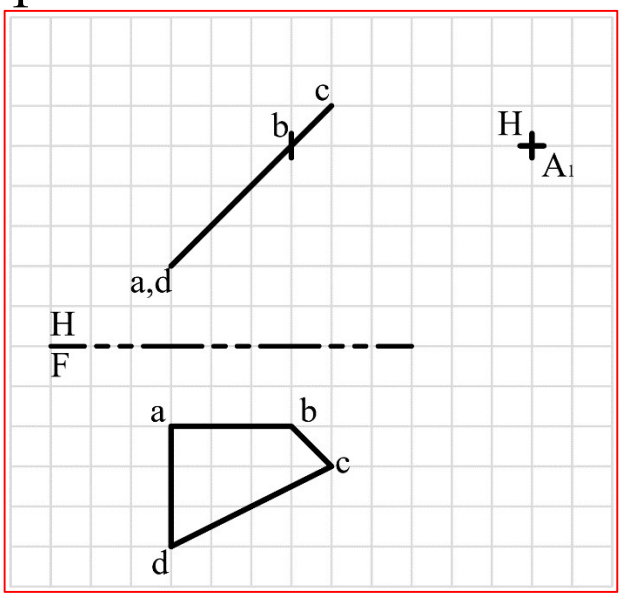
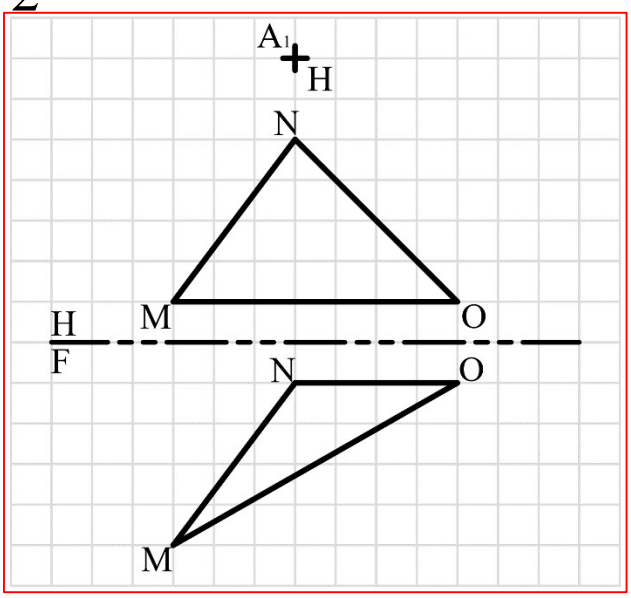
TRUE SHAPE OF A PLANE

REDRAW THE FOLLOWING EXERCISES ON THE GIVEN "GRID PAPER", THEN FIND THE TRUE SHAPE VIEWS OF THE PLANES OF ALL EXERCISES SHOWN BELOW.

1

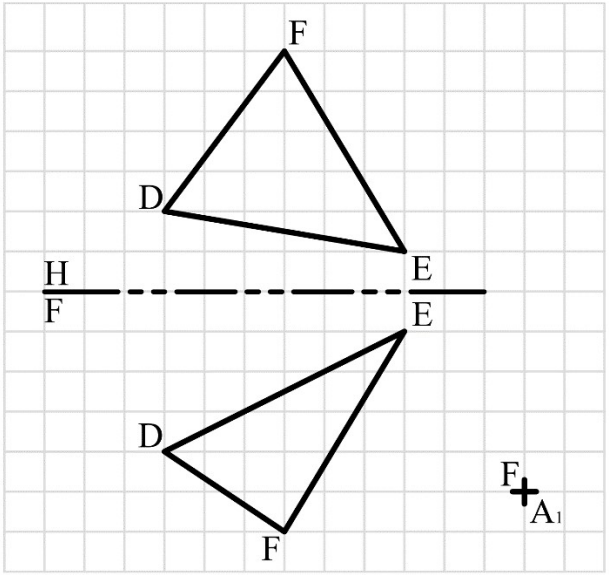


2

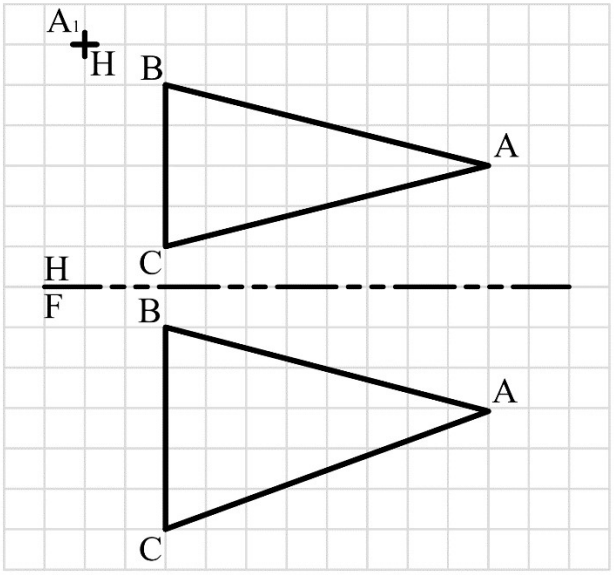


Change H+A1 to the left. Remove one of the true lines.

3



4



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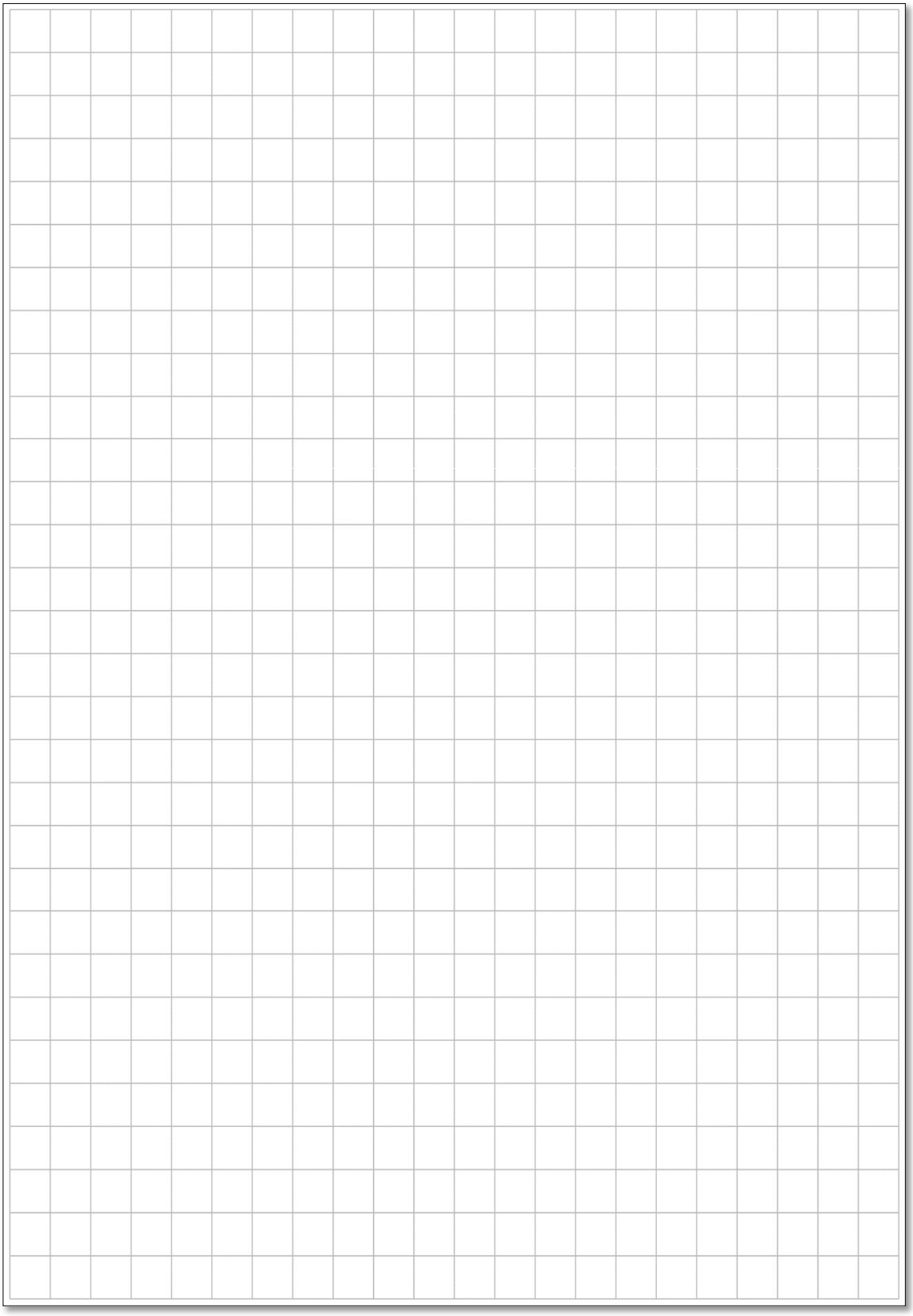
ANSWER SHEET OF TRUE SHAPE

Ex. 1

Ex. 2



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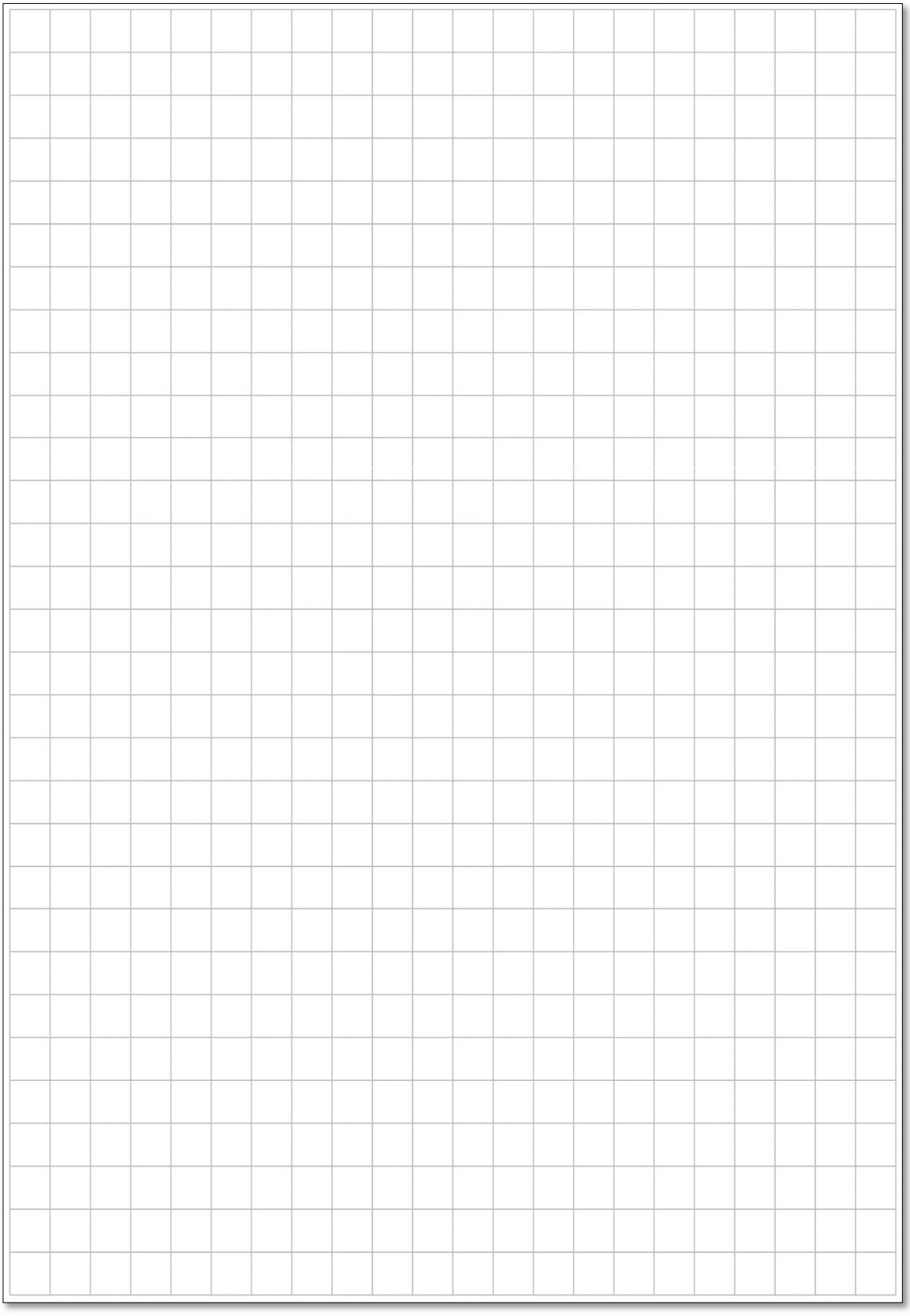
ANSWER SHEET OF TRUE SHAPE

Ex. 3

Ex. 4



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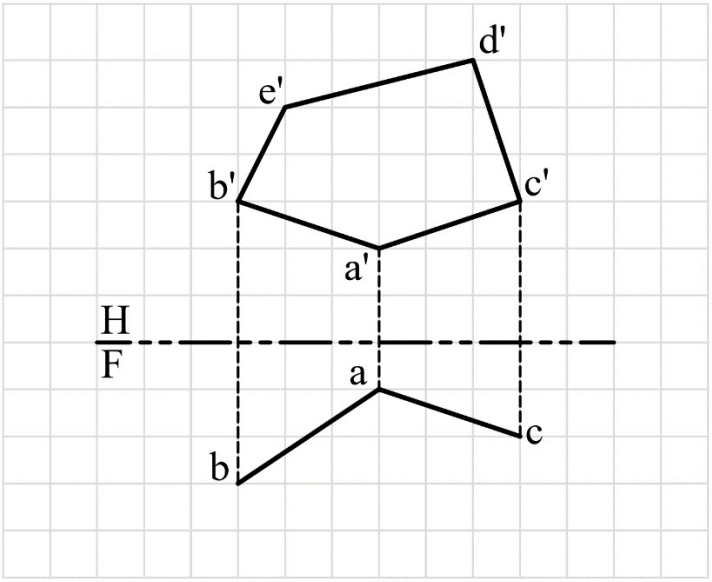
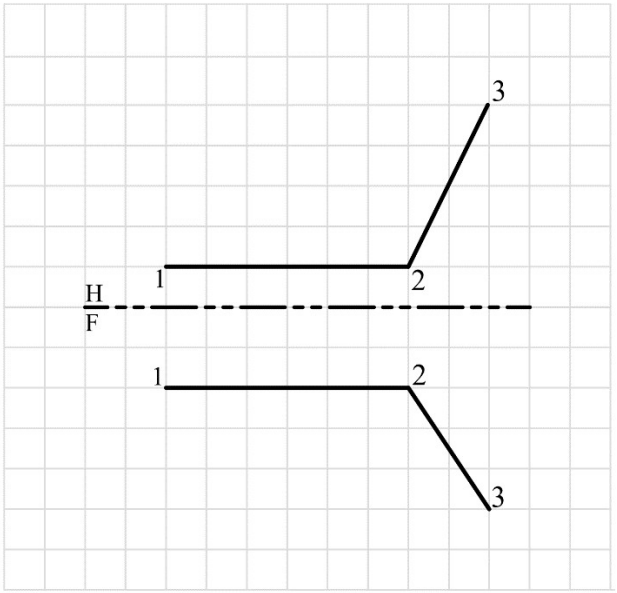
APPLICATIONS ON TRUE SHAPE OF A PLANE

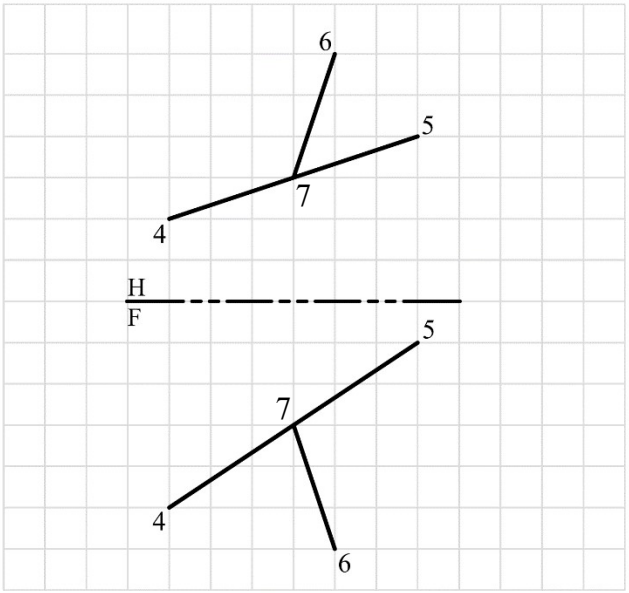
1 USING THE GIVEN HORIZONTAL AND FRONTAL PROJECTIONS **ONLY**, DETERMINE THE FRONTAL PROJECTION OF THE PLANE PENTAGON **(abcde).**



