

Isometric Projections

ID1041

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Room 221, Academic Block B.

1

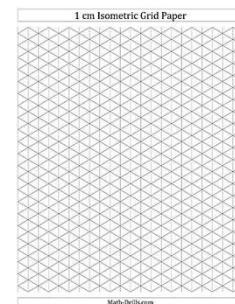
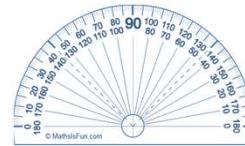
Grading Plan

- Total 4 classes and 11 problems:
 - 18 Feb 2022: Problems 1 and 2
 - 25 Feb 2022: Problems 3, 4, and 5
 - 4 Mar 2022: Problems 6, 7, and 8
 - 11 Mar 2022: Problems 9, 10, and 11
- Each assignment has 15% weightage
- One exam: 40% weightage
- The final score will be added to the score of the orthographic part before assigning a letter grade.

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Modalities

- If drawing on a blank sheet, you will need to use a protractor and ruler to draw isometric views.
- Alternatively, you can use isometric grid sheets and free-hand sketching.
- Those who are on campus can collect these sheets tomorrow between 2:00 PM and 3:00 PM from B Block LG-05 from **Mr. Gourav**. Please carry your ID card.



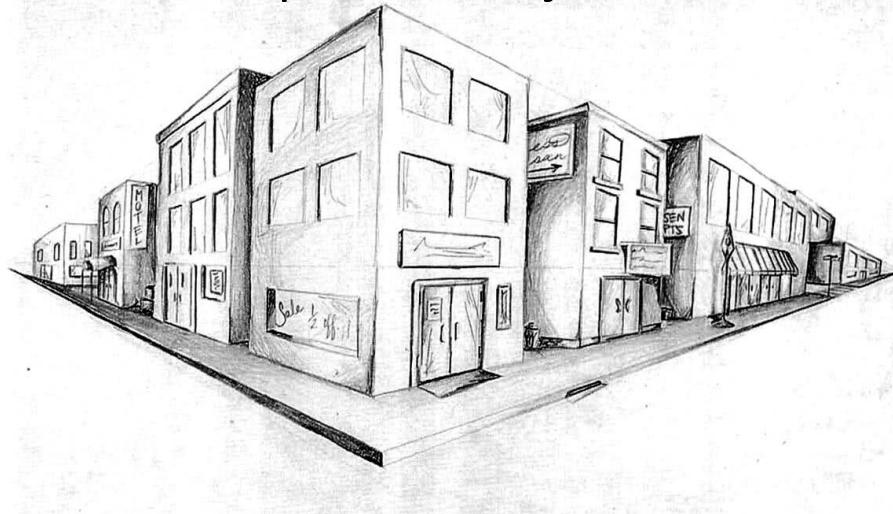
3

Why Pictorial Drawings?

- Often difficult to construct an object mentally from multi-view drawings.
- These are also projections
 - Albeit from a better vantage point so as to get a better overview

4

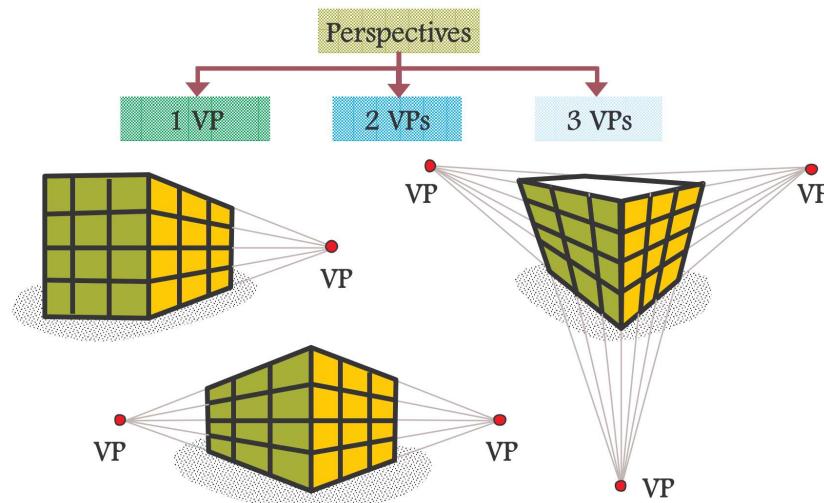
Perspective Projections



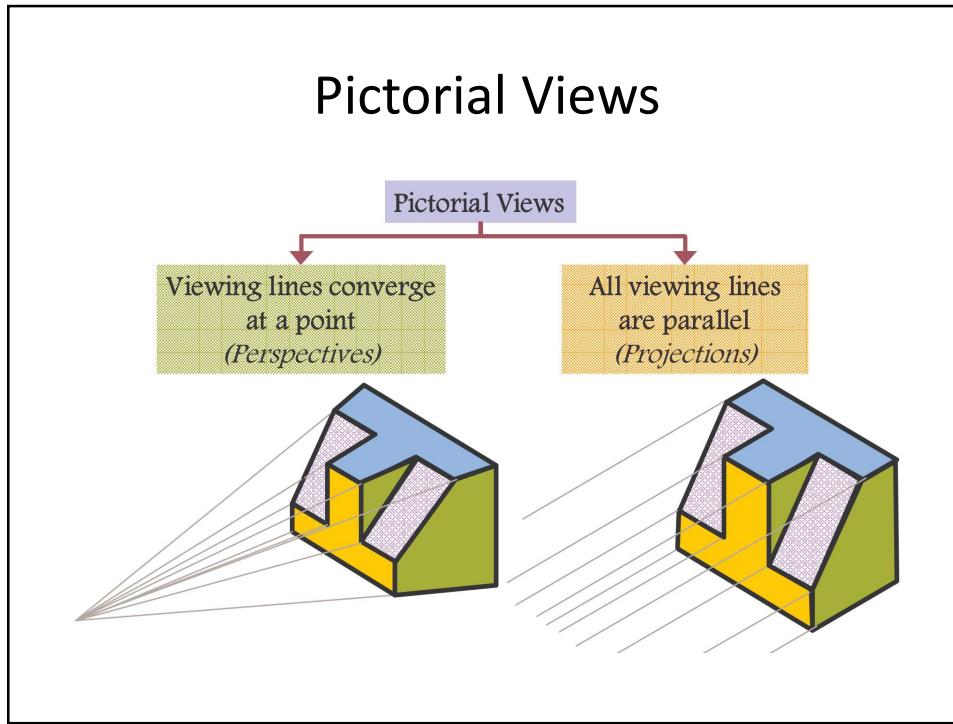
<http://www.perspectiveprojection.com/>

5

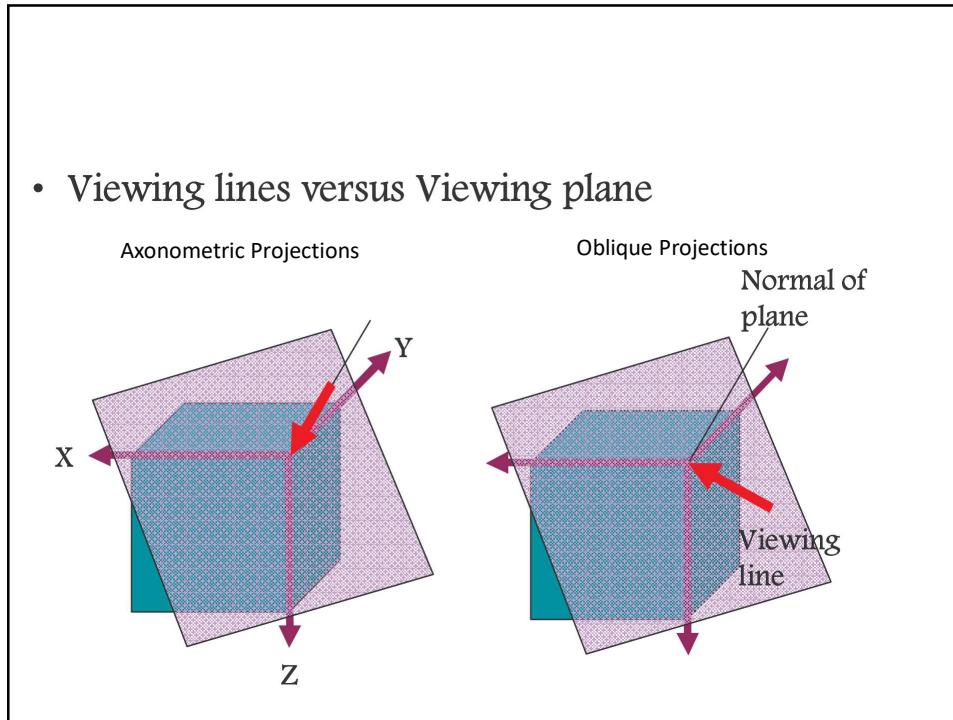
Views



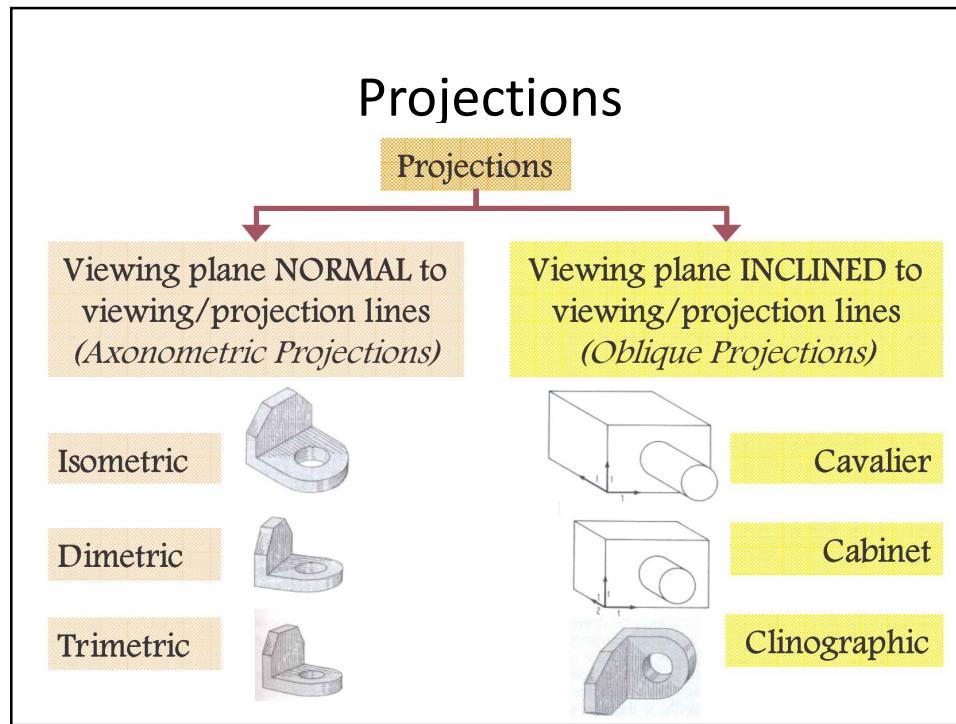
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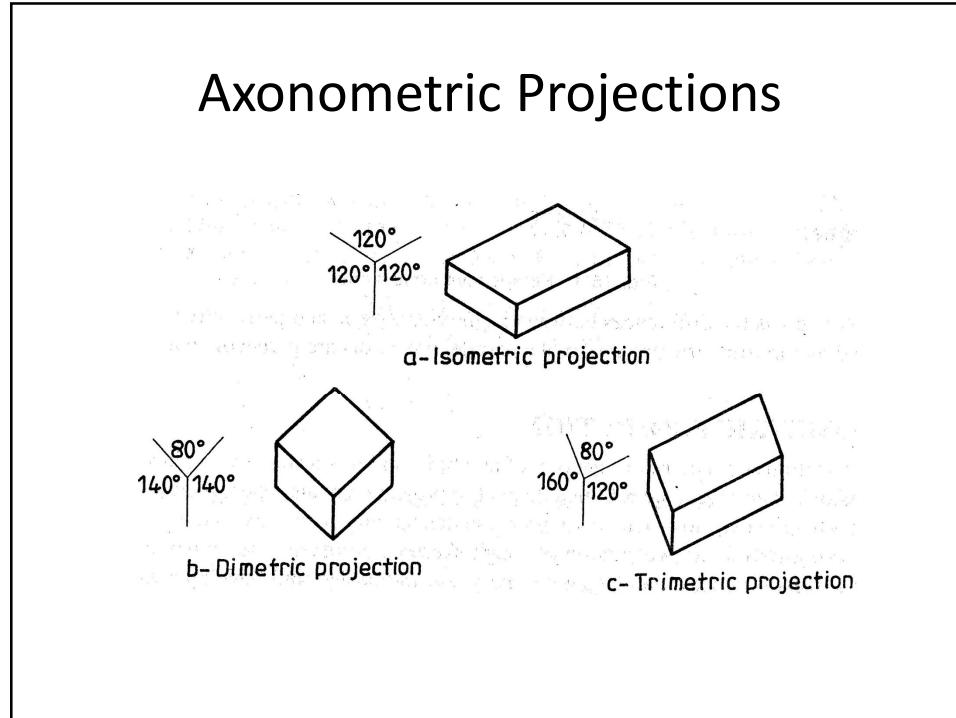
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8

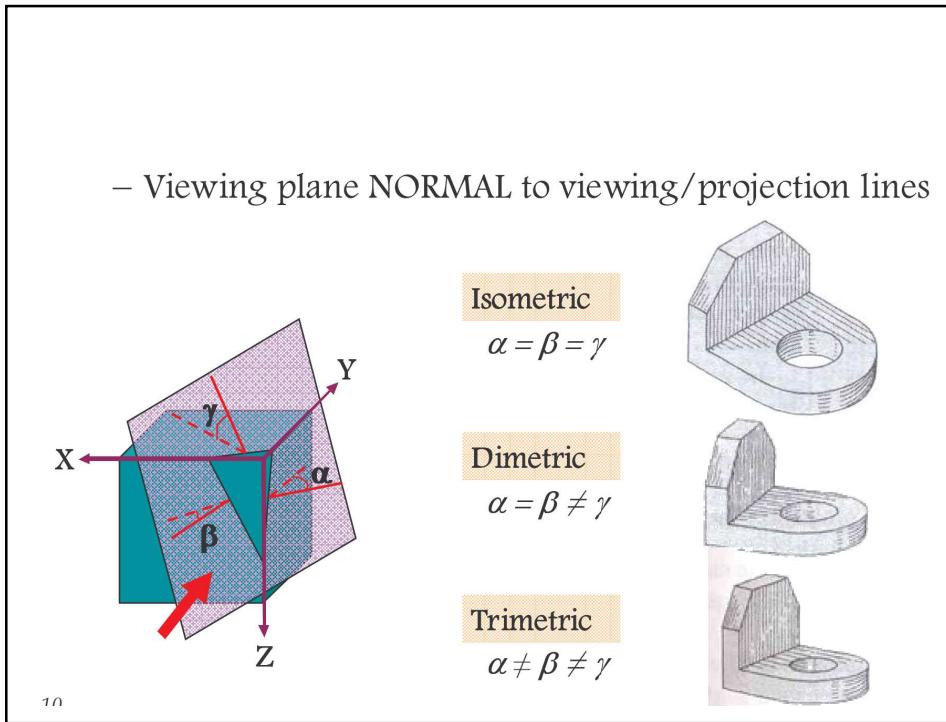


9



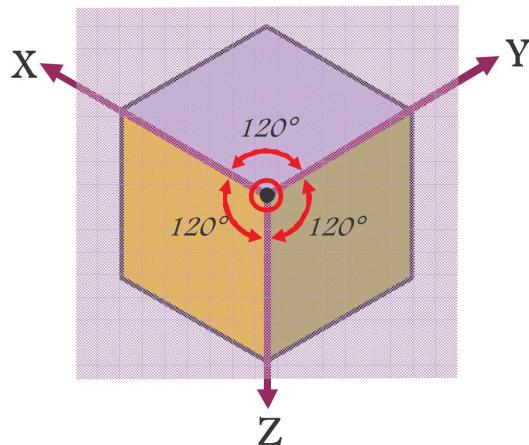
10

- Viewing plane NORMAL to viewing/projection lines



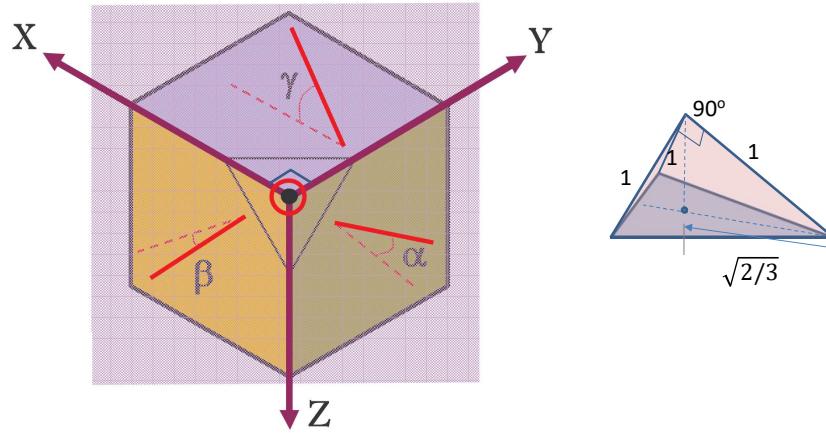
11

Cube in Isometric View



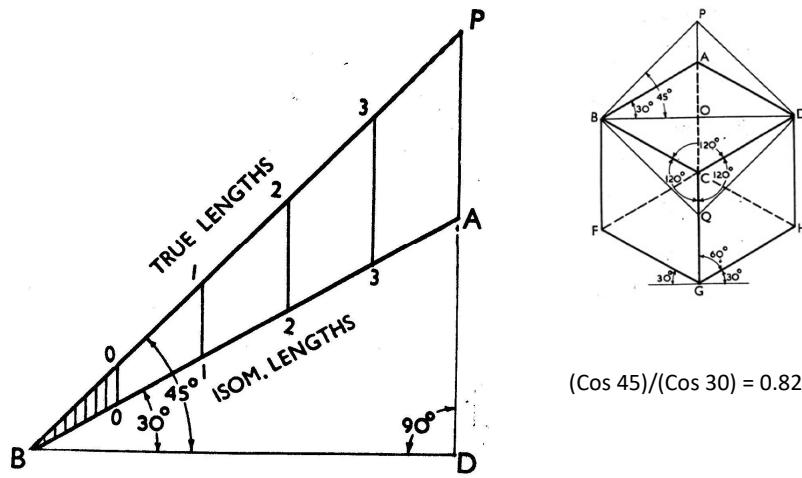
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Isometric Projections



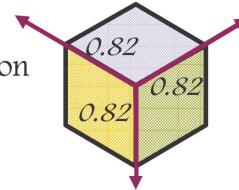
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Isometric Projections - Scales

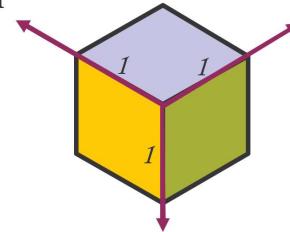


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- Isometric Projection
 - Drawn to fore-shortened dimension
 - Reduced by 0.82 ($= 1/1.224$)

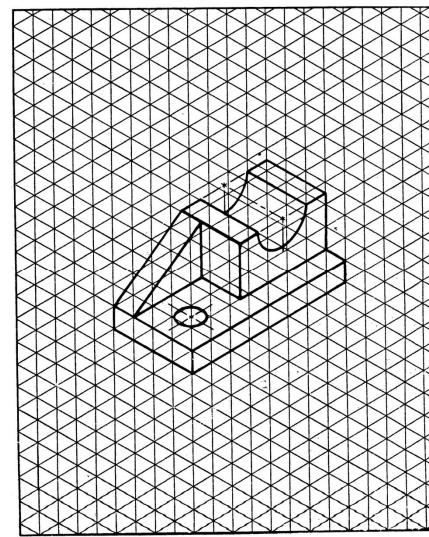


- Isometric Drawing
 - Drawn to full given dimension
 - Since all dimensions fore-shortened by same amount