2 REDRAW THE FOLLOWING EXERCISES ON THE GIVEN **"GRID PAPER"**. THEN FIND THE ANGLE BETWEEN THE LINES.



(A): Line 1-2 and 2-3



(B): Line 4-5 and Line 6-7

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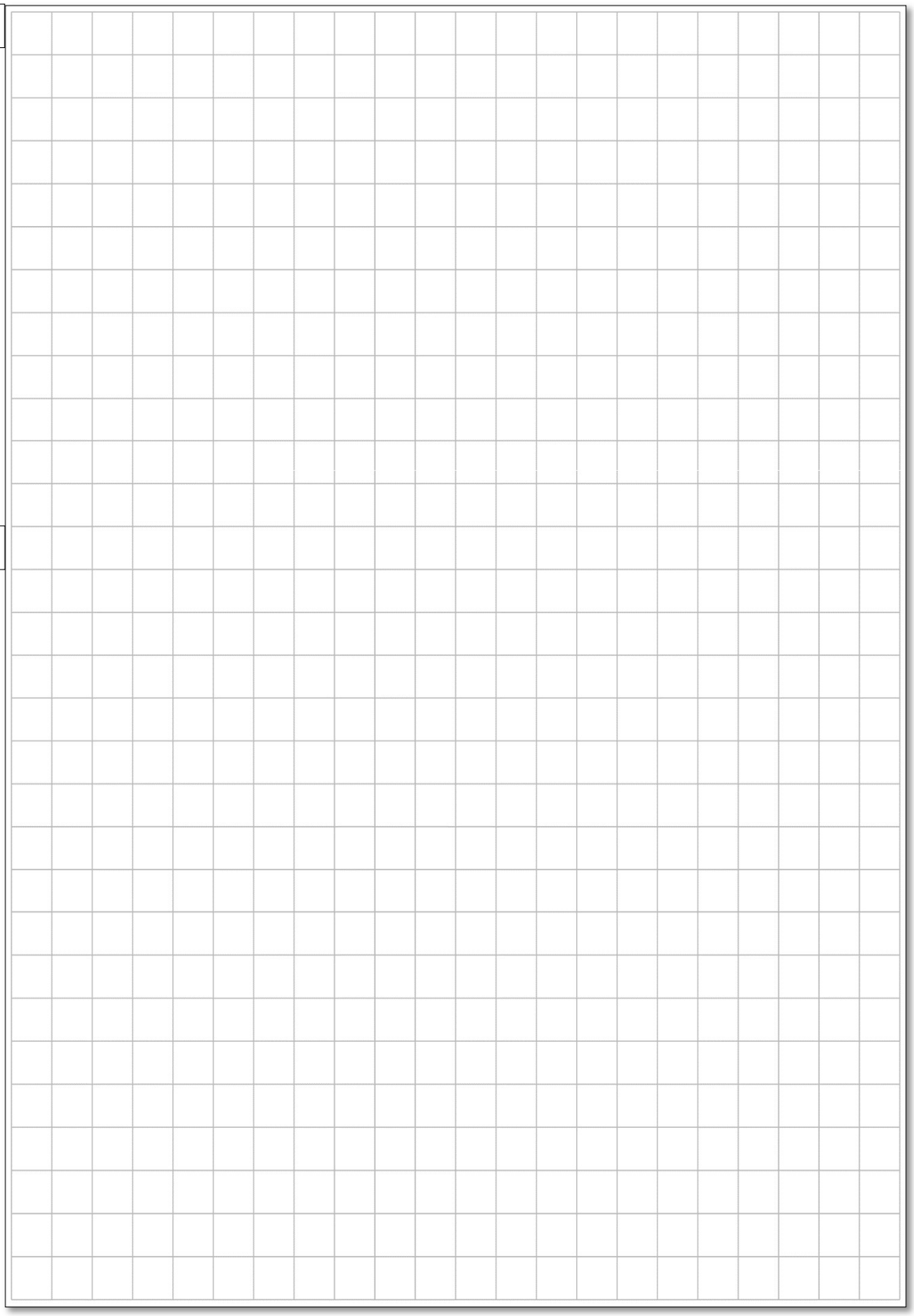
ANSWER SHEET OF APPLICATION ON TRUE SHAPE

Ex. 2A

Ex. 2B



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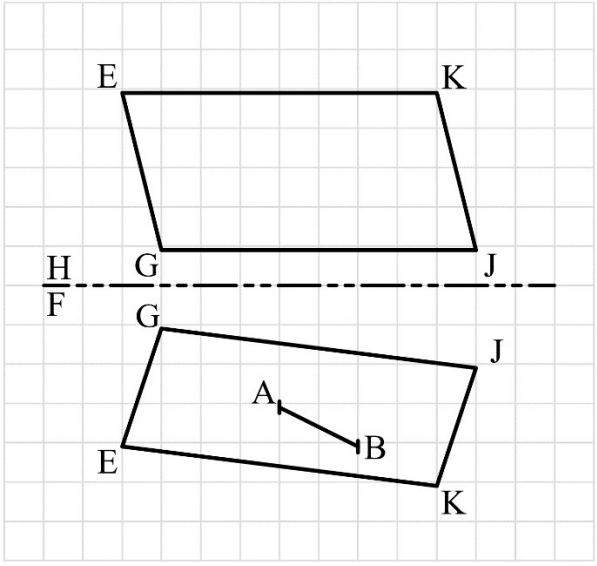
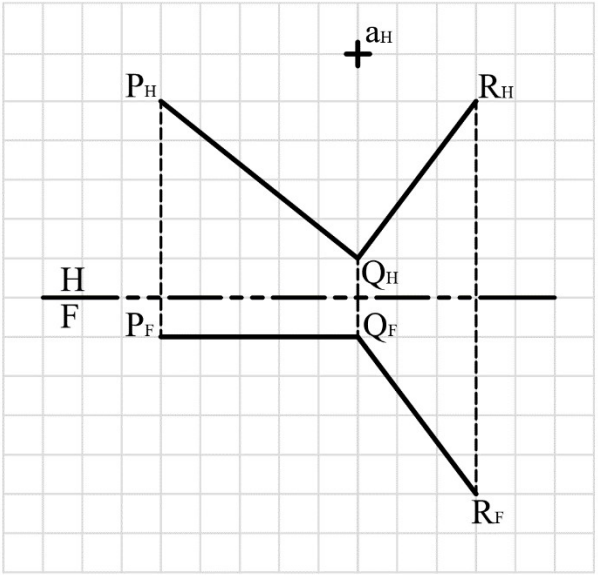
3 REDRAW THE FOLLOWING EXERCISE ON THE GIVEN **"GRID PAPER"** WHERE LINE **(AB)** IS ONE SIDE OF A REGULAR HEXAGON LYING IN PLANE (**EGJK)**. DRAW THE HEXAGONAL IN THE VIEW WHERE IT APPEARS TRUE.



4 POINT **(a)** IS THE BACK CORNER OF A 19 MM SQUARE LYING IN A PLANE (**PQR)**. TWO SIDES OF THE SQUARE ARE PARALLEL TO LINE (**PQ)**. REDRAW THE FOLLOWING EXERCISE ON THE GIVEN "**GRID PAPER**", THEN COMPLETE THE SQUARE IN THE VIEW WHERE IT APPEARS TRUE.

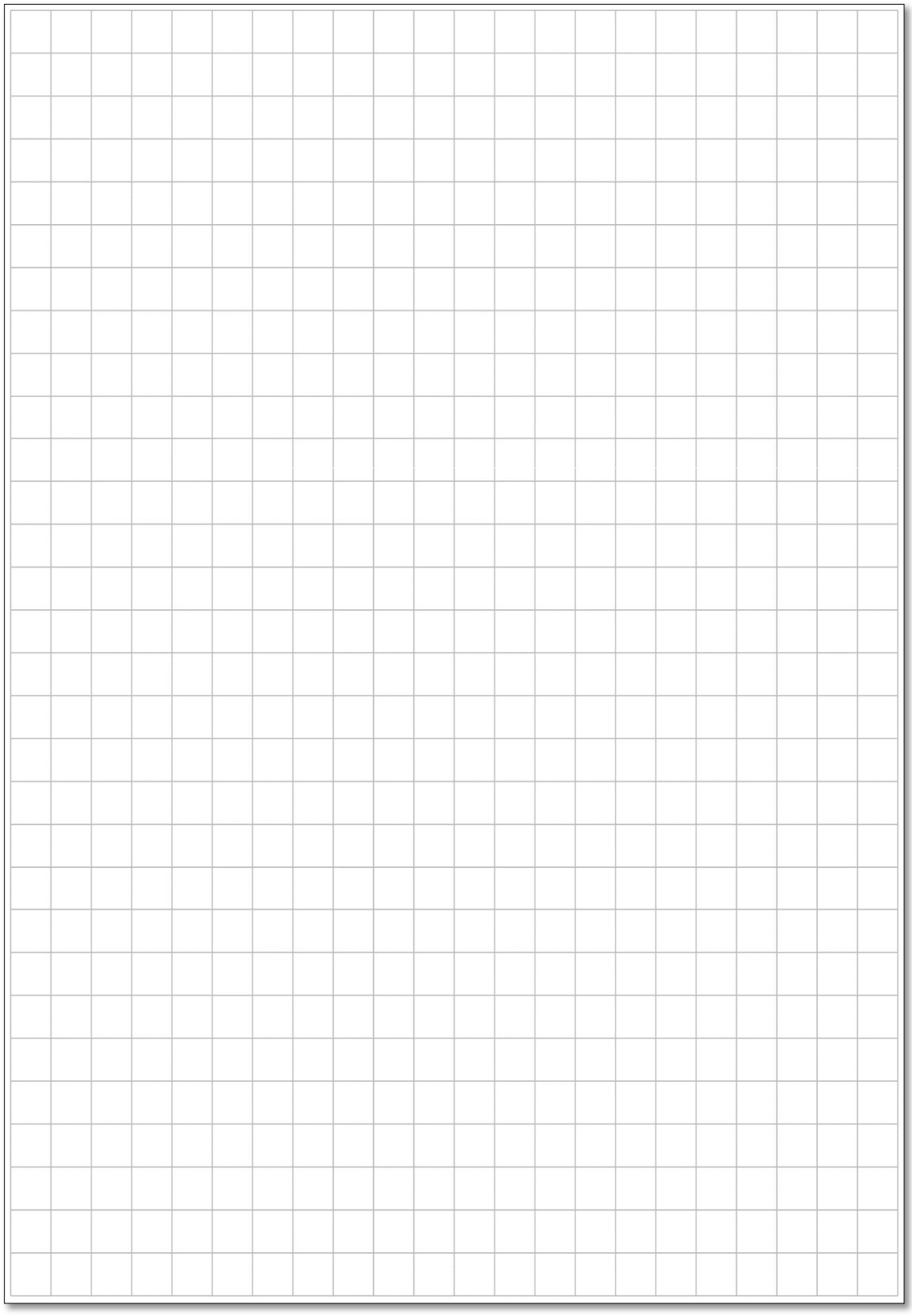


NAME: _____	**SECTION NO.:** _____	**53**
FILE NO.: _____	**DATE:** _____	

ANSWER SHEET OF APPLICATION ON TRUE SHAPE

Ex. 3

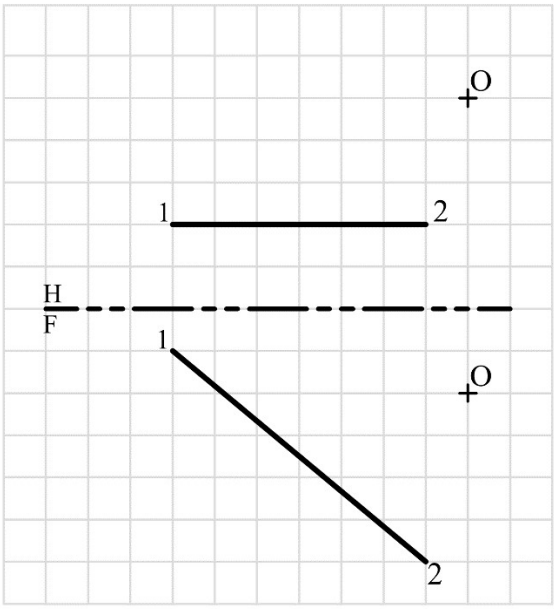
Ex. 4



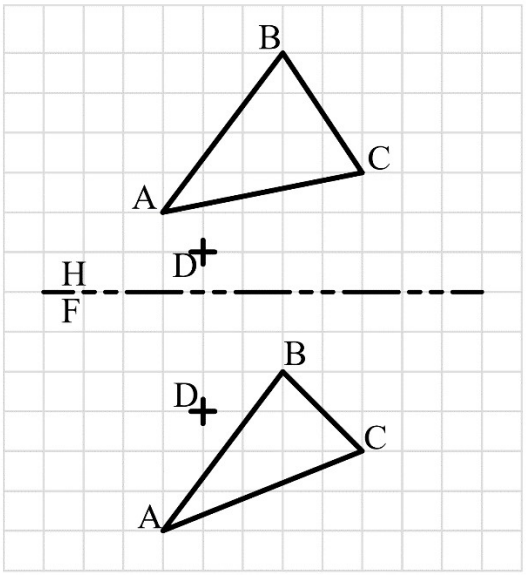
NAME: _____	**SECTION NO.:** _____	**54**
FILE NO.: _____	**DATE:** _____	

PERPENDICULARITY

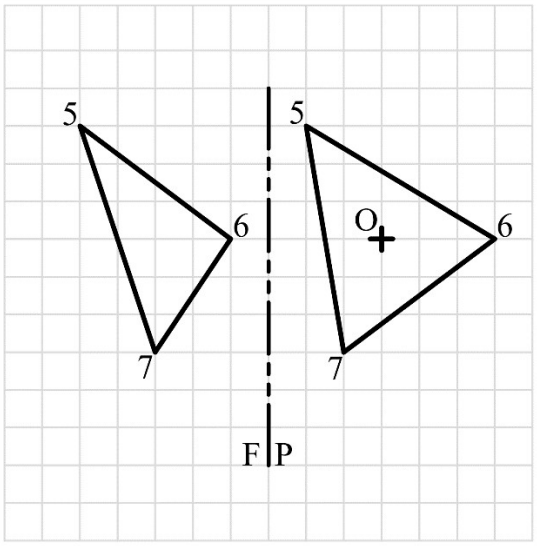
1 REDRAW THE FOLLOWING EXERCISE ON THE GIVEN "**GRID PAPER**", THEN DRAW A **PERPENDICULAR** LINE FROM POINT **(O)** TO THE GIVEN LINE (1-2). THEN FIND THE TRUE LENGTH OF THIS LINE.



2 REDRAW THE FOLLOWING EXERCISE ON THE GIVEN "**GRID PAPER**", THEN MEASURE THE TRUE LENGTH OF THE SHORTEST LINE FROM POINT **(D)** TO THE PLANE **(ABC)**. DRAW THE LINE IN ALL VIEWS. **METRIC SCALE 1:2**.



3 REDRAW THE FOLLOWING EXERCISE ON THE GIVEN "**GRID PAPER**", THEN DRAW A LINE THAT IS **1-INCH** LONG FROM POINT **(O)** ON THE PLANE, PERPENDICULAR TO THE PLANE. SHOW THE LINE IN BOTH VIEWS.



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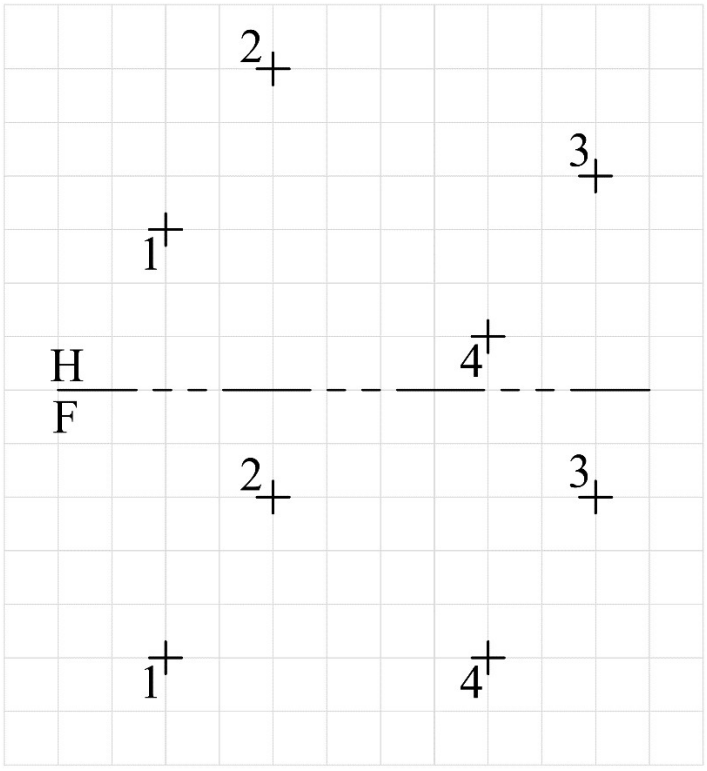
FILE NO.: _____	**DATE:** _____	

4 REDRAW THE FOLLOWING EXERCISE ON THE GIVEN "**GRID PAPER**" WHERE THE PLANE FORMED BY THE POINTS **(1-2-3-4)** IS THE BASE OF A RIGHT PYRAMID. THE VERTEX **(V)** HAS AN ALTITUDE OF **(1")** ABOVE THE BASE AT ITS **MIDPOINT**.

a) **DRAW** THE PYRAMID IN ALL VIEWS.

b) FIND THE **TRUE SHAPE** OF THE BASE, AND THEN COMPUTE ITS **AREA**.