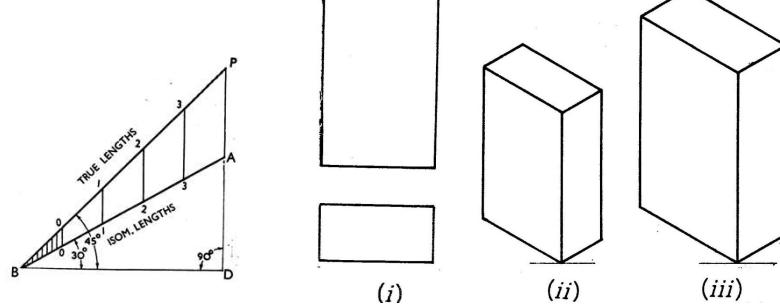
15

Isometric Graph



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Isometric View

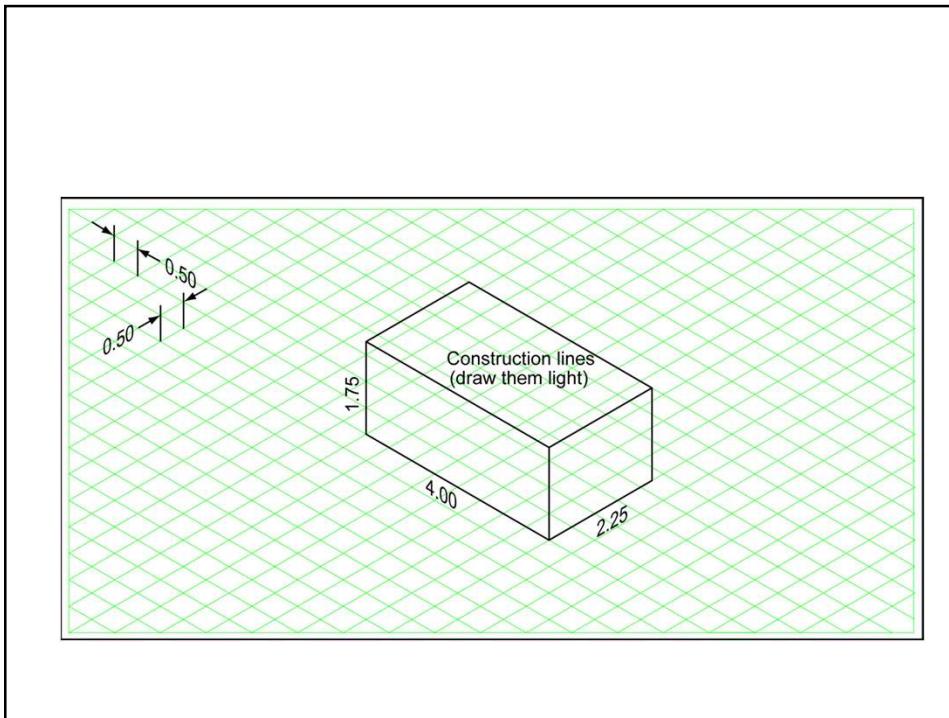


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Basic steps for drawing Isometric Drawings

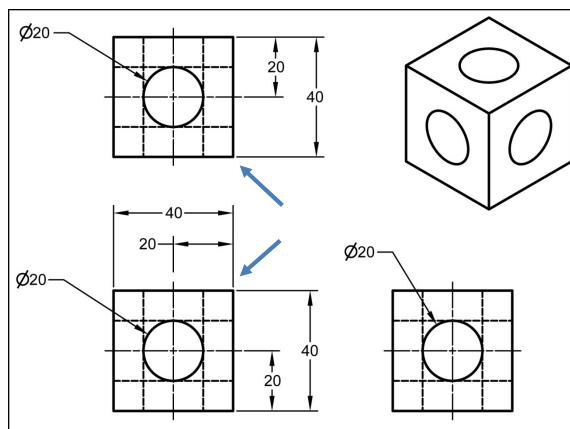
- Note the largest dimensions in the three directions from the multi-view drawings to get an idea about the size of the figure
- Select the position of the origin accordingly.
- Draw construction lines that represent isometric axes.
- Draw the enclosing box with the largest dimensions such that the object just fits into the box. You may have to use appropriate scale for magnifying or reducing the size of the object.
- Draw the lines of the object that are parallel to the isometric axes.
- Mark required lengths on the lines.
- Draw the lines that are not parallel to the isometric axes and complete the figure.

18



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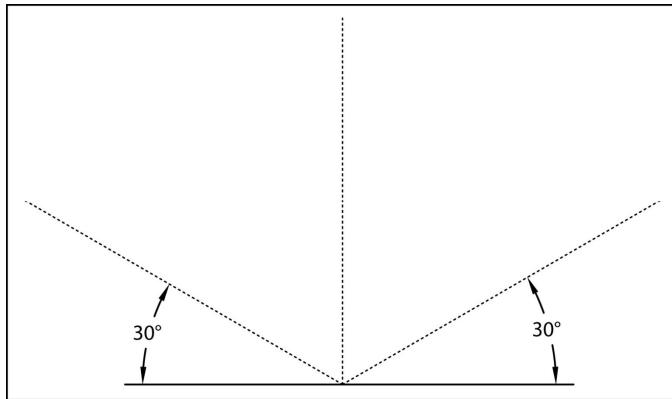
Problem 1



20

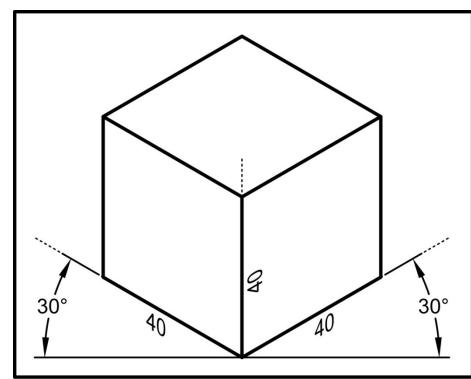
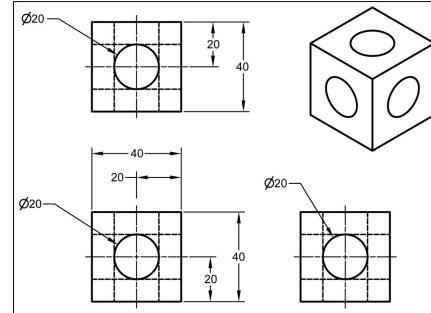
Problem 1

Draw the three construction lines that represent the isometric axes.



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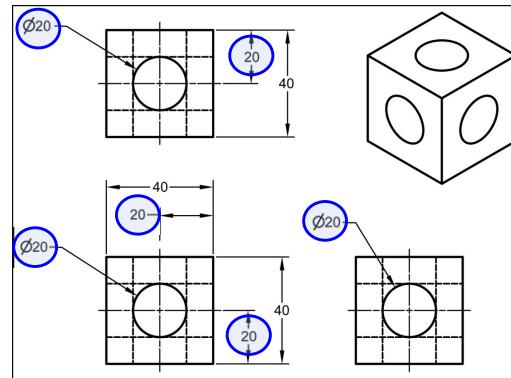
Problem 1



22

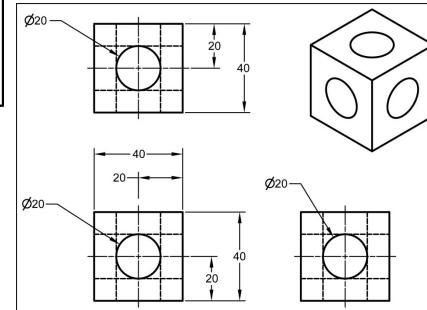
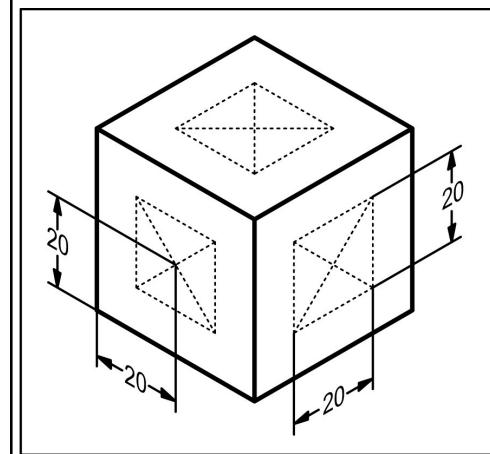
Problem 1

Draw a rhombus whose diagonals meet at the center of the circle and the length of the sides are equal to the circle's diameter.



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Problem 1



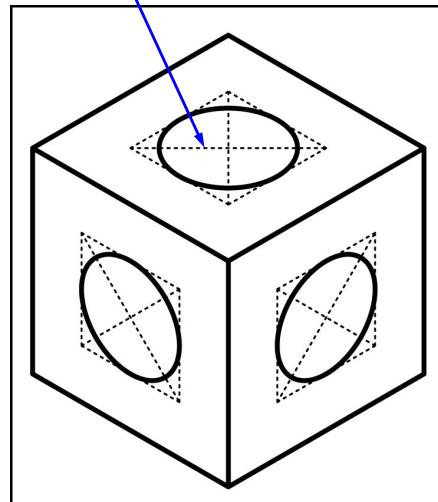
24

Problem 1

Step 3) Draw an ellipse in the box whose major axis is aligned with the long diagonal of the box.

- The ellipses touch the box at the midpoint of its sides.

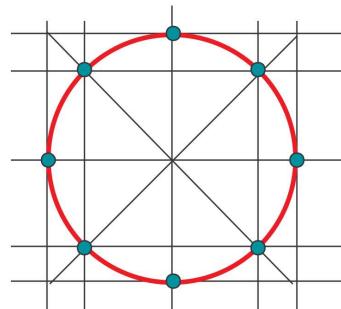
Major Axis



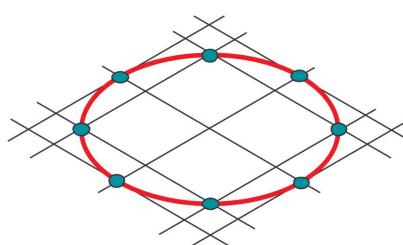
25

Problem 1

Drawing an Ellipse



Orthographic View

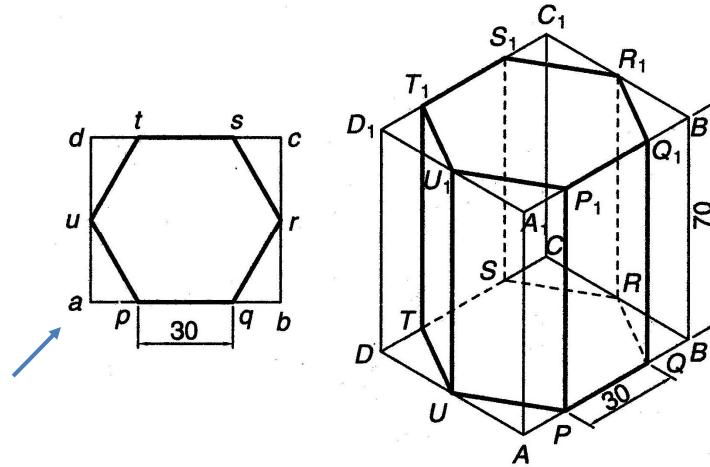


Isometric View

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Problem 2

Draw an isometric projection of a hexagonal prism having a base with a 30 mm side and a 70 mm long axis resting on its base on the HP with an edge of the base parallel to the VP



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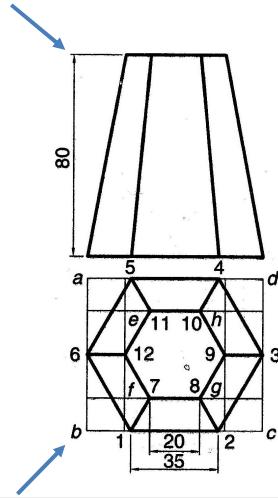
Rules Not to be Violated in Orthographic Drawings

- Parallel lines remain parallel (viewing from afar)
- Lines parallel to the three isometric axes are drawn in true length.
- Dimensions of lines in other directions change.
- Squares and rectangles (**with sides parallel to the isometric axes**) turn into rhombuses and parallelograms, respectively.
- Circles turn into ellipses.

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Problem 3

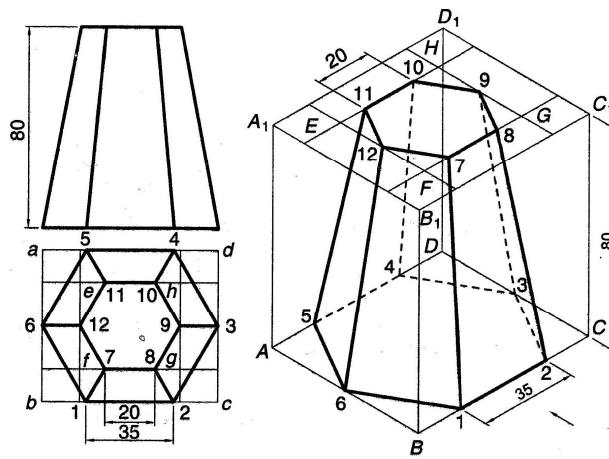
Draw an isometric projection of the frustum of a hexagonal pyramid having 35 mm base side, 20 mm top side, and 80 mm long axis, resting on its base on the HP with an edge of the base parallel to the VP



29

Problem 3

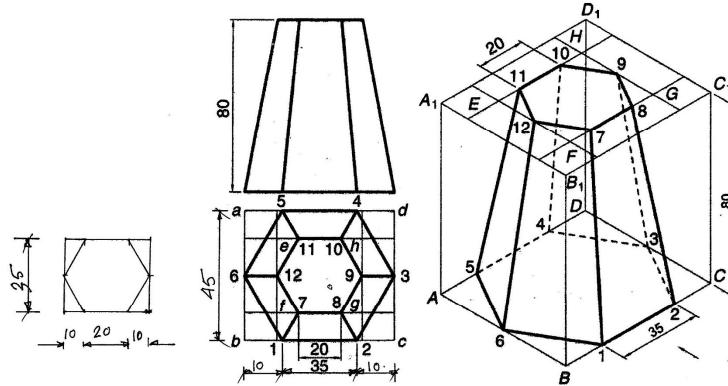
Draw an isometric projection of the frustum of a hexagonal pyramid having 35 mm base side, 20 mm top side, and 80 mm long axis, resting on its base on the HP with an edge of the base parallel to the VP



30

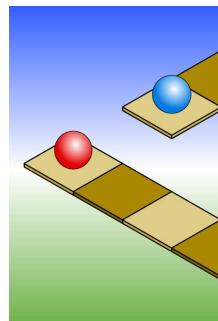
Problem 3

Draw an isometric projection of the frustum of a hexagonal pyramid having 35 mm base side, 20 mm top side, and 80 mm long axis, resting on its base on the HP with an edge of the base parallel to the VP



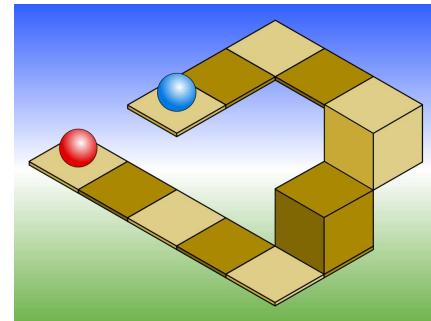
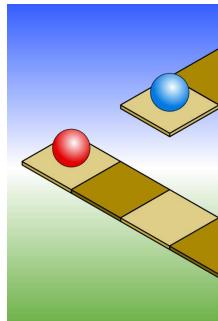
31

Limitations



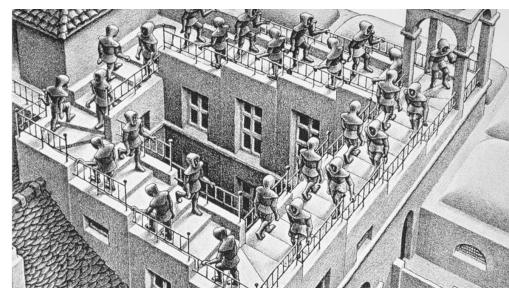
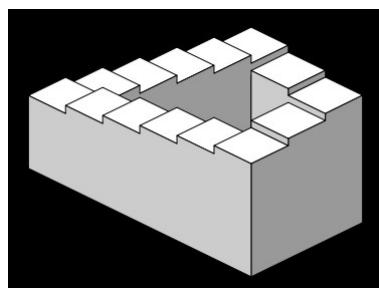
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Limitations



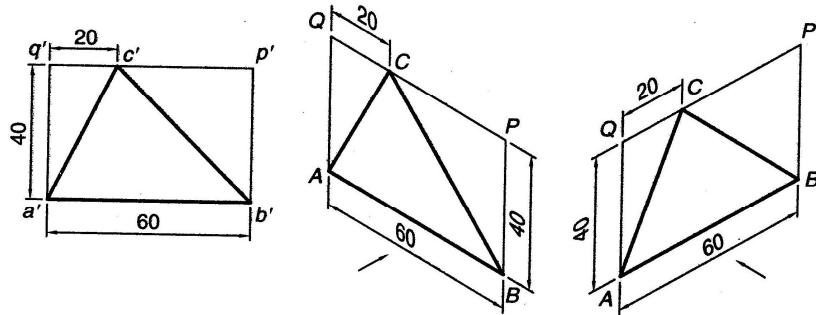
33

Limitations



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Isometric projection of a surface - Dimensioning and lettering

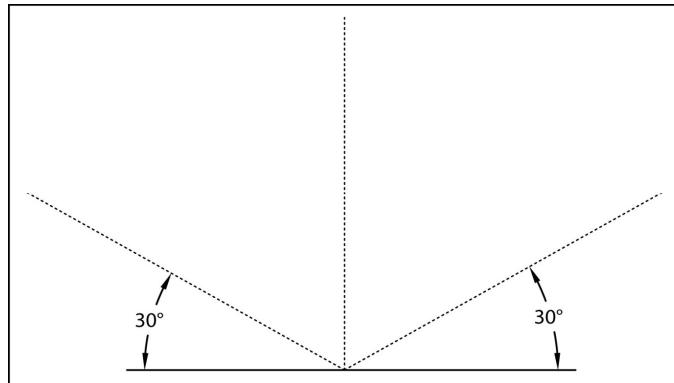


35

Problem 4

Drawing Linear Features

Step 1) Draw the three construction lines that represent the isometric axes.



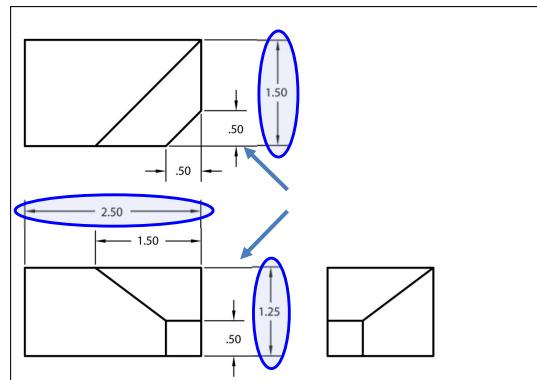
36

Problem 4

Drawing Linear Features

Step 2) Draw a defining box.

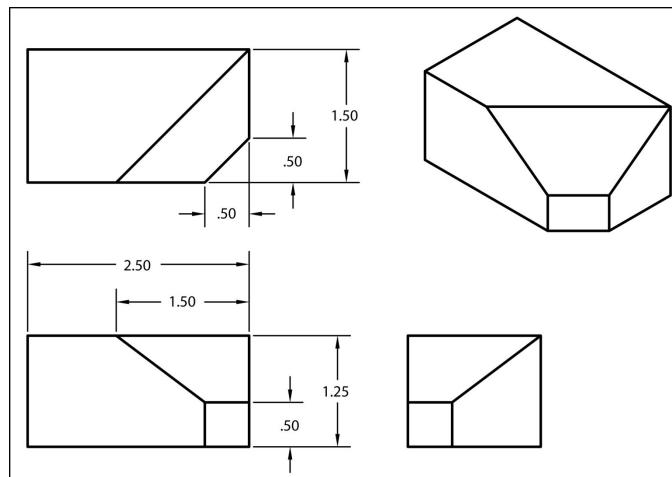
- Sides = maximum height, width and depth dimensions of the object.



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Problem 4

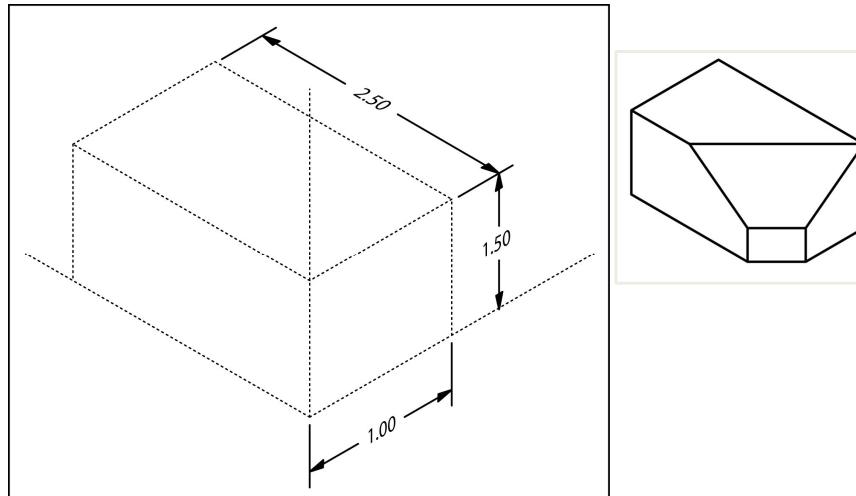
Drawing Linear Features



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Problem 4

Drawing Linear Features

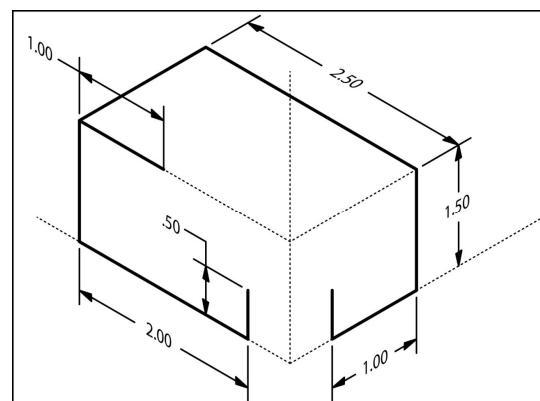
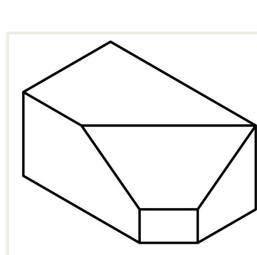


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Problem 4

Drawing Linear Features

Step 3) Draw the lines of the object that are parallel to the axes.