(NOTE: V = $\frac{1}{3}$ AH)

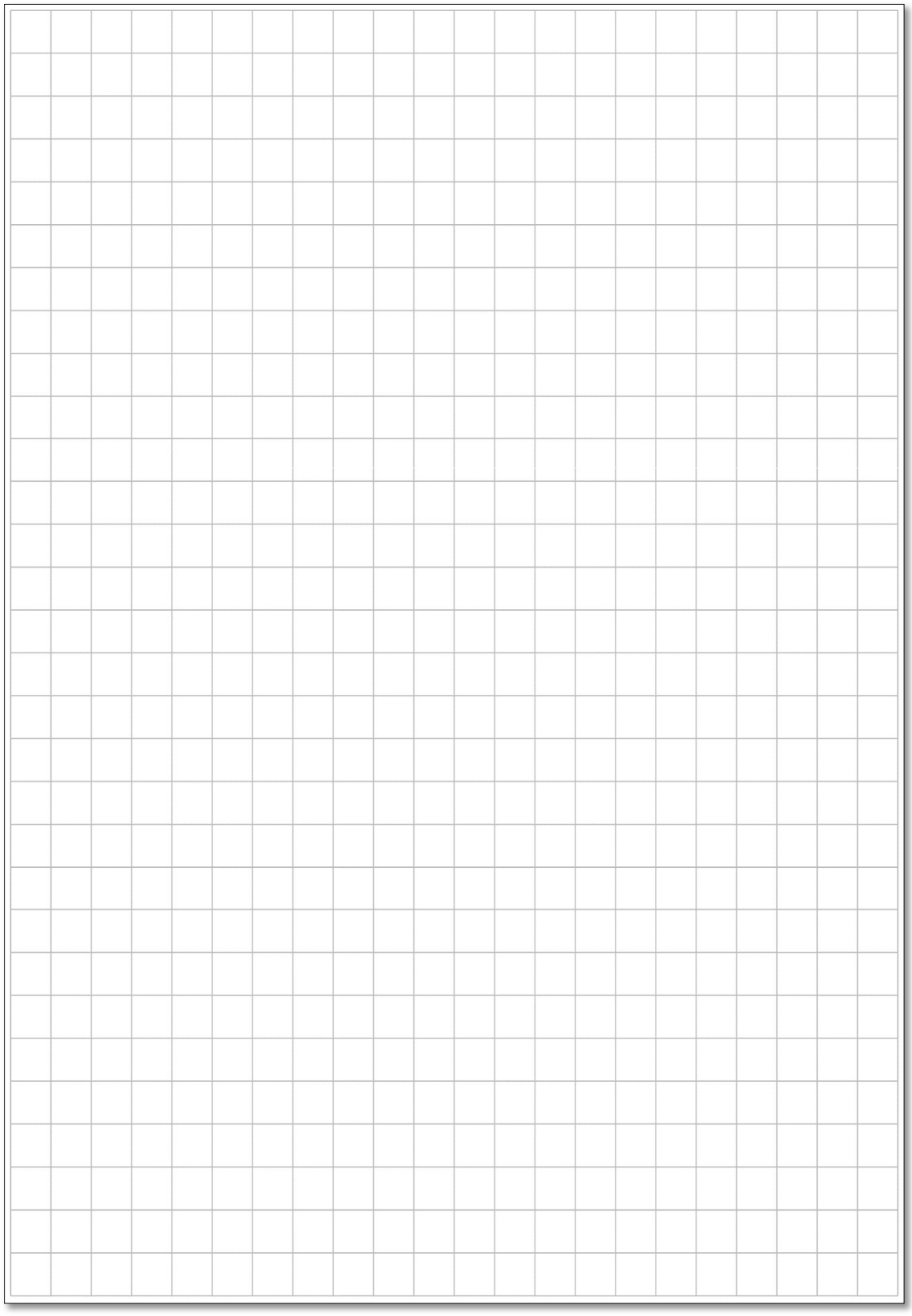


NAME: _____	**SECTION NO.:** _____	**56**
FILE NO.: _____	**DATE:** _____	

ANSWER SHEET OF PERPENDICULARITY

Ex. 1

Ex. 2

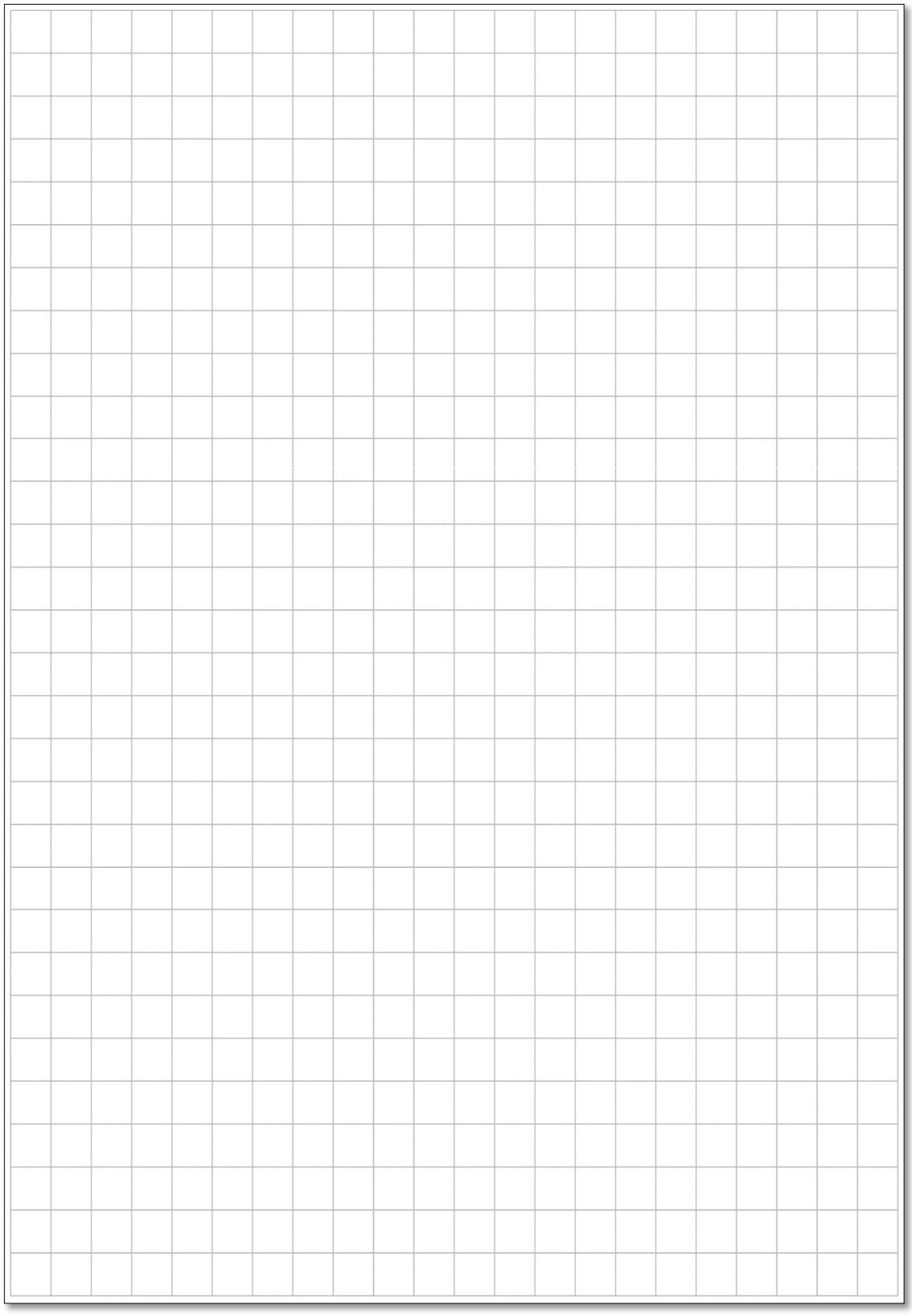


NAME: _____	**SECTION NO.:** _____	**57**
FILE NO.: _____	**DATE:** _____	

ANSWER SHEET OF PERPENDICULARITY

Ex. 3

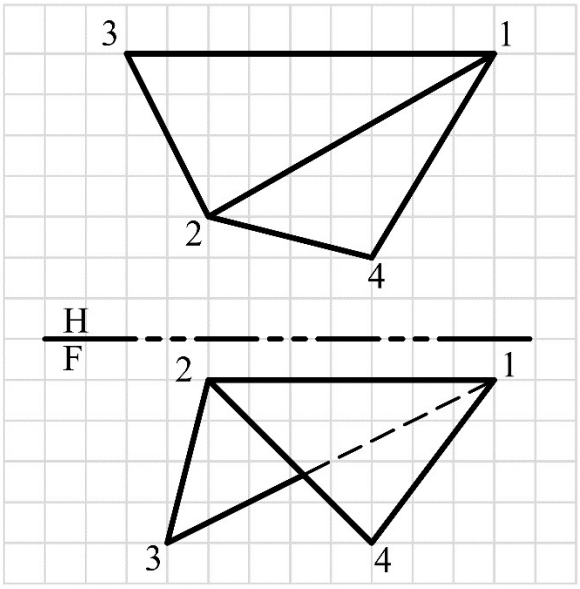
Ex. 4



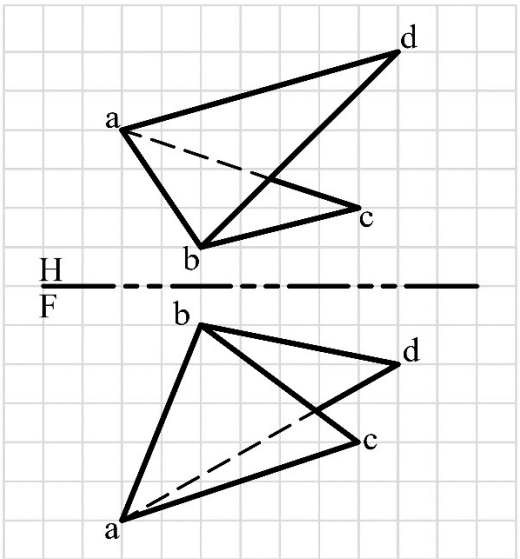
NAME: _____	**SECTION NO.:** _____	**58**
FILE NO.: _____	**DATE:** _____	

ANGLE BETWEEN TWO INTERSECTED PLANES (DIHEDRAL ANGLE)

1 REDRAW THE FOLLOWING EXERCISE ON THE GIVEN "**GRID PAPER**", THEN DRAW THE VIEW THAT SHOWS THE TRUE ANGLE BETWEEN THE PLANES **(1-2-3)** AND **(1-2-4)**. SHOW ALL CONSTRUCTIONS. THE ANGLE BETWEEN THE PLANES IS .



2 REDRAW THE FOLLOWING EXERCISE ON THE GIVEN "**GRID PAPER**", THEN DETERMINE THE ANGLE BETWEEN PLANES **(ABC)** AND **(ABD)**. SHOW ALL CONSTRUCTIONS. THE ANGLE BETWEEN THE PLANES IS _____.

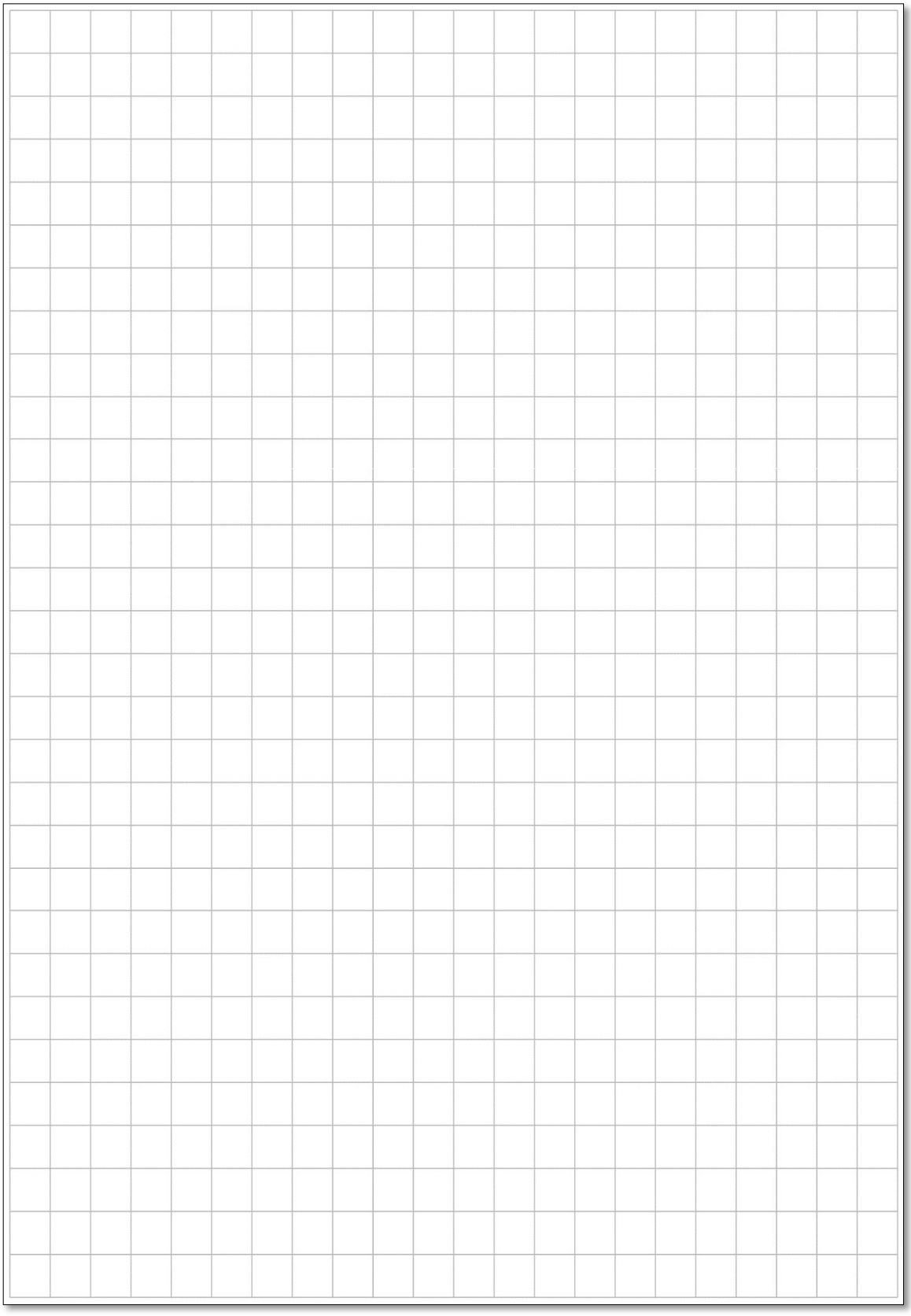


NAME: _____	**SECTION NO.:** _____	**59**
FILE NO.: _____	**DATE:** _____	

ANSWER SHEET OF DIHEDRAL ANGLE

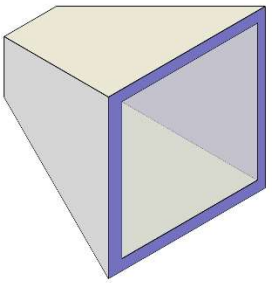
Ex. 1

Ex. 2

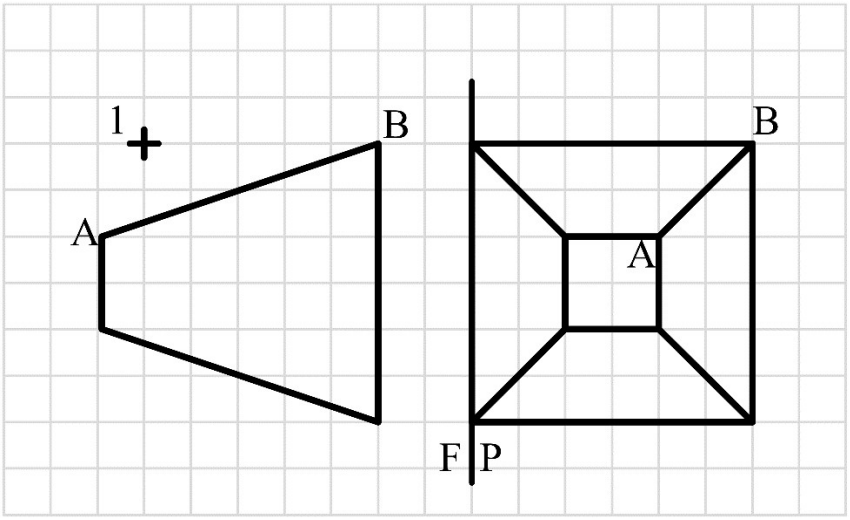


NAME: _____	**SECTION NO.:** _____	**60**
FILE NO.: _____	**DATE:** _____	

3 IN ORDER TO BUILD A **DIFFUSER SECTION** SIMILAR TO THE ONE IN THE FIGURE, THE DIHEDRAL ANGLE MUST BE KNOWN. USE **(AB)** AS THE OF INTERSECTION. REDRAW THE FOLLOWING EXERCISE ON THE GIVEN "**GRID PAPER**" TO FIND THIS ANGLE.



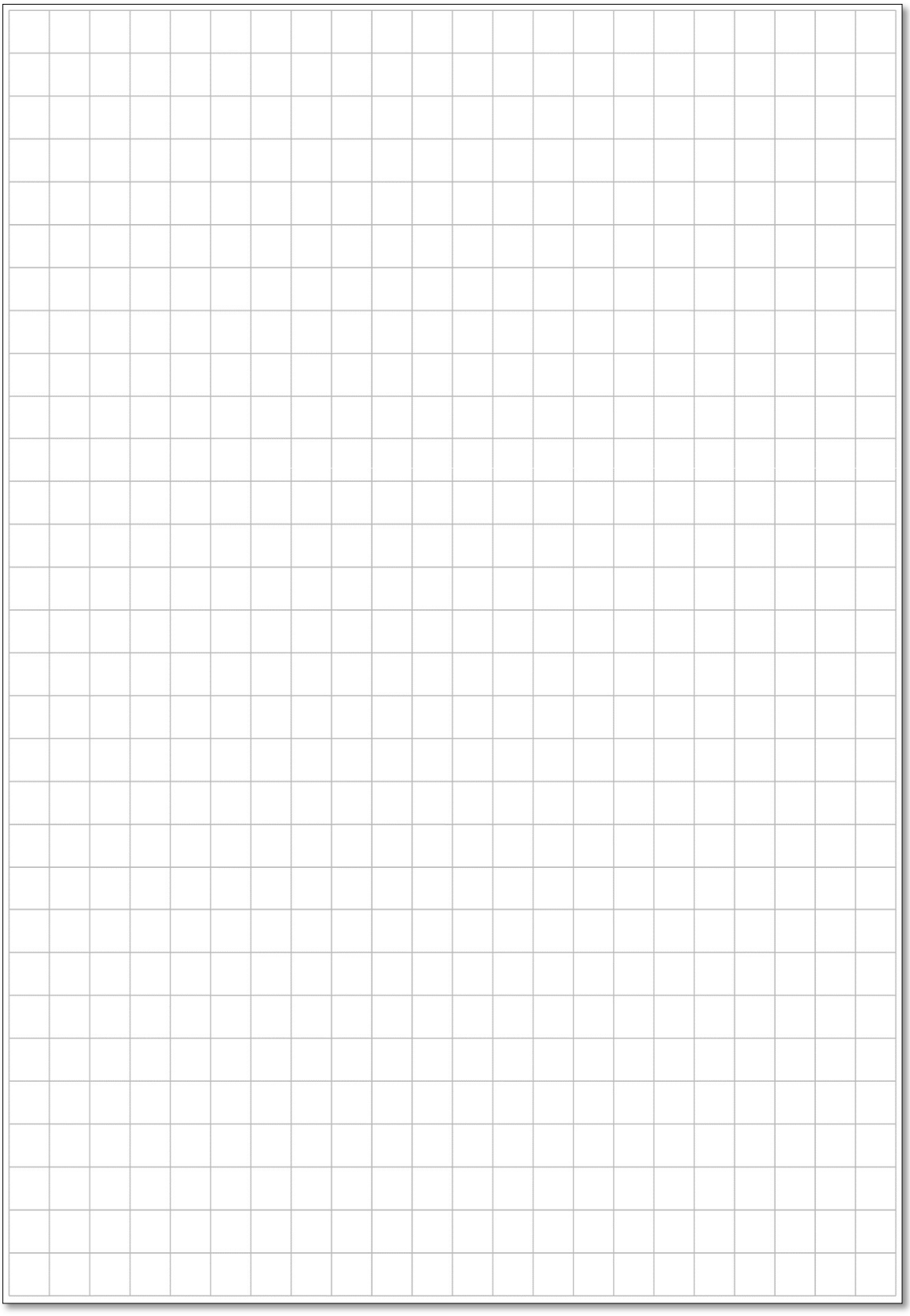
THE ANGLE IS _____.



NAME: _____	**SECTION NO.:** _____	**61**
FILE NO.: _____	**DATE:** _____	

ANSWER SHEET OF DIHEDRAL ANGLE

Ex. 3



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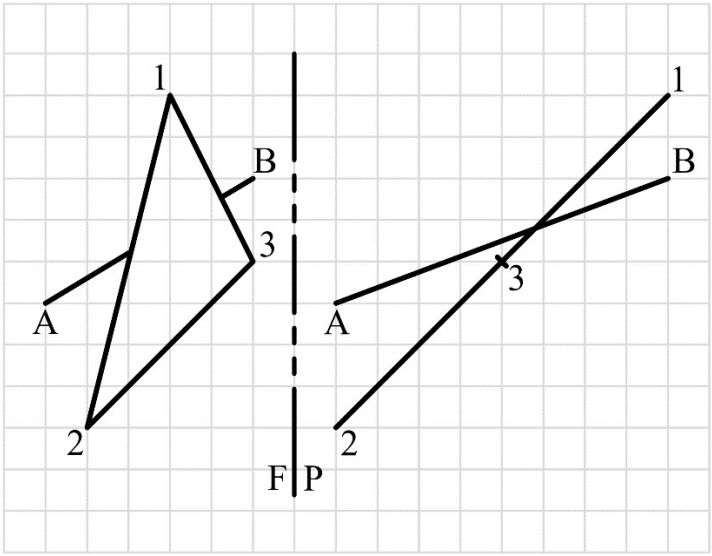
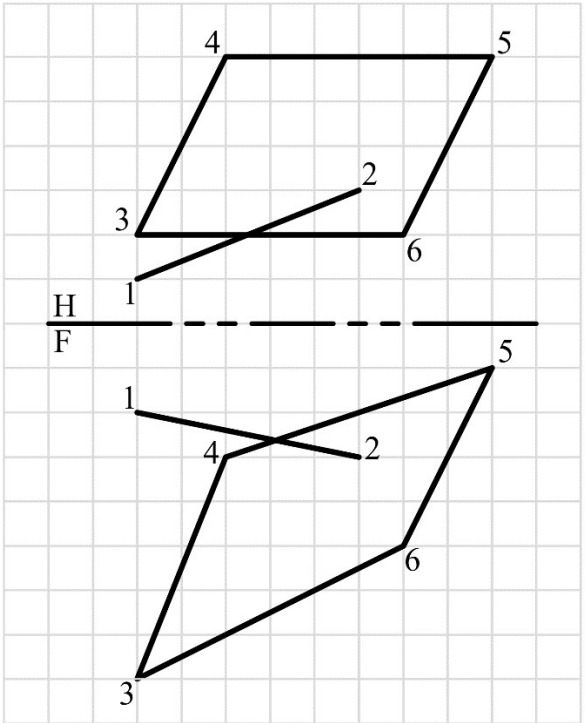
FILE NO.: _____	**DATE:** _____	

ANGLE BETWEEN A LINE AND A PLANE

1 REDRAW THE FOLLOWING EXERCISE ON THE GIVEN "**GRID PAPER**", THEN FIND THE ANGLE BETWEEN THE LINE AND THE PLANE USING **THE PLANE METHOD**.
THE ANGLE IS _____.



2 REDRAW THE FOLLOWING EXERCISE ON THE GIVEN "**GRID PAPER**", THEN FIND THE ANGLE BETWEEN CONTROL CABLE **(1-2)** AND BULKHEAD **(3-4-5-6)**. THE ANGLE IS _____.

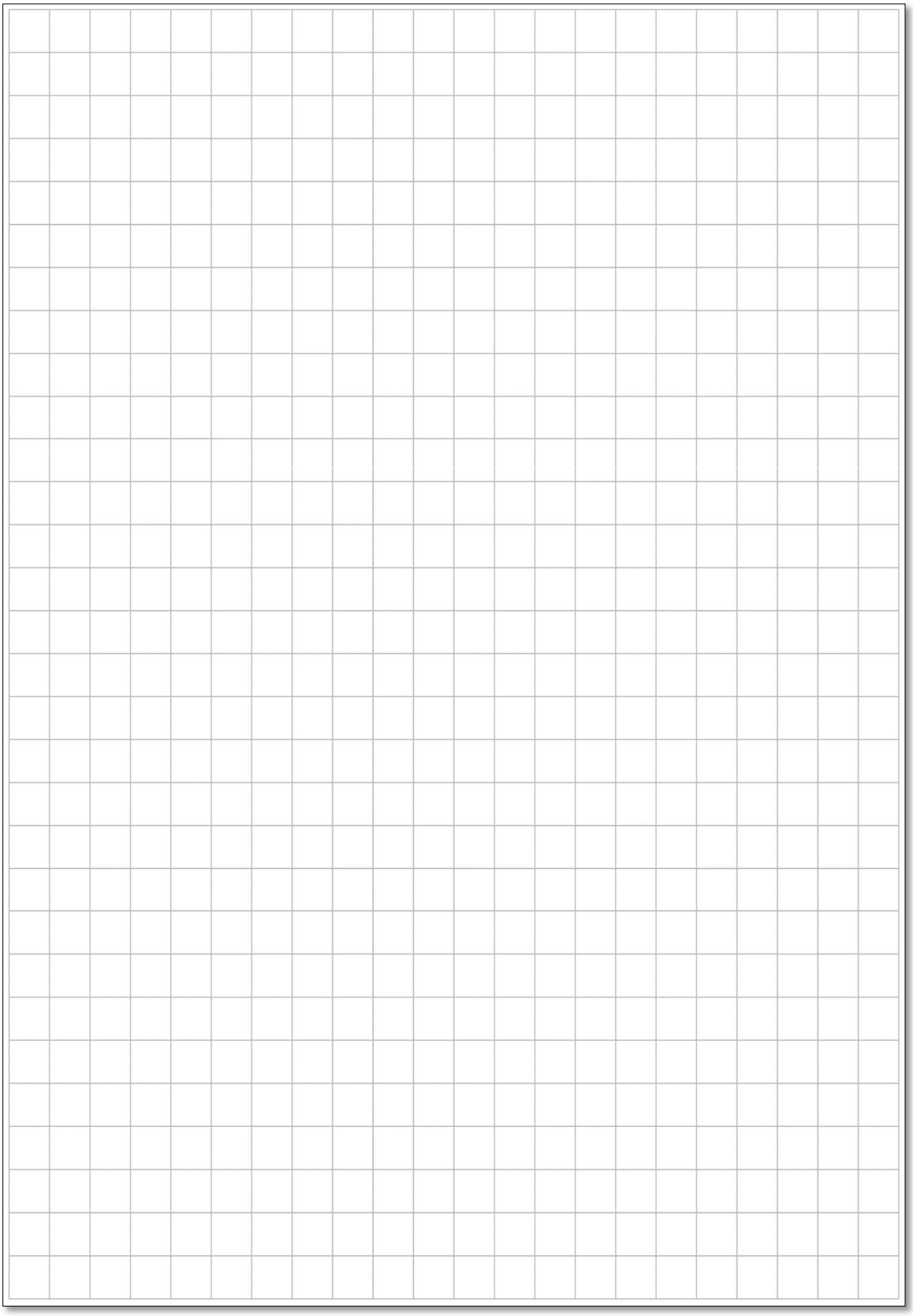


NAME: _____	**SECTION NO.:** _____	**63**
FILE NO.: _____	**DATE:** _____	

ANSWER SHEET OF ANGLE BETWEEN A LINE AND A PLANE

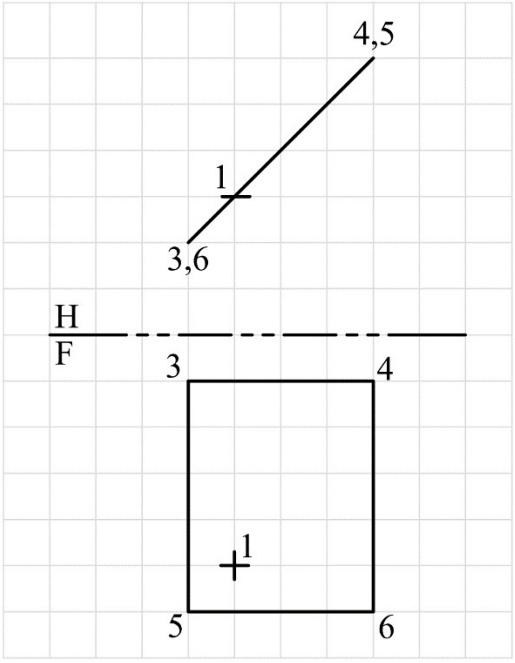
Ex. 1

Ex. 2

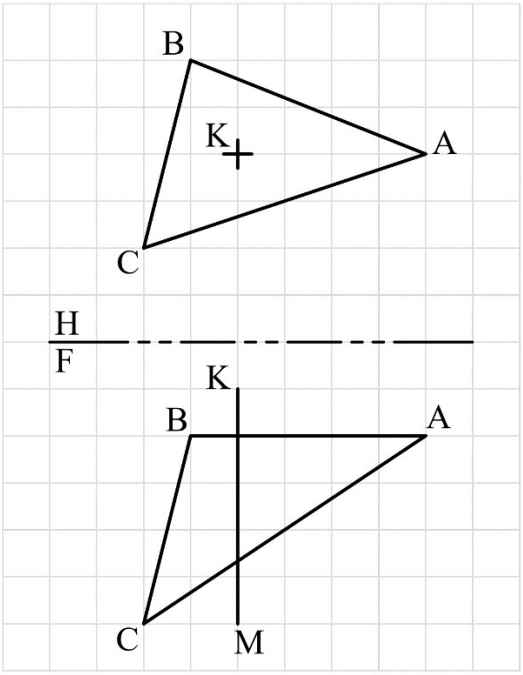


NAME: _____	**SECTION NO.:** _____	**64**
FILE NO.: _____	**DATE:** _____	

3 REDRAW THE FOLLOWING EXERCISE ON THE GIVEN "**GRID PAPER**" TO ESTABLISH THE VIEWS OF 1.5" LINE **(1-2)** SUCH THAT LINE **(1-2)** FORMS AN ANGLE OF 25º WITH THE GIVEN SURFACE **(3-4-5-6)**.



4 REDRAW THE FOLLOWING EXERCISE ON THE GIVEN "**GRID PAPER**" TO FIND THE ANGLE BETWEEN THE VERTICAL LINE **(MK)** AND PLANE **(ABC)**.