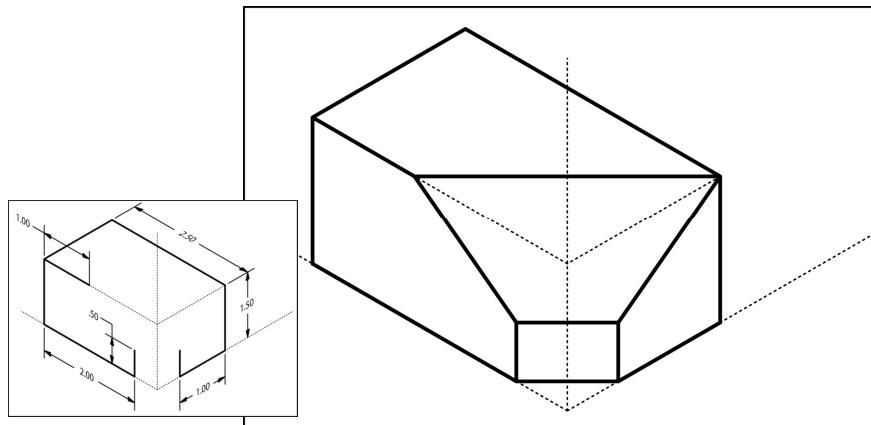


40

Problem 4

Drawing Linear Features

Step 4) Add the lines of the object that are not parallel to one of the axes.

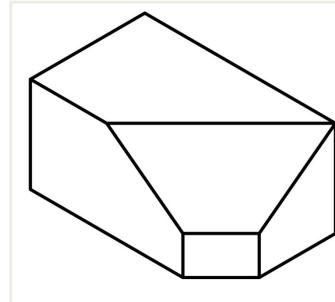


41

Problem 4

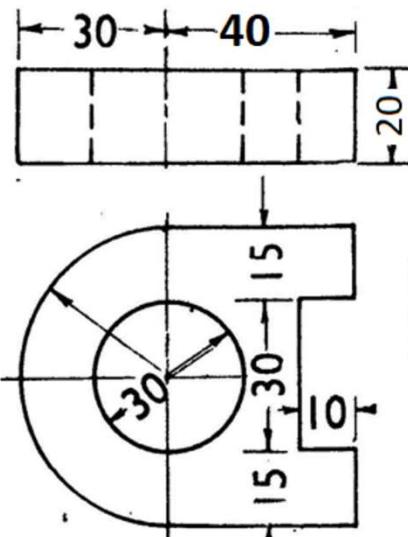
Drawing Linear Features

Step 5) Erase or remove the construction lines.



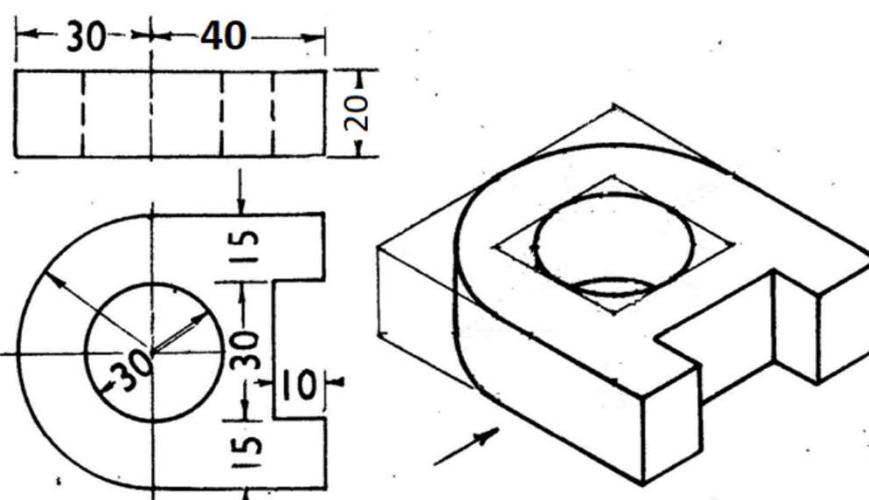
42

Problem 5



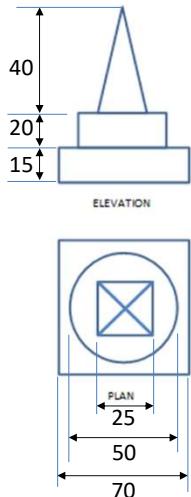
43

Problem 5



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Problem 6

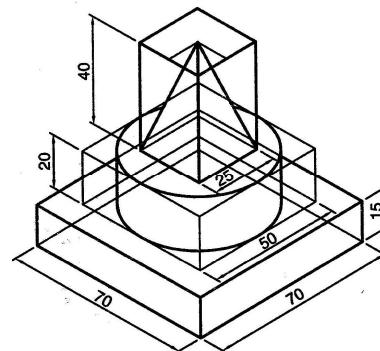


A square pyramid rests centrally over a cylindrical block which is resting centrally on the top of a square block. Draw isometric projection of the arrangement. Consider the pyramid has a base of 25 mm side and a 40 mm long axis, the cylindrical block has a 50 mm base diameter and 20 mm thickness, and the square block has a 70 mm base side and 15 mm thickness.

45

Problem 6

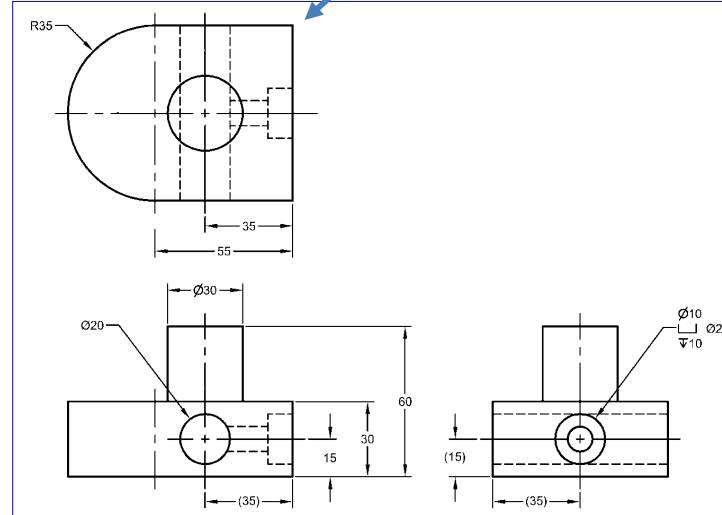
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46

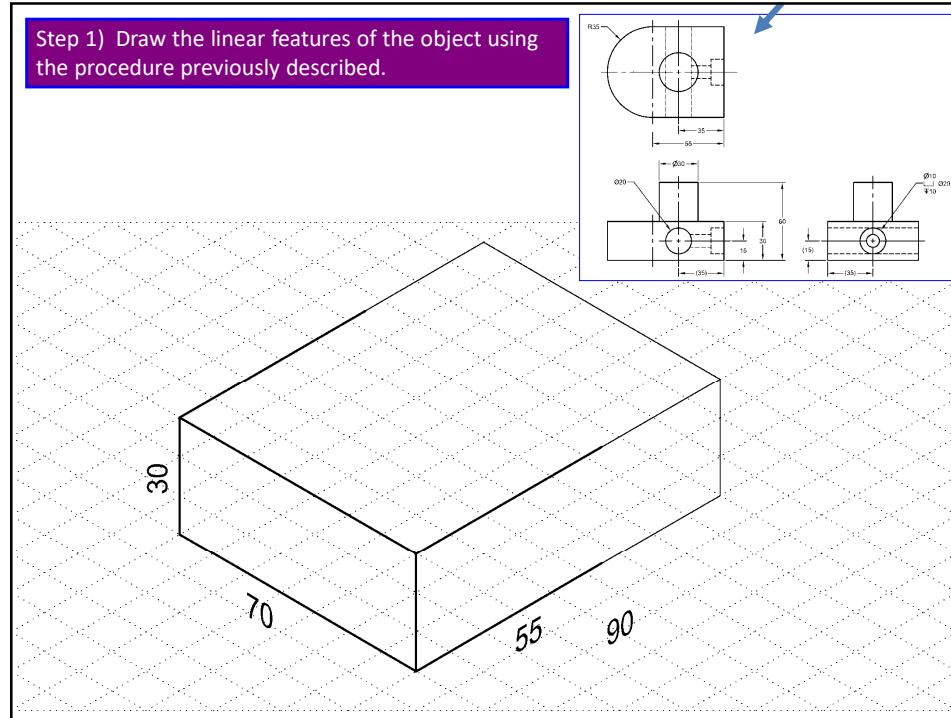
Problem 7

- Create a full-scale isometric pictorial of the following object. The grid spacing is 10 mm.

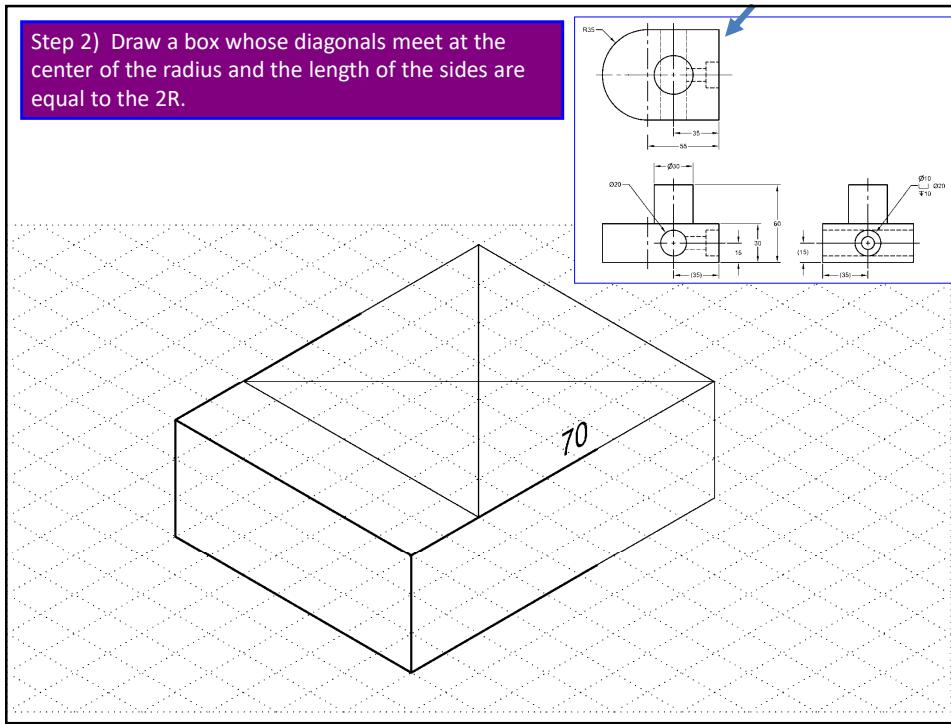


47

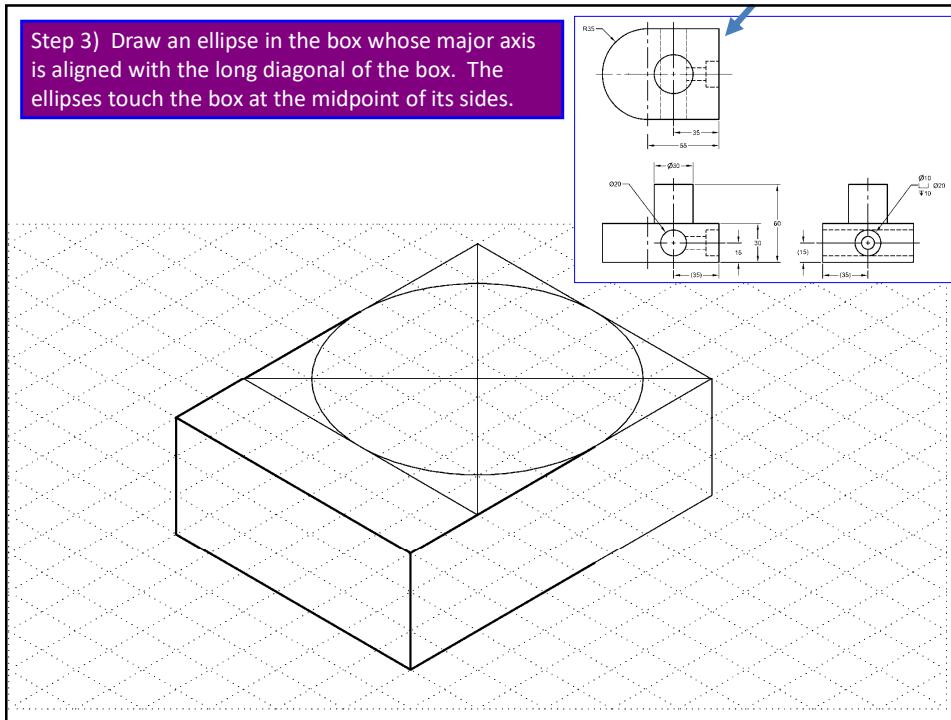
Step 1) Draw the linear features of the object using the procedure previously described.



48

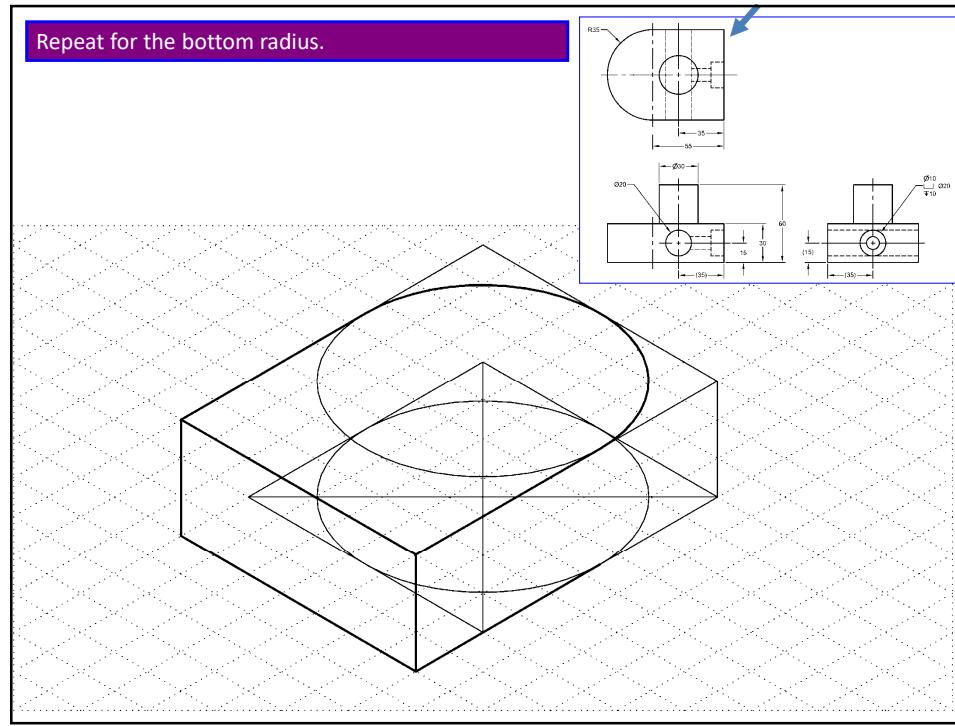


49



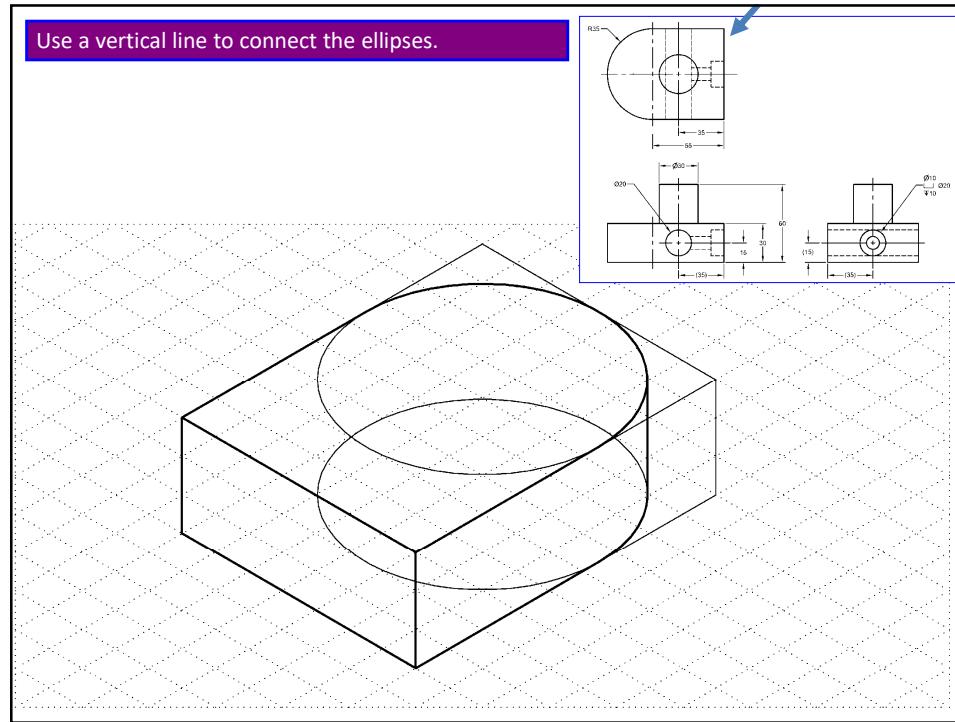
50

Repeat for the bottom radius.



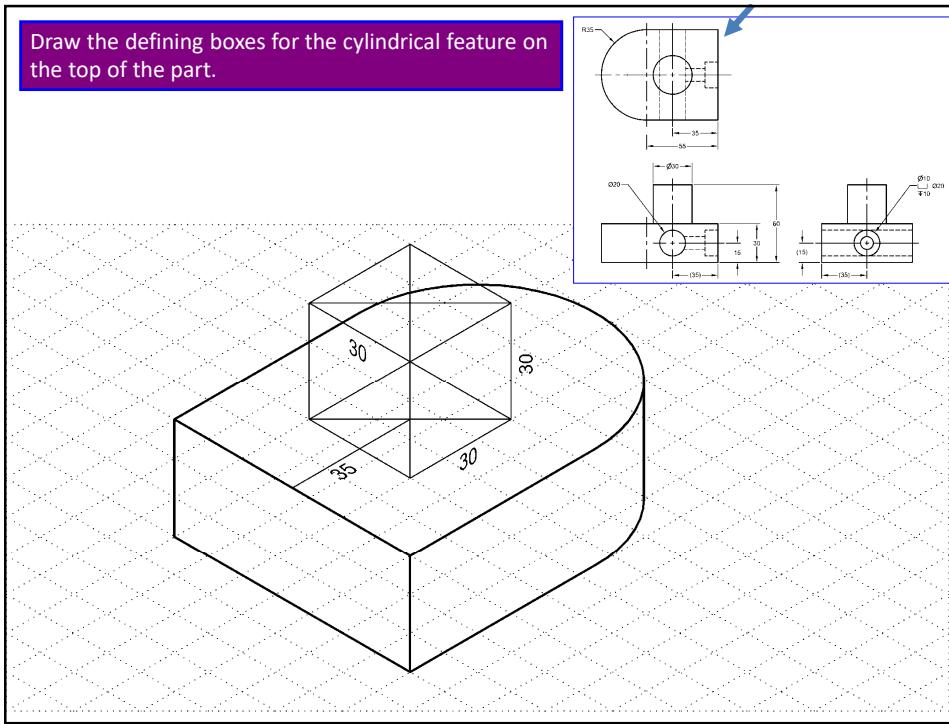
51

Use a vertical line to connect the ellipses.



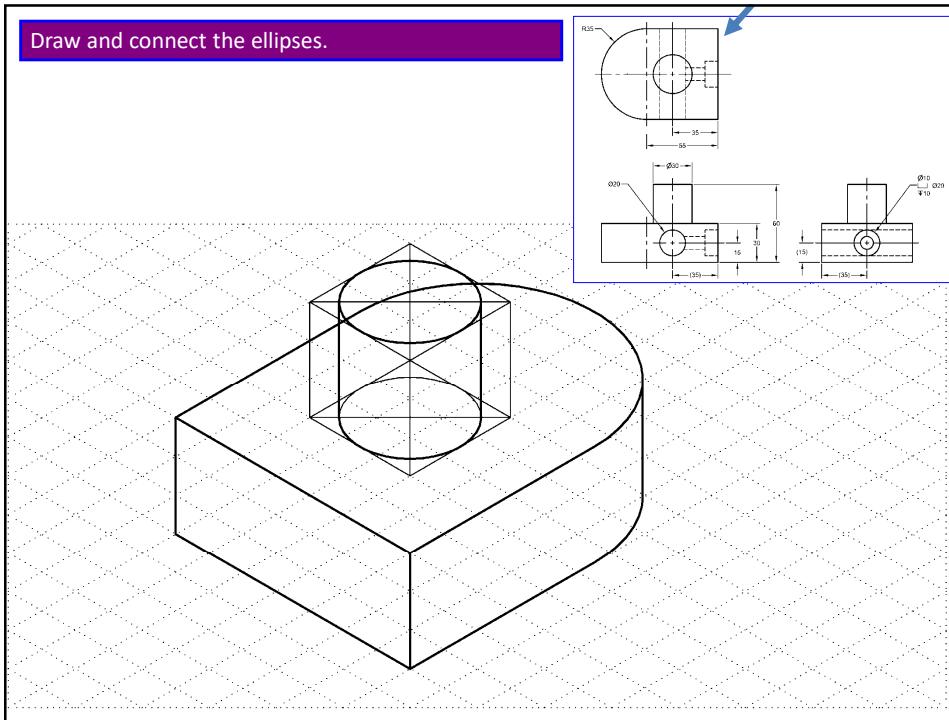
52

Draw the defining boxes for the cylindrical feature on the top of the part.