NAME: _____	**SECTION NO.:** _____	**65**
FILE NO.: _____	**DATE:** _____	

ANSWER SHEET OF ANGLE BETWEEN A LINE AND A PLANE

Ex. 3

Ex. 4

NAME: _____	**SECTION NO.:** _____	**66**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**67**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**68**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**69**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**70**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**71**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**72**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**73**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**74**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**75**
FILE NO.: _____	**DATE:** _____	

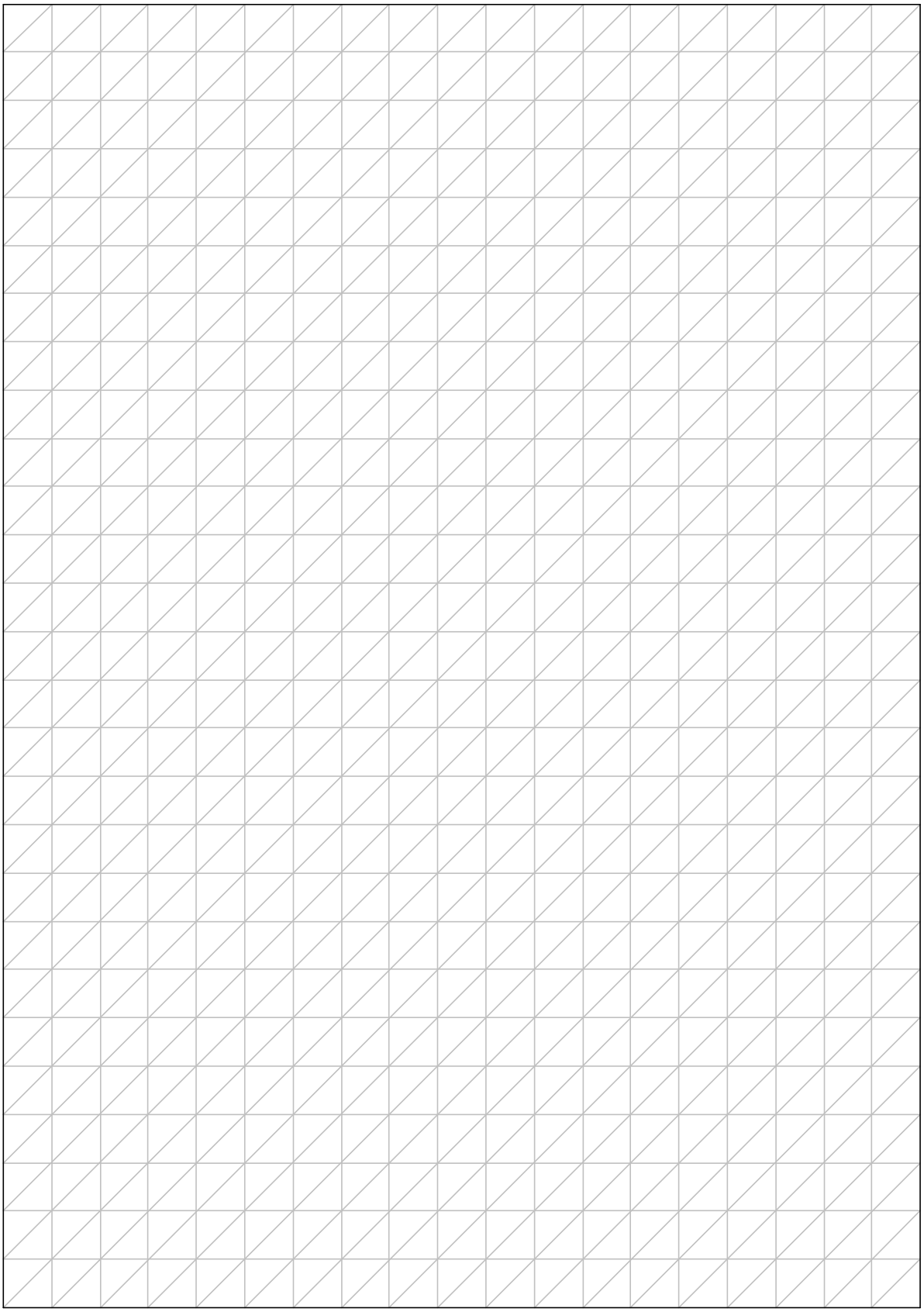
NAME: _____	**SECTION NO.:** _____	**76**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	77
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**78**
FILE NO.: _____	**DATE:** _____	

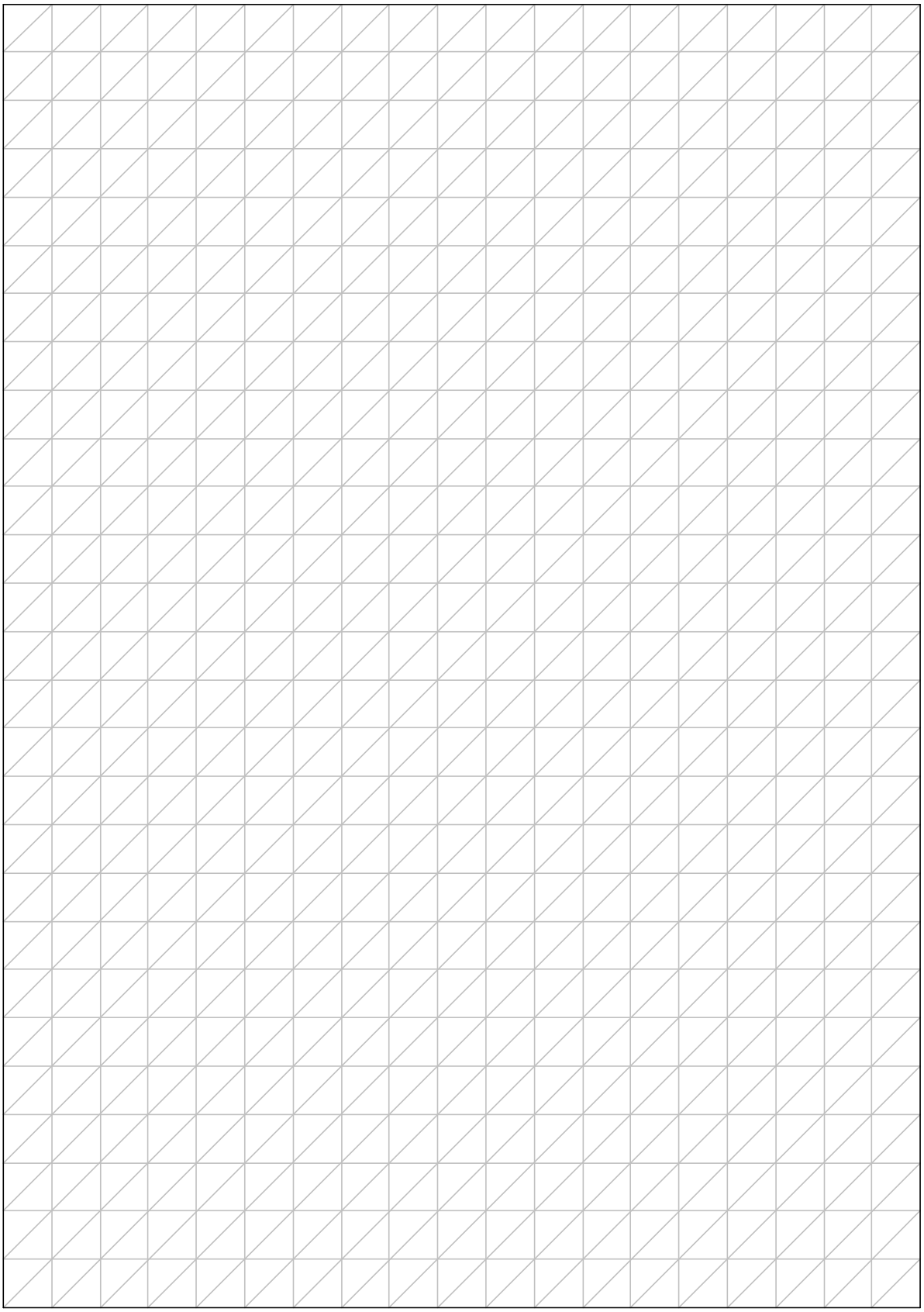
NAME: _____	**SECTION NO.:** _____	**79**
FILE NO.: _____	**DATE:** _____	

Oblique Grid



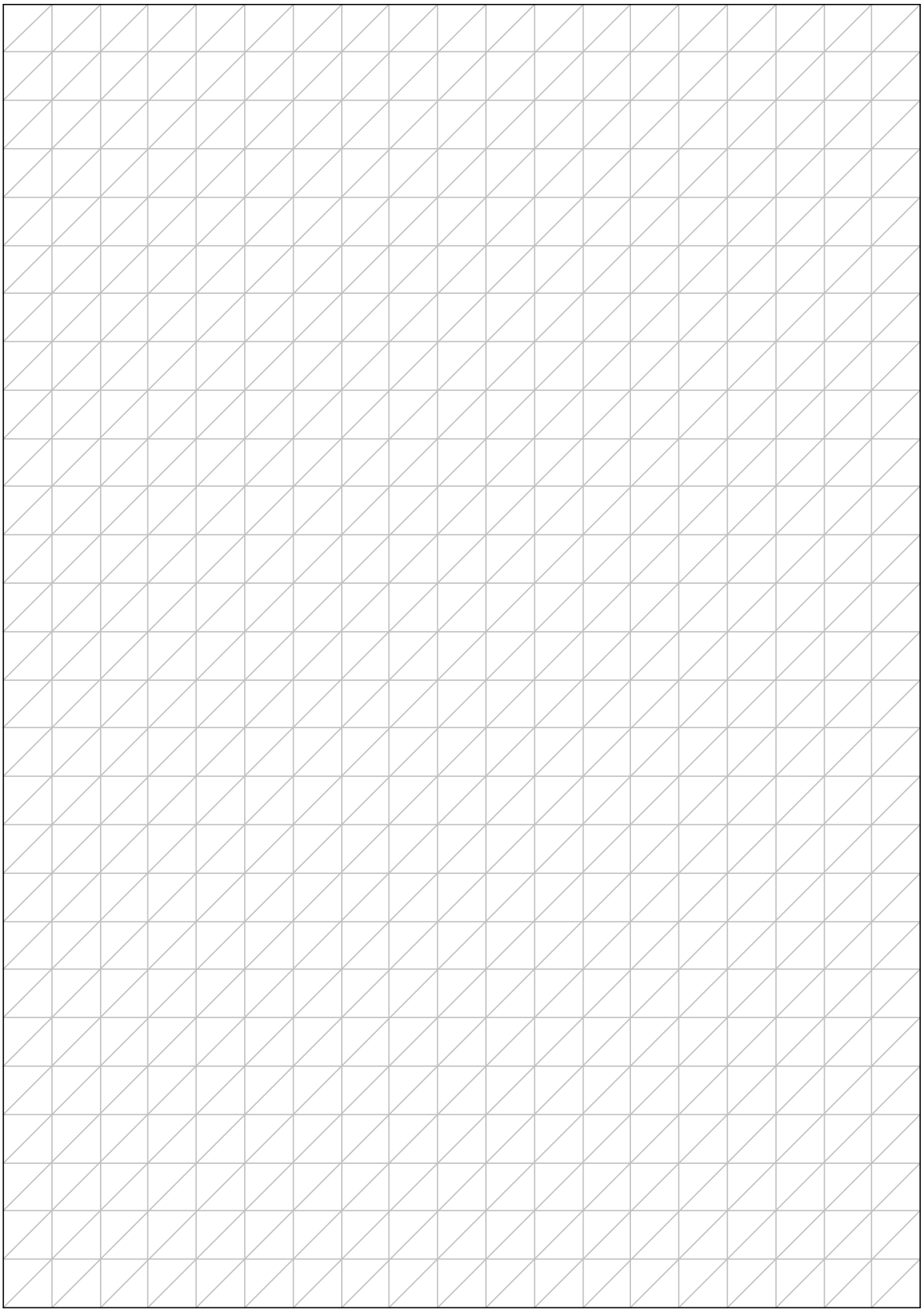
NAME: _____	**SECTION NO.:** _____	**80**
FILE NO.: _____	**DATE:** _____	

Oblique Grid



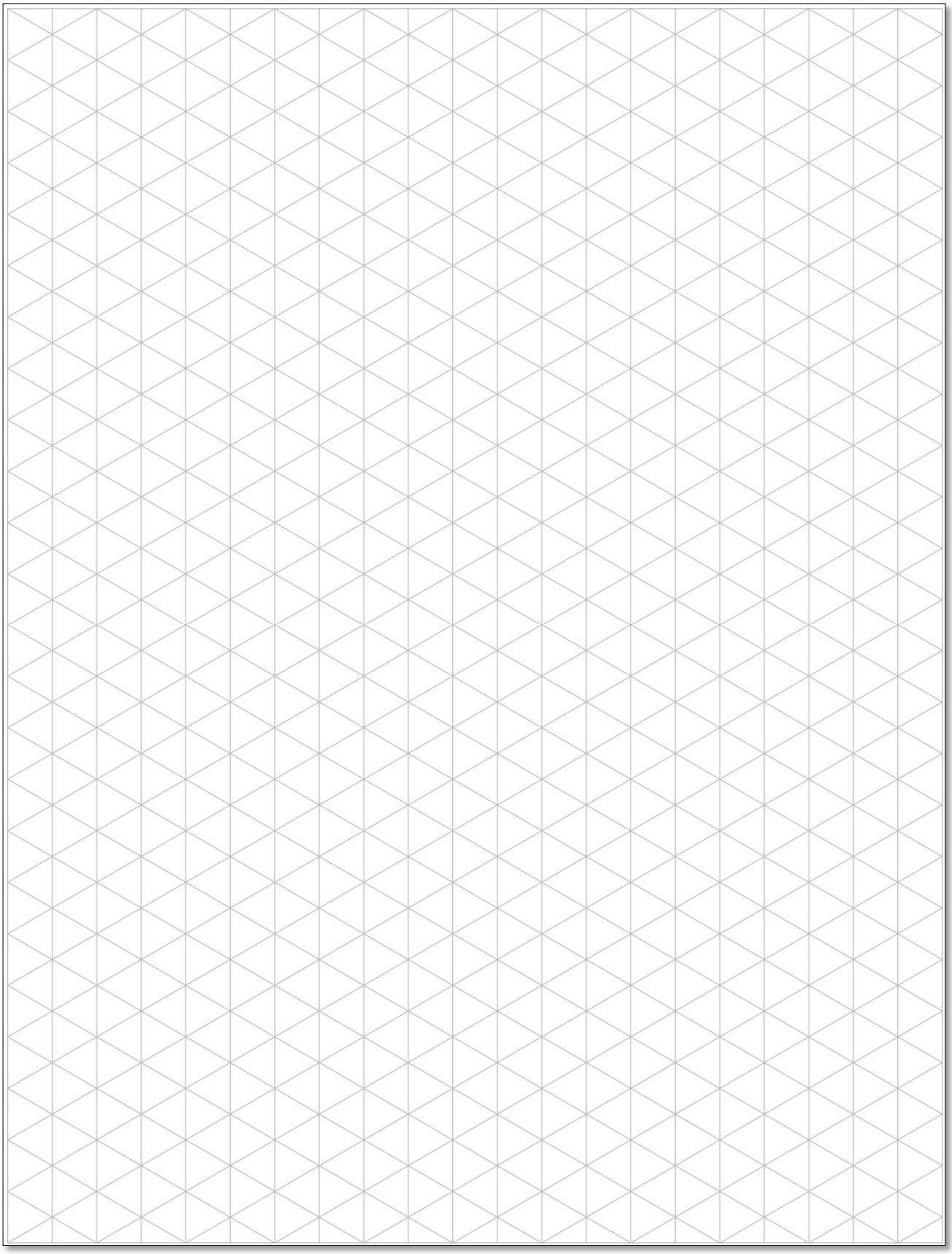
NAME: _____	**SECTION NO.:** _____	**81**
FILE NO.: _____	**DATE:** _____	

Oblique Grid



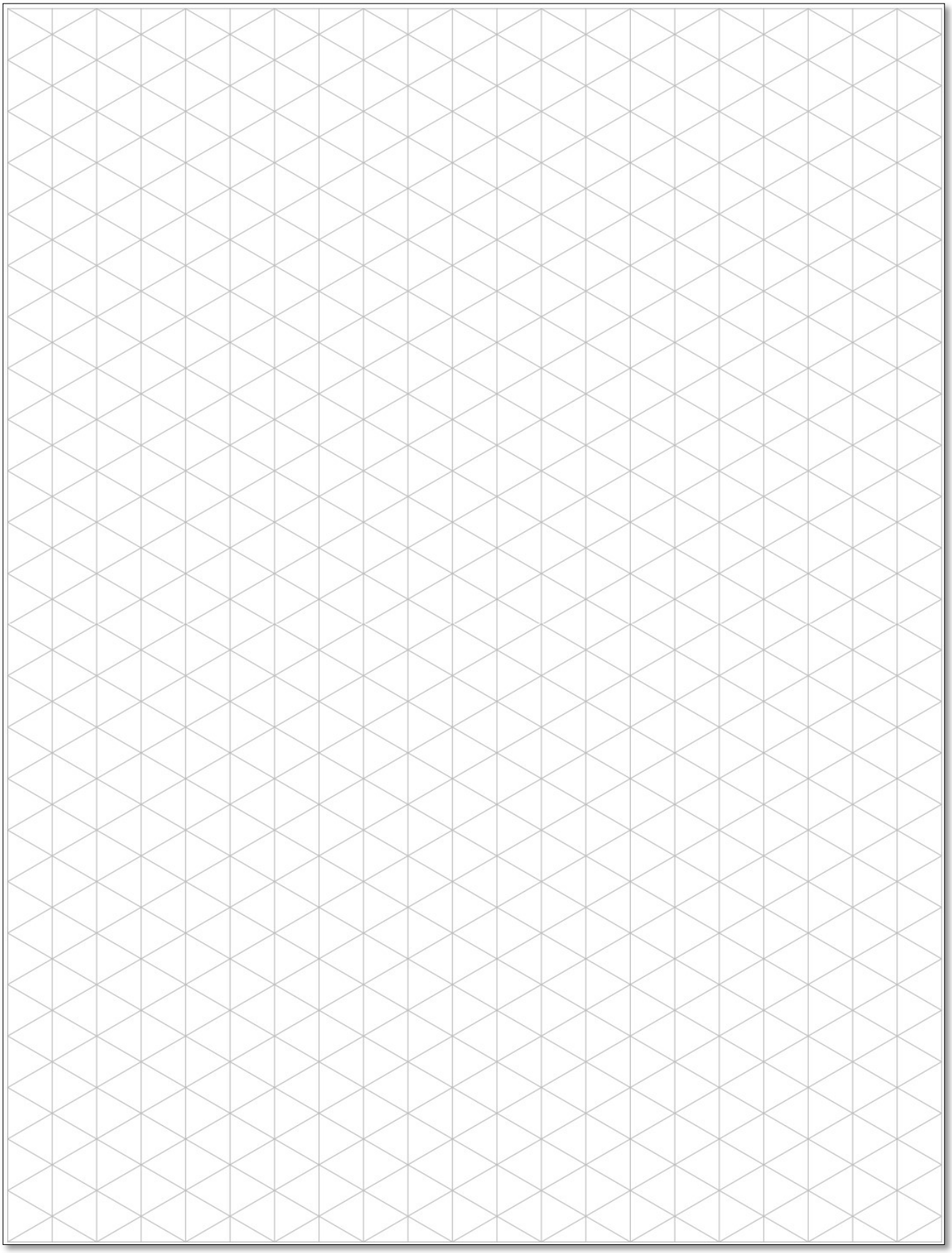
NAME: _____	**SECTION NO.:** _____	**82**
FILE NO.: _____	**DATE:** _____	

Isometric Grid



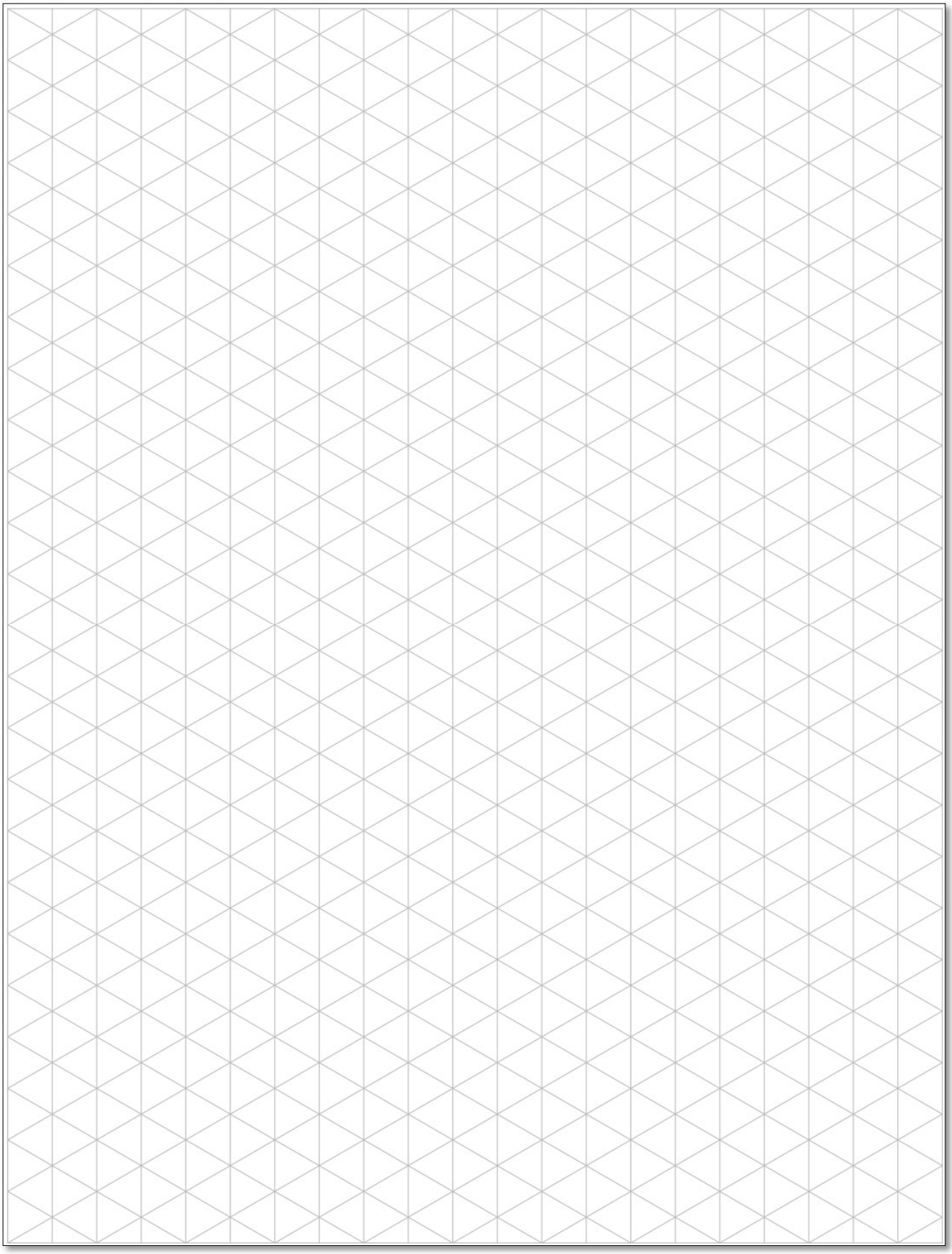
NAME: _____	**SECTION NO.:** _____	**83**
FILE NO.: _____	**DATE:** _____	

Isometric Grid



NAME: _____	**SECTION NO.:** _____	**84**
FILE NO.: _____	**DATE:** _____	

Isometric Grid



NAME: _____	**SECTION NO.:** _____	**85**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**86**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**87**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**88**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**89**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**90**
FILE NO.: _____	**DATE:** _____	

NAME: _____	**SECTION NO.:** _____	**91**
FILE NO.: _____	**DATE:** _____	

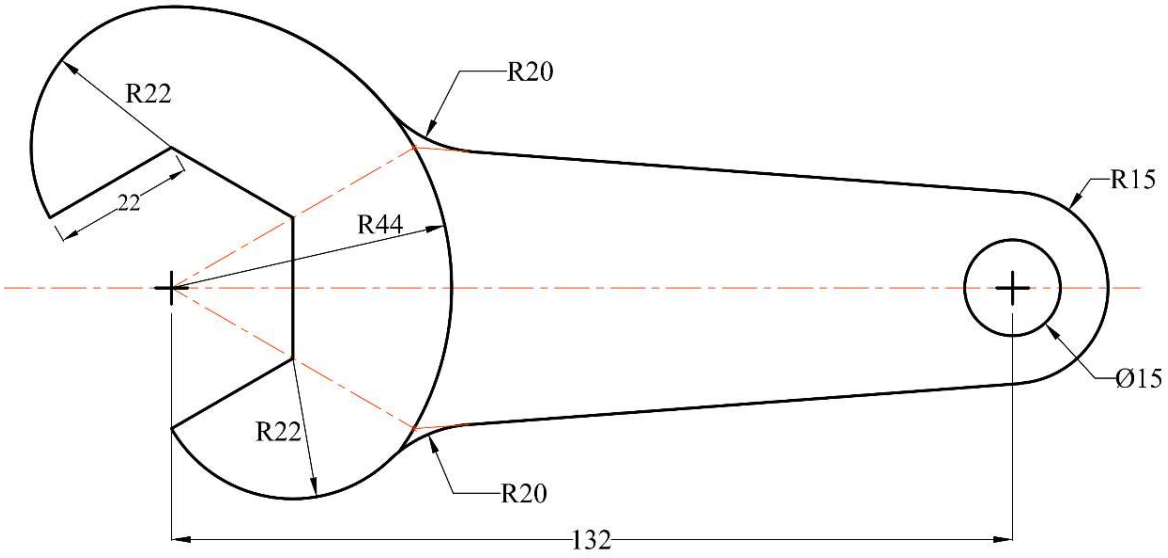
NAME: _____	**SECTION NO.:** _____	**92**
FILE NO.: _____	**DATE:** _____	

Extra Exercises

NAME: _____	**SECTION NO.:** _____	**93**
FILE NO.: _____	**DATE:** _____	

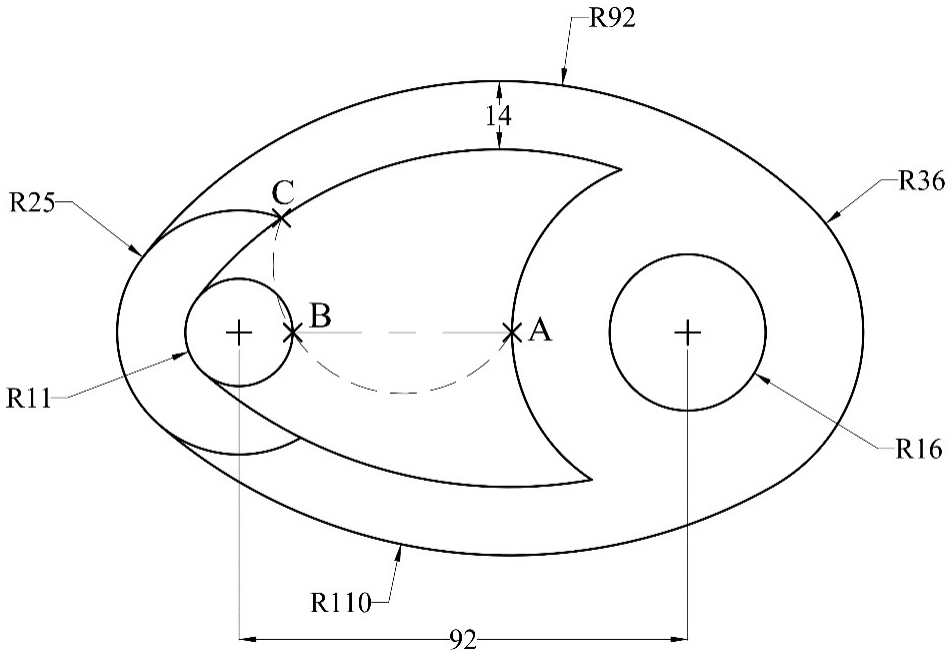
TANGENCY

Exercise (1): Draw the given view. Show all constructions.



Exercise (2):

1. Draw the given view. Show all constructions.
2. Find the radius of the arc that passes through points (A), (B), and (C).



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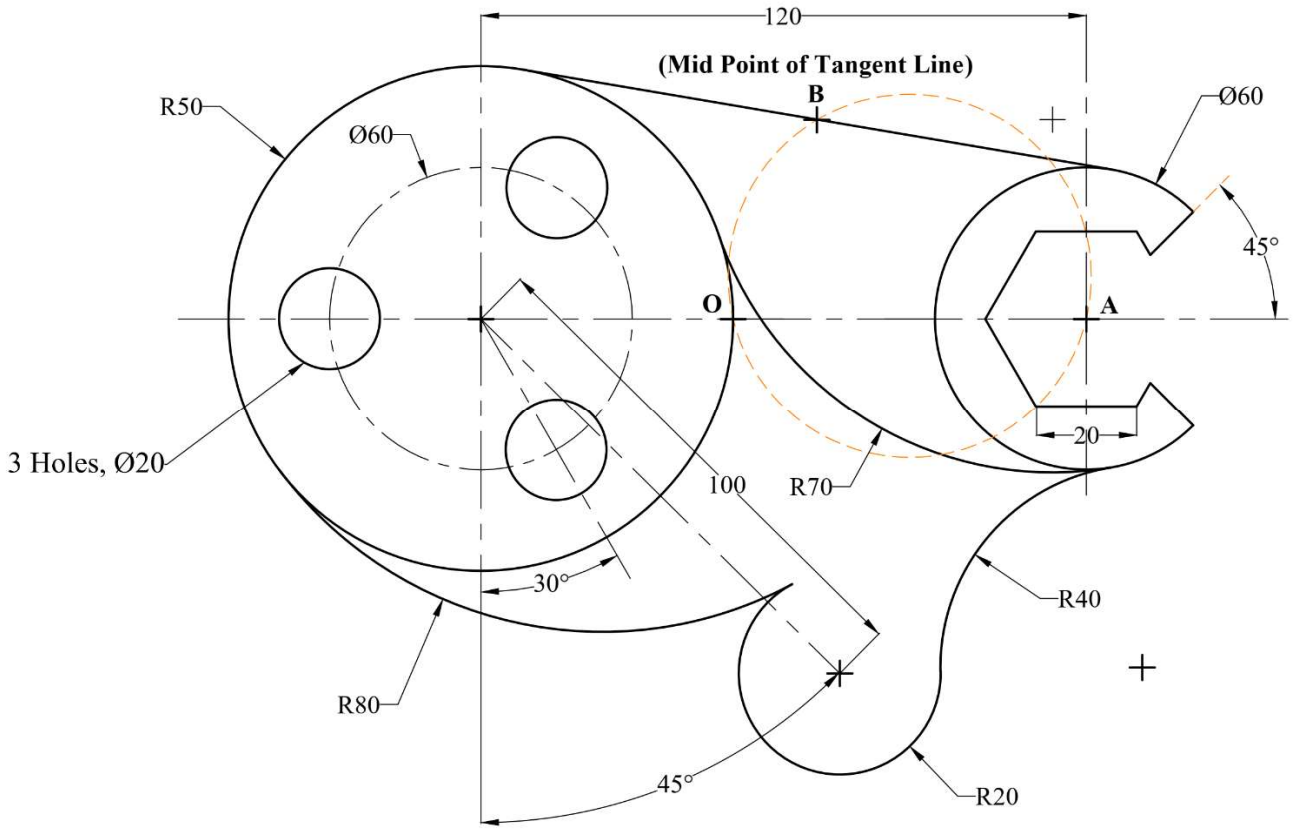
FILE NO.: _____	**DATE:** _____	

Exercise (3):

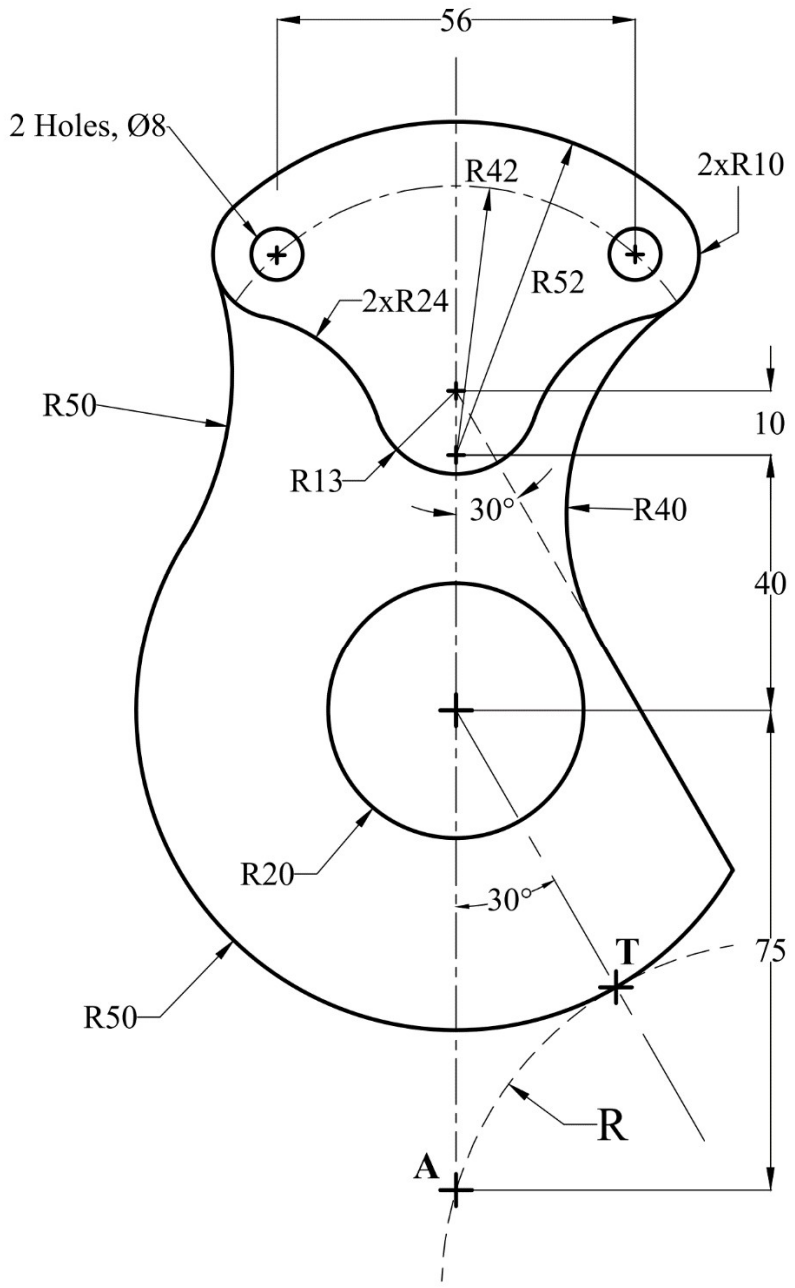
1. Draw the following, show the construction lines, and mark all tangent points.
2. Find the radius of the circle that passes through points (A), (B), and (O).