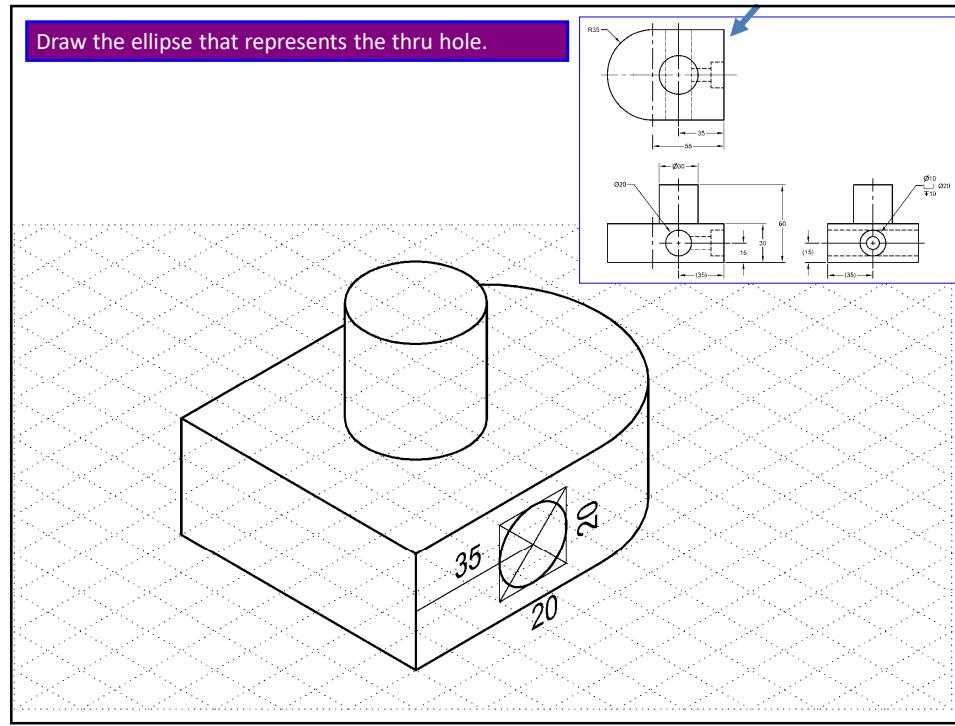
53

Draw and connect the ellipses.



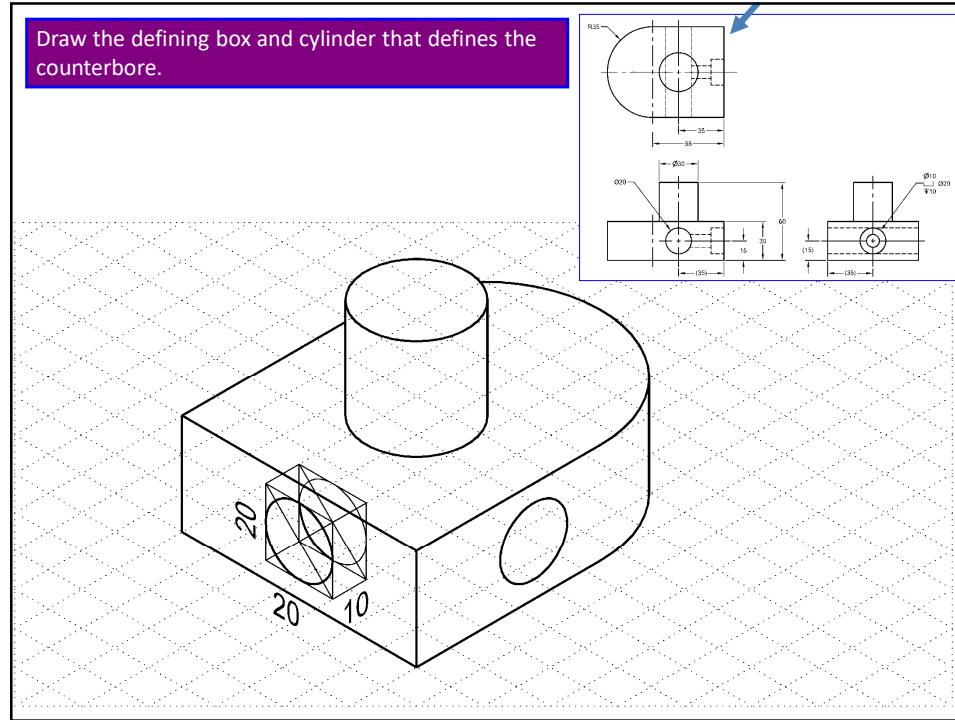
54

Draw the ellipse that represents the thru hole.



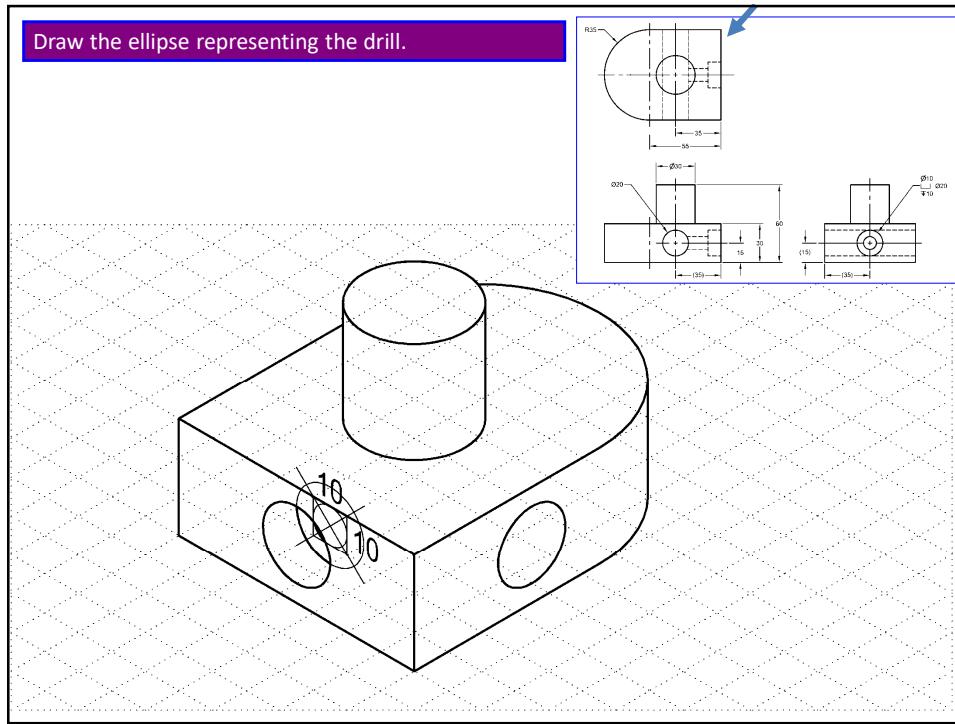
55

Draw the defining box and cylinder that defines the counterbore.



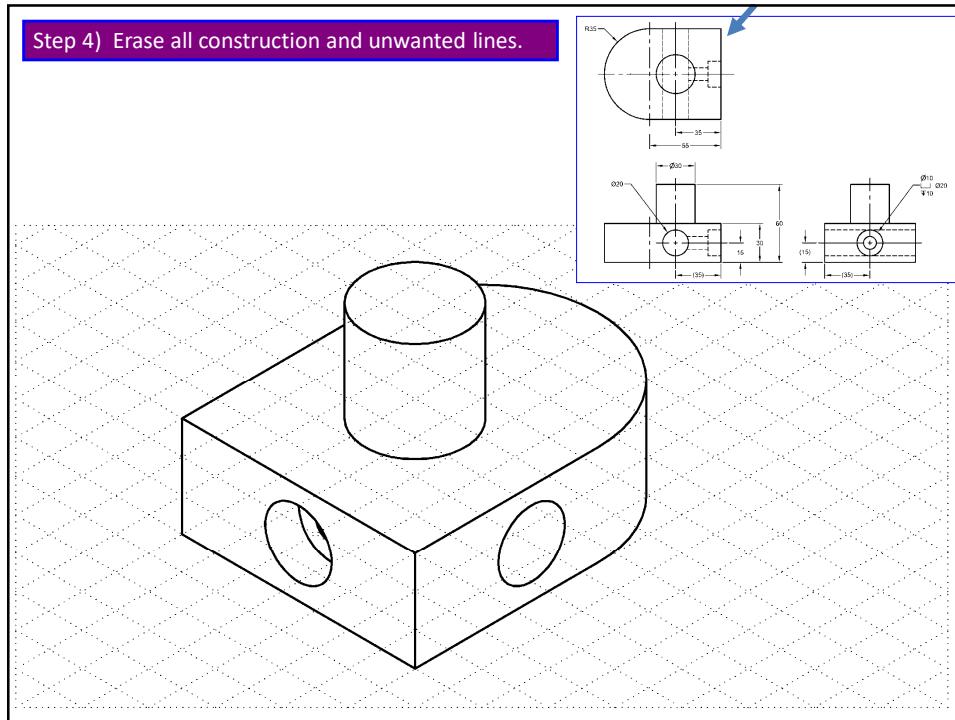
56

Draw the ellipse representing the drill.