NAME: _____	**SECTION NO.:** _____	**95**
FILE NO.: _____	**DATE:** _____	

Exercise (4):

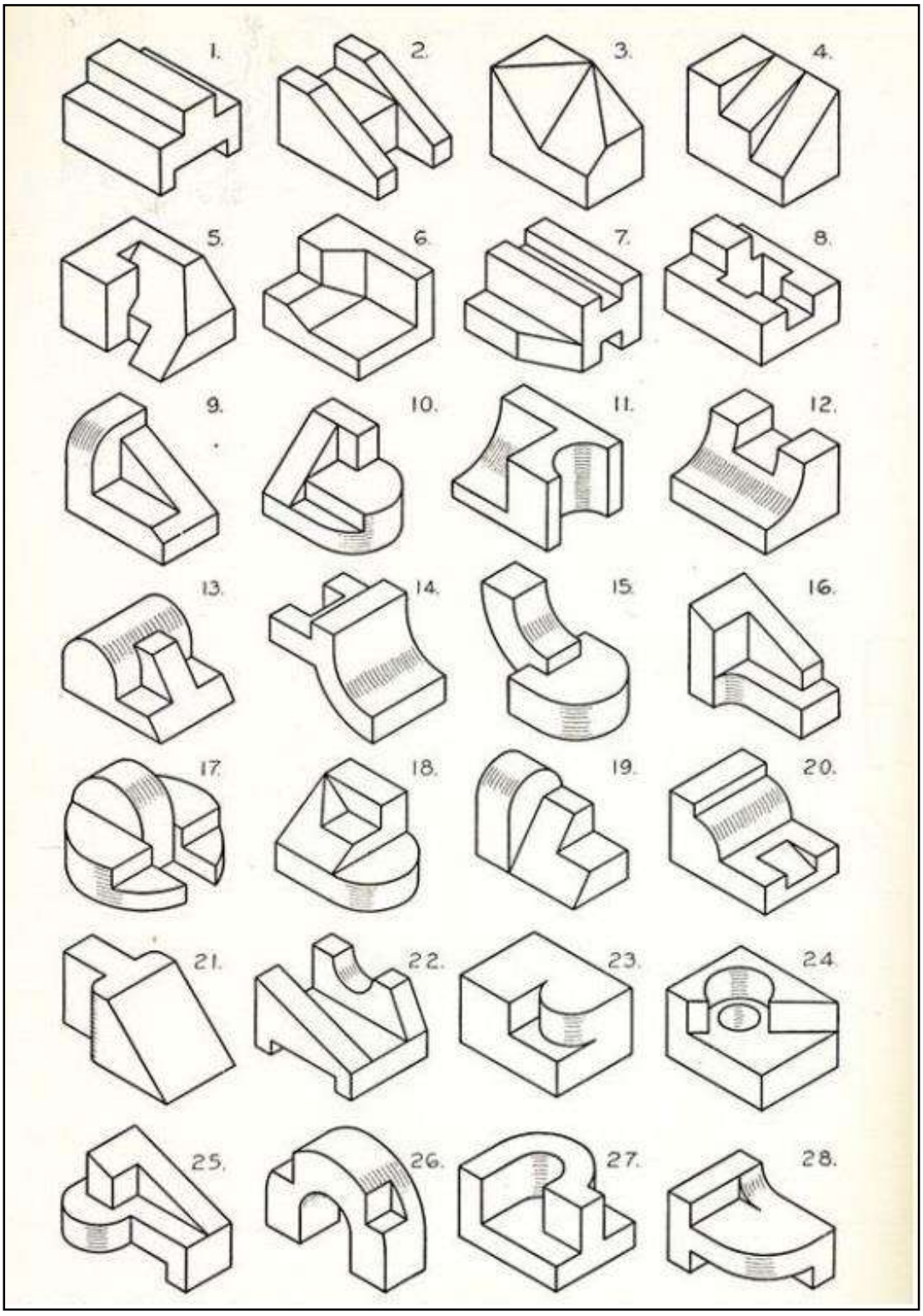
Draw the following, show the construction lines, and mark all tangent points. Then, Find the radius of the circle that passes through points (A) and tangent at point (T).



NAME: _____	**SECTION NO.:** _____	**96**
FILE NO.: _____	**DATE:** _____	

PROJECTION AND SECTION

Exercise (1): Sketch using freehand, the orthographic projections for all solids.



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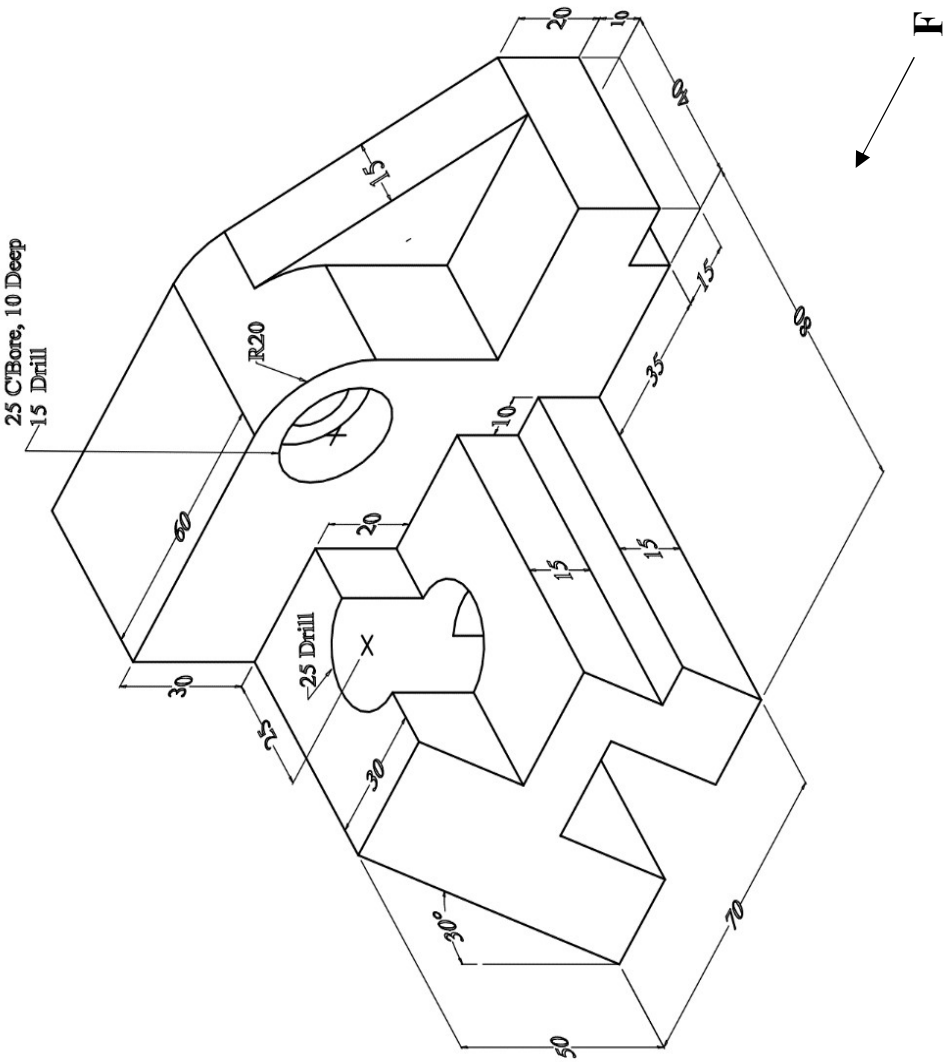
FILE NO.: _____	**DATE:** _____	

Exercise (2): For the given solid, draw the top view, front, and the side views.



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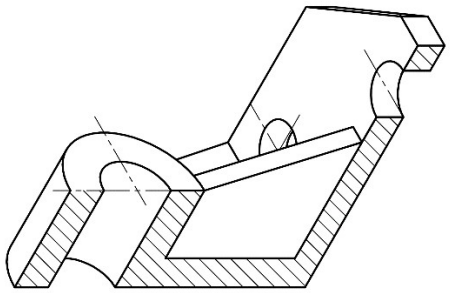
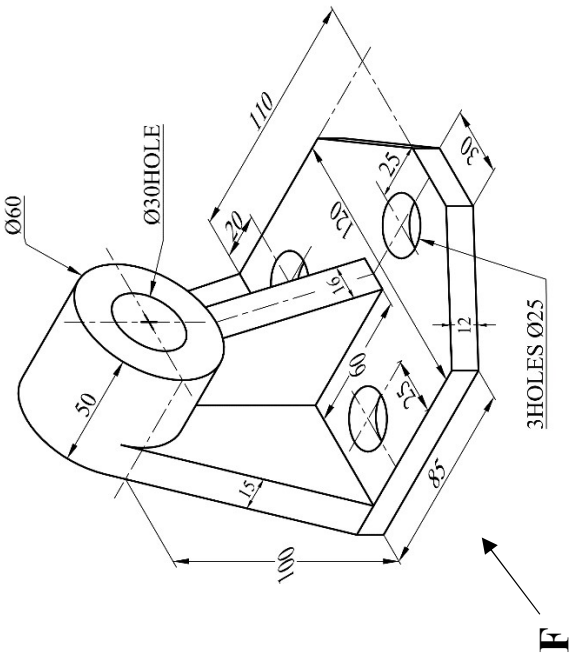
FILE NO.: _____	**DATE:** _____	





Exercise (3): Draw the full sectional front, top, and the right side (Use A3 Sheet).views.

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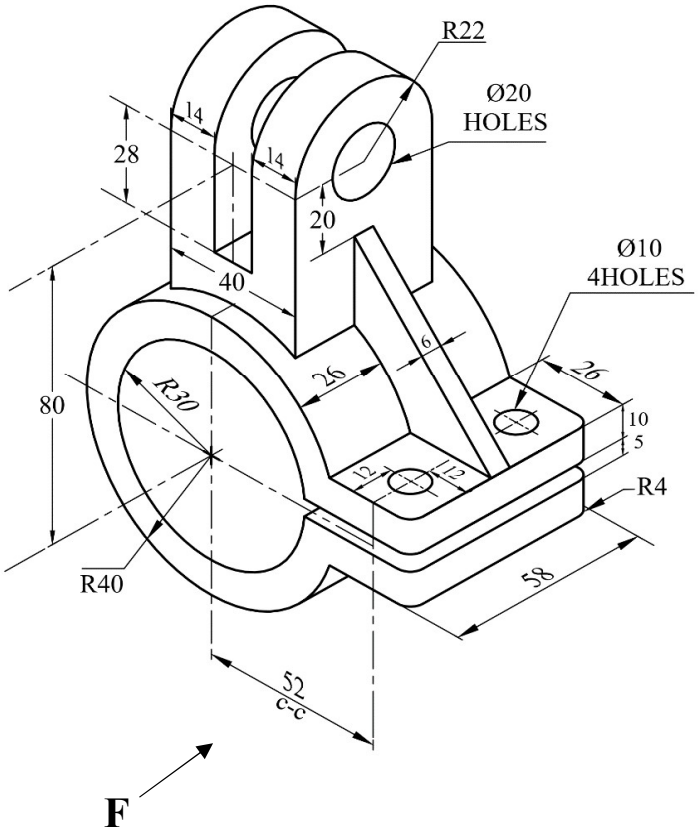
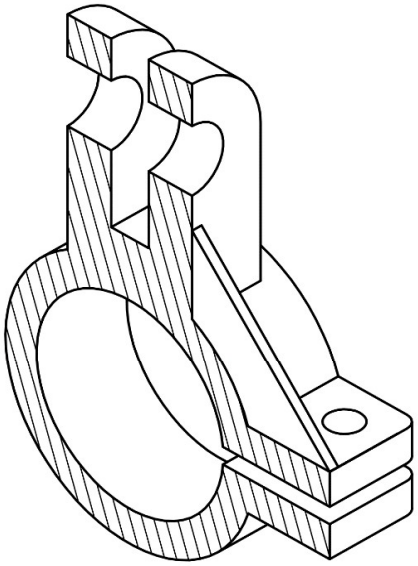
FILE NO.: _____	**DATE:** _____	

Exercise (4): Draw the full sectional front, top, and the right side views.





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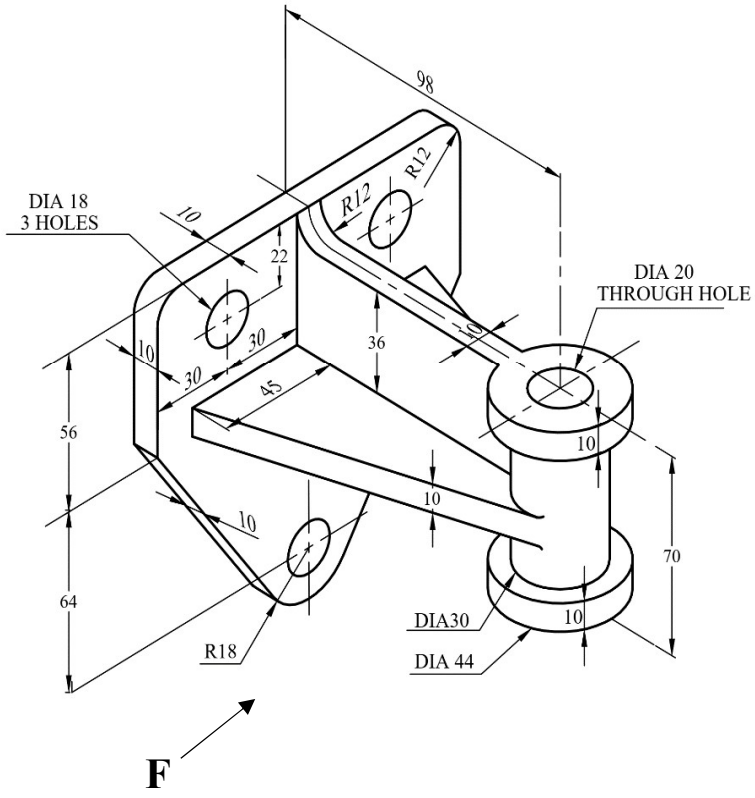
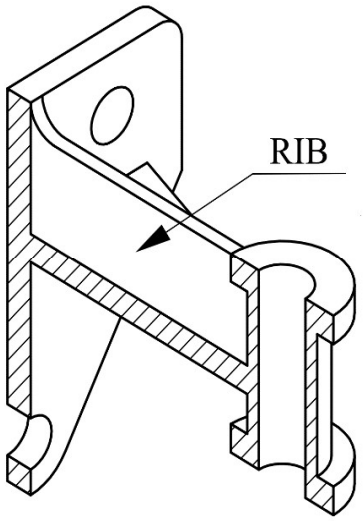
FILE NO.: _____	**DATE:** _____	

Exercise (5): Draw the full sectional front, top, and the right side views of the given wall bracket (Use A3 Sheet).

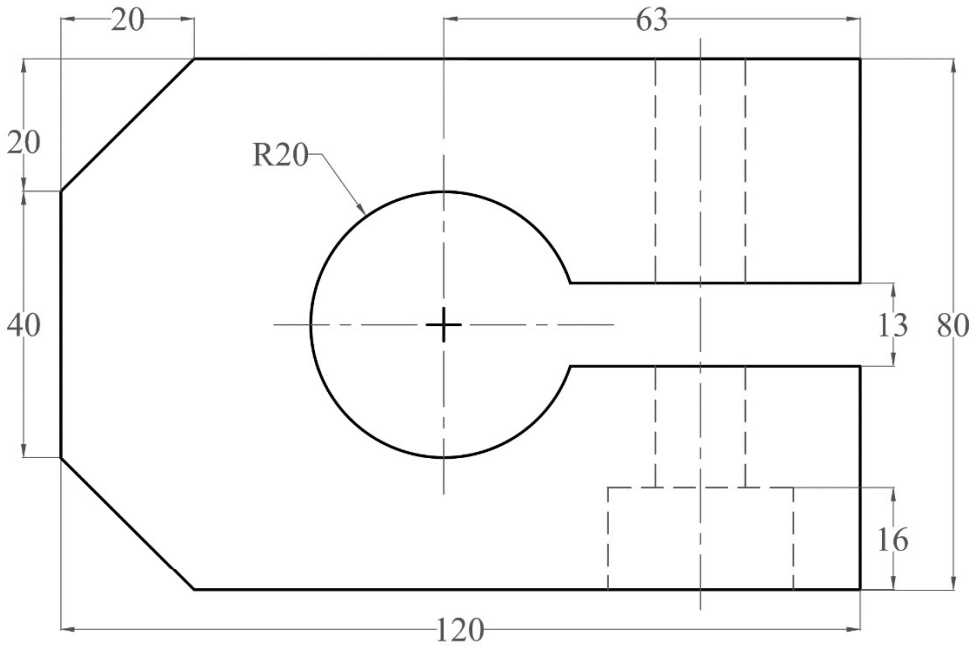


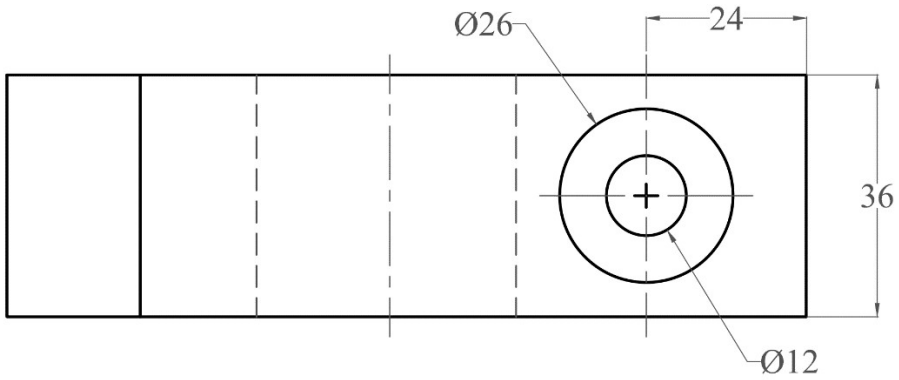


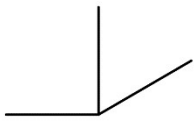
NAME: _____	**SECTION NO.:** _____	**101**
FILE NO.: _____	**DATE:** _____	

OBLIQUE DRAWING

Exercise (1): For the given orthographic views, draw an oblique drawing.







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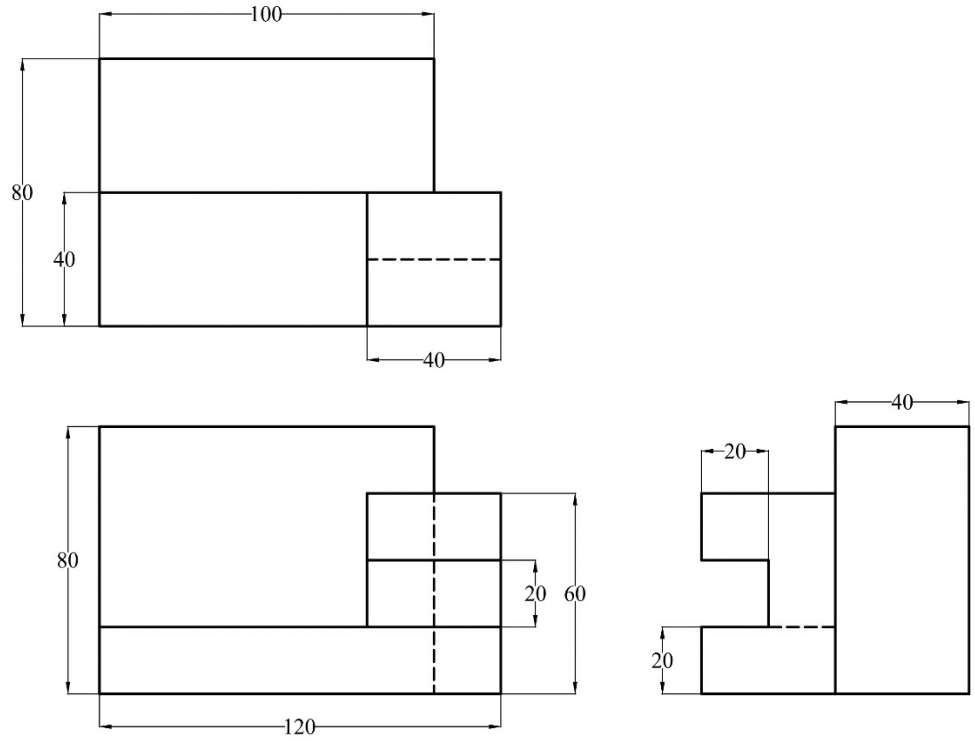
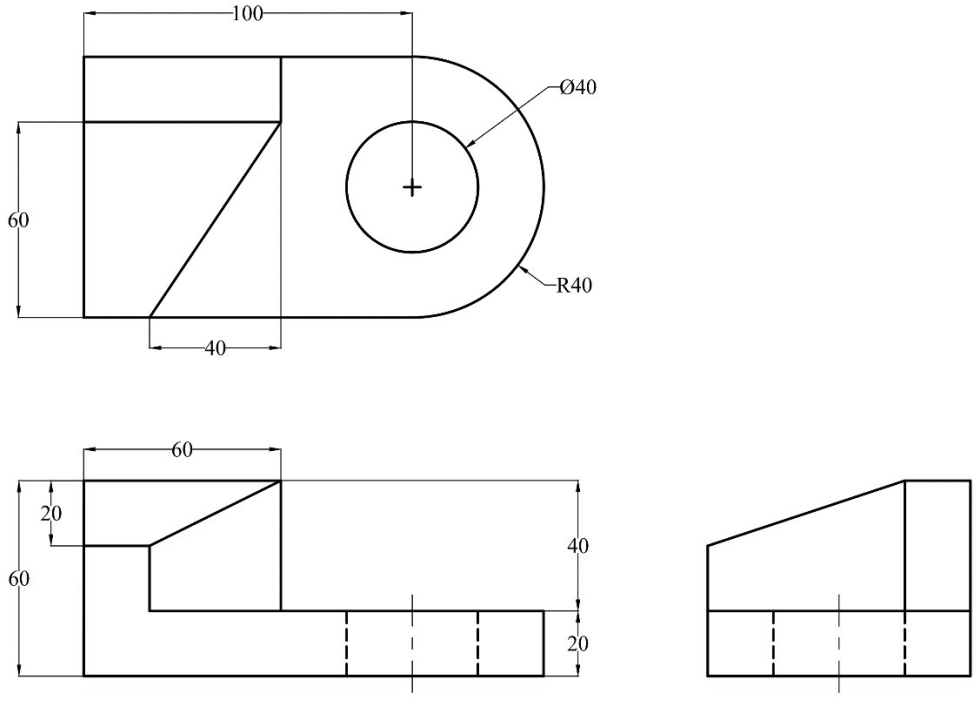
FILE NO.: _____	**DATE:** _____	

ISOMETRIC DRAWING

Exercise (1): For the given orthographic views, draw an isometric drawing.



Exercise (2): For the given orthographic views, draw an isometric drawing.



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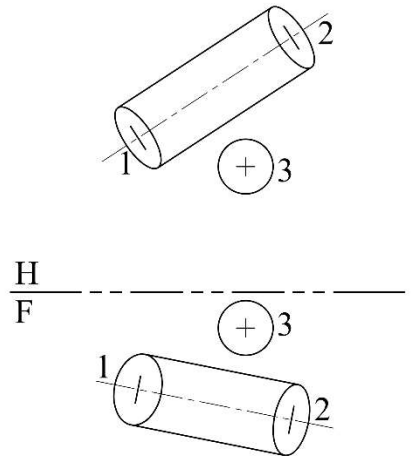
DESCRIPTIVE GEOMETRY (AUXILIARY PROJECTION)

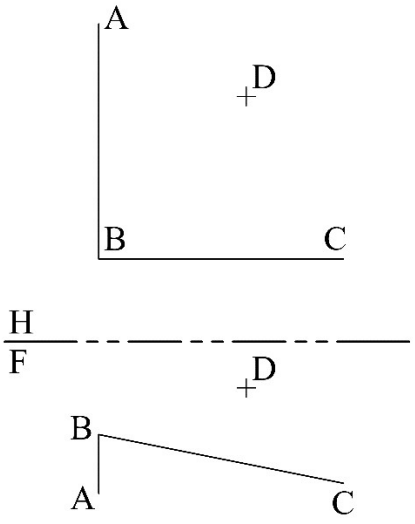
1 DETERMINE THE **CLEARANCE** (MINIMUM DISTANCE) BETWEEN **CYLINDER 1-2** AND A **SPHERICAL TANK 3**.



2 GIVEN HORIZONTAL AND FRONT VIEWS OF TWO PIPES, INTERSECT AT POINT **(B)** IN A RESIDENTIAL AREA. **AB AND BC** ARE THE CENTERLINES OF WATER PIPES (AB AND BC). **D** IS THE LOCATION OF A WATER METER AT THE RESIDENTIAL AREA.

a. WHAT WOULD BE THE **DISTANCES** BETWEEN THE WATER METER **(D)** AND THE PIPES?

b. WHAT WOULD BE **THE LENGTH OF THE SHORTEST PIPE**?



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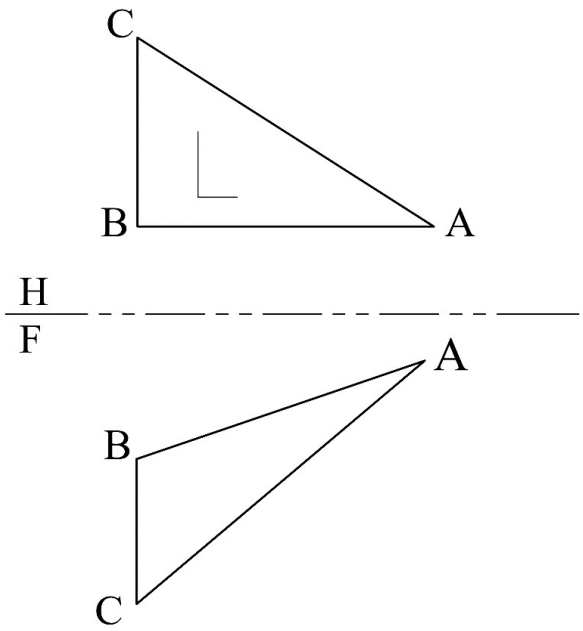
APPLICATIONS

1 USE THE GIVEN TWO VIEWS **ONLY** TO COMPLETE THE MISSING VIEW OF LETTER **(L)**, WHICH LIES ON THE PLANE **(ABC)**.



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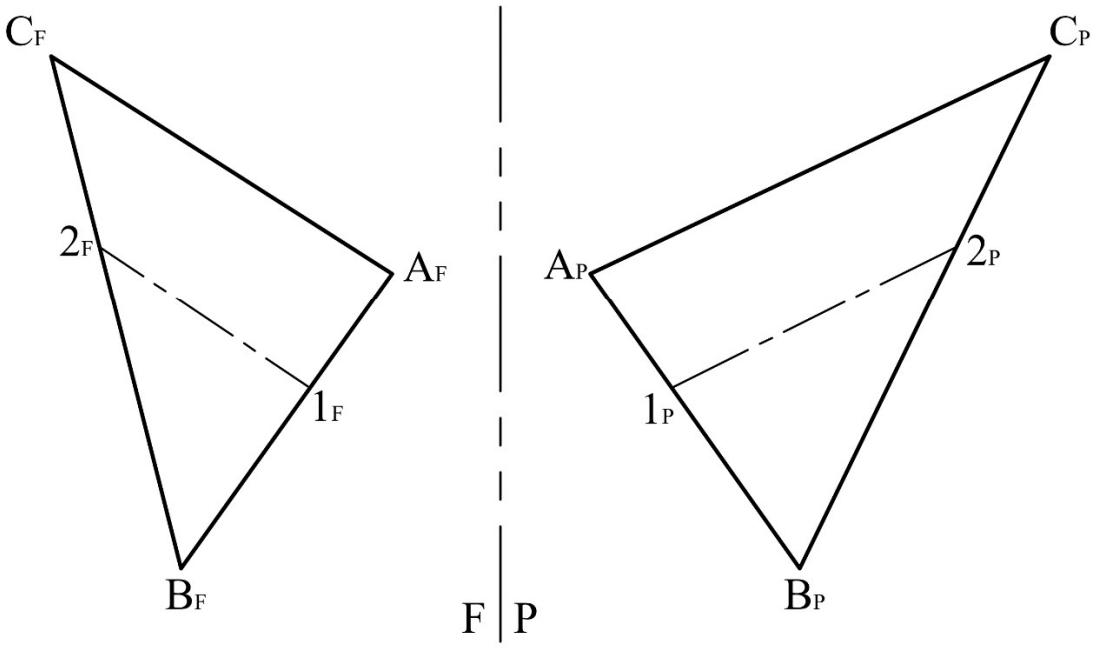
3 A CIRCULAR HOLE IS TO BE CUT IN SURFACE (**ABC**). THE CENTER OF THE HOLE LIES ON LINE (**1-2**) AND IS 48 mm FROM **(A)**. COMPLETE THE FRONT AND RIGHT SIDE VIEWS OF HOLE. (HOLE DIAMETER IS 38 mm).



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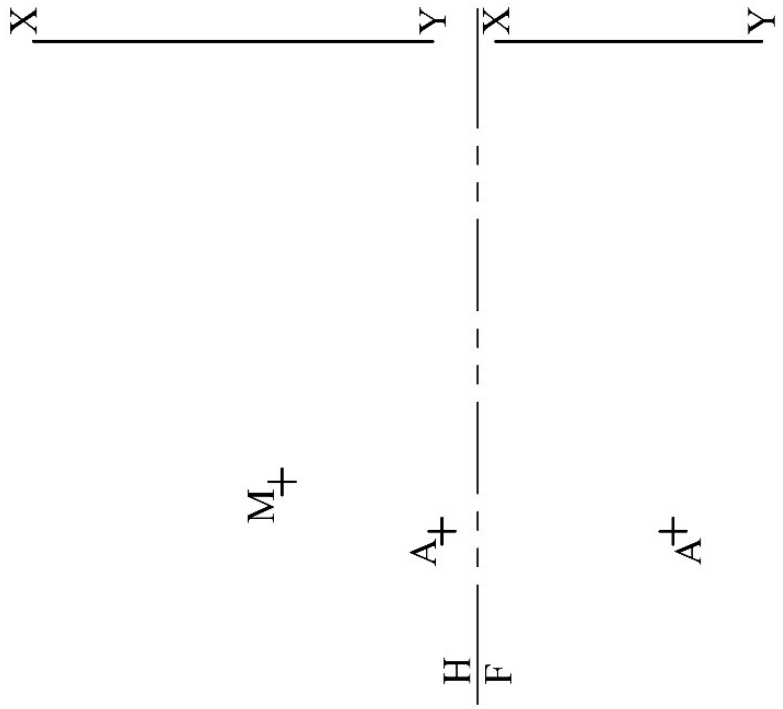
4 CONSTRUCT THE OBLIQUE HEXAGONAL PYRAMID OF BASE **(ABCDEF)**, WHICH LIES IN THE HORIZONTAL PLANE WITH **CENTER AT (M)**. THE VERTEX **(V)** OF THE PYRAMID LIES ON LINE **(XY)**. THE PYRAMID **HEIGHT** IS 39 mm.



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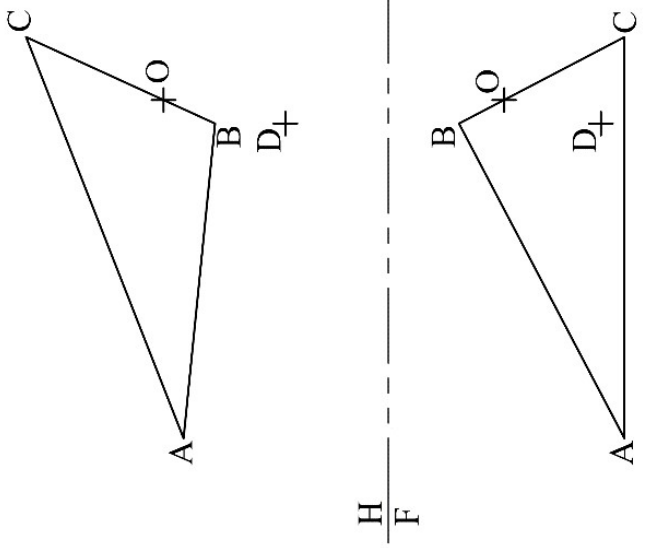
5 DRAW **THE RIGHT CONE** OF THE FOLLOWING SPECIFICATIONS:

a. ITS BASE LIES IN THE PLANE (**ABC**) WITH BASE CENTER AT (**O**).
b. POINT D IS ON ITS LATERAL SURFACE.
c. THE CONE'S HEIGHT = 35 mm.



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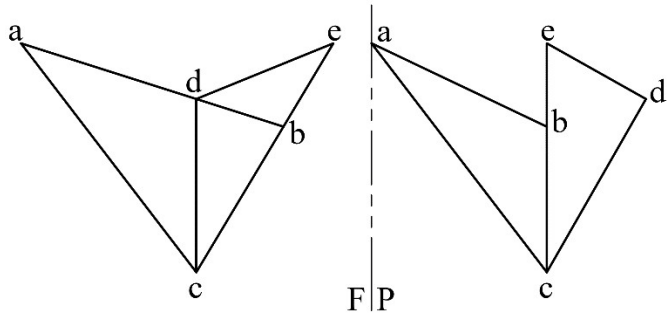
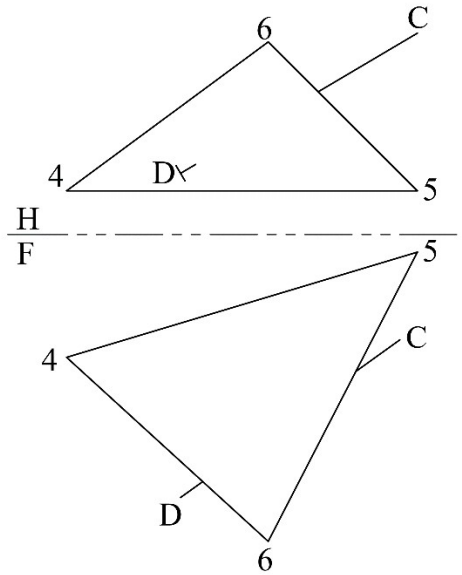
6 FIND THE DIHEDRAL ANGLE BETWEEN THE TWO PLANES (**ABC**) AND (**CDE**).
THE ANGLE IS _____.



2 AN ASTRONAUT'S LINE OF SIGHT IS ALONG LINE **(DC)**, WHICH INTERSECTS THE TRIANGULAR WINDOW OF A SPACECRAFT. DETERMINE THE ANGLE BETWEEN THE LINE AND THE PLANE BY **THE PLANE METHOD**.

START PROJECTION FROM THE TOP VIEW. THE ANGLE IS _____.


Courtesy of Ryan Aeronautical Co.



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