57

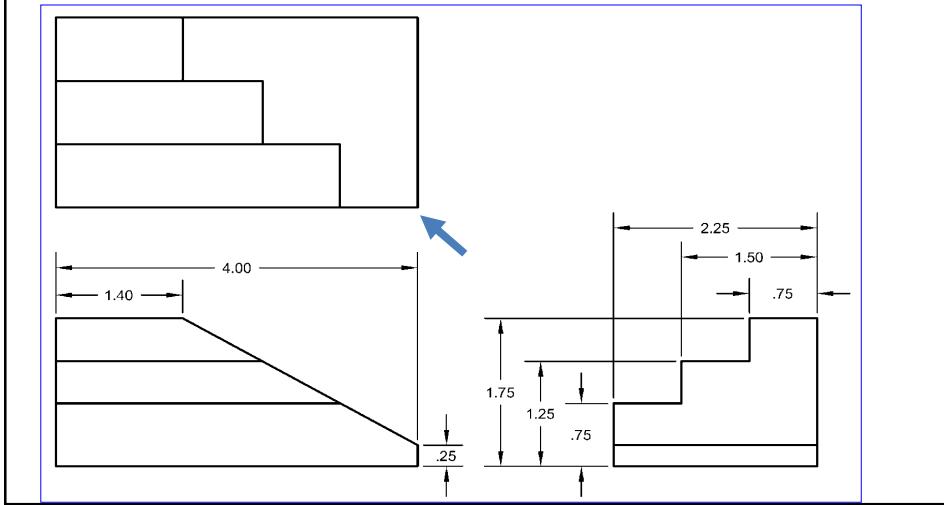
Step 4) Erase all construction and unwanted lines.



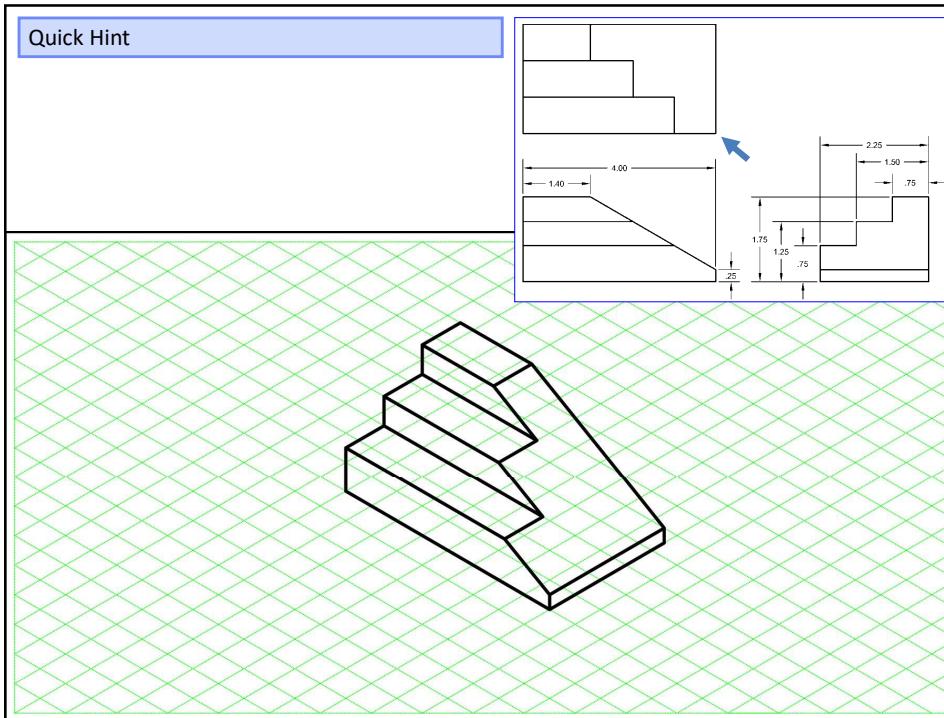
58

Problem 8

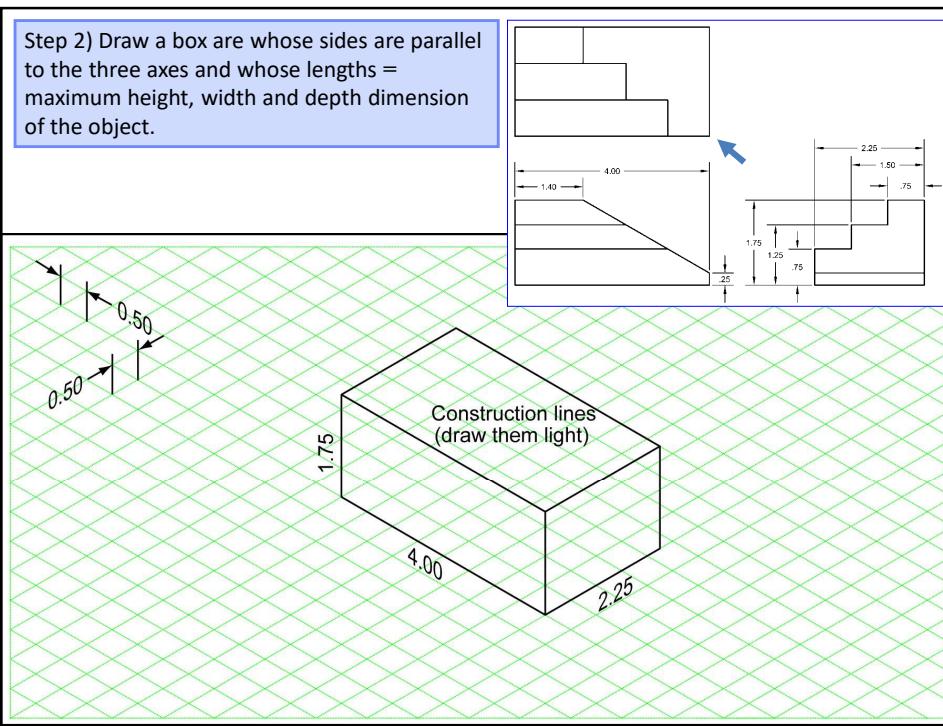
- Create a full-scale isometric pictorial of the following object.



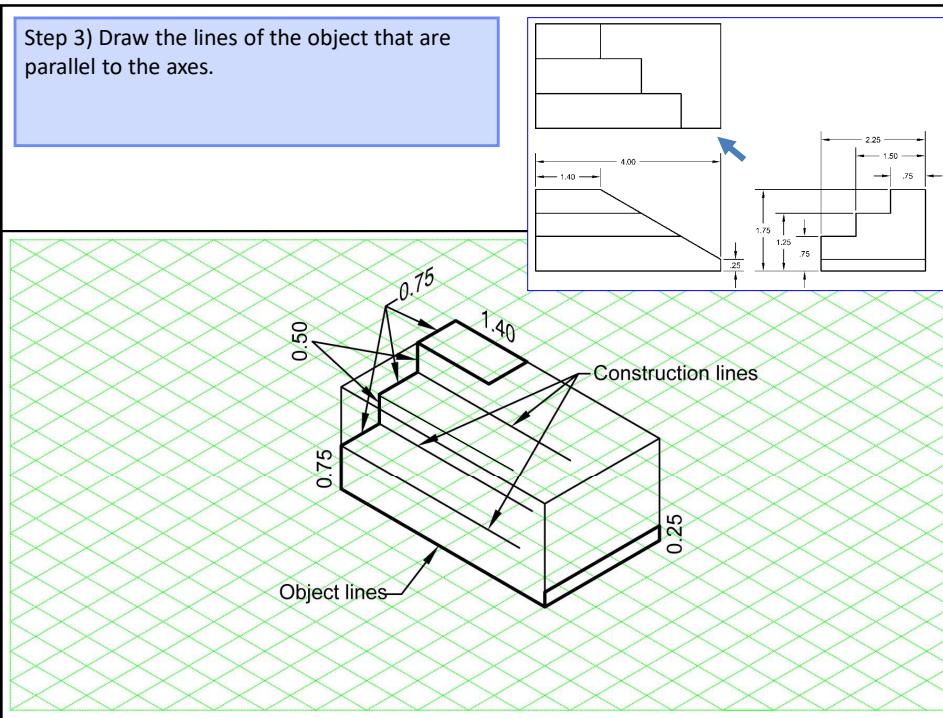
59



60

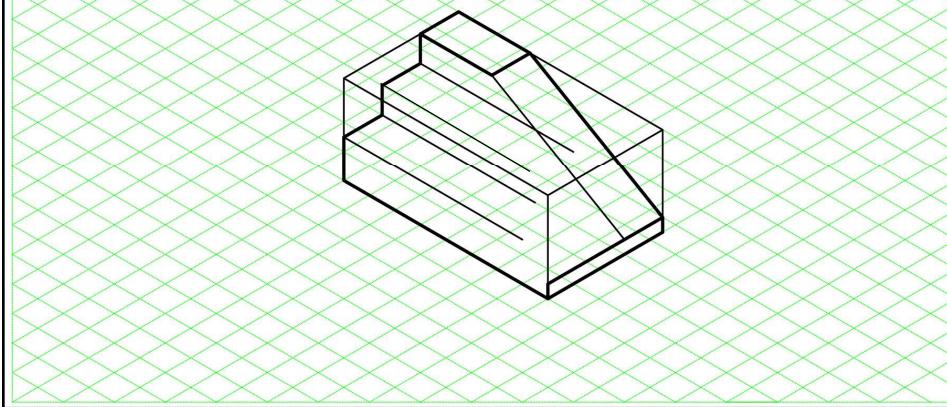
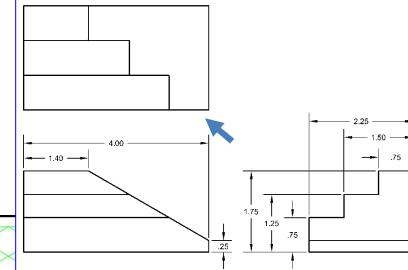


61

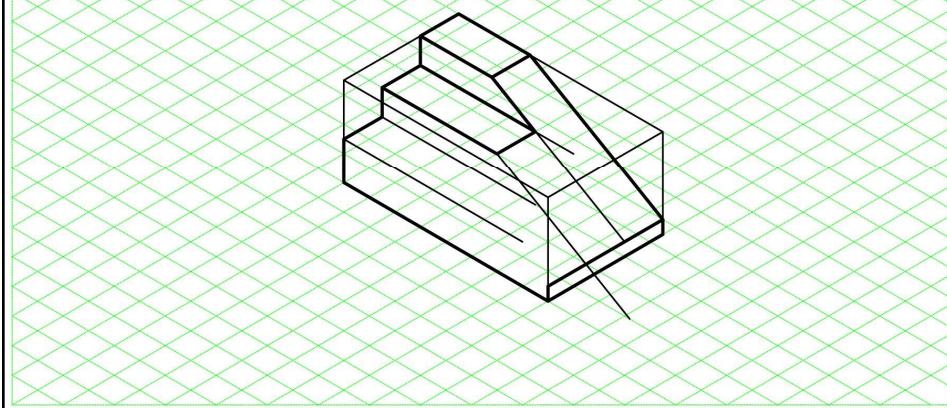
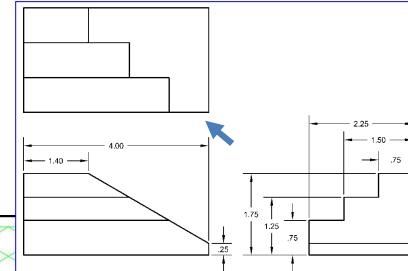


62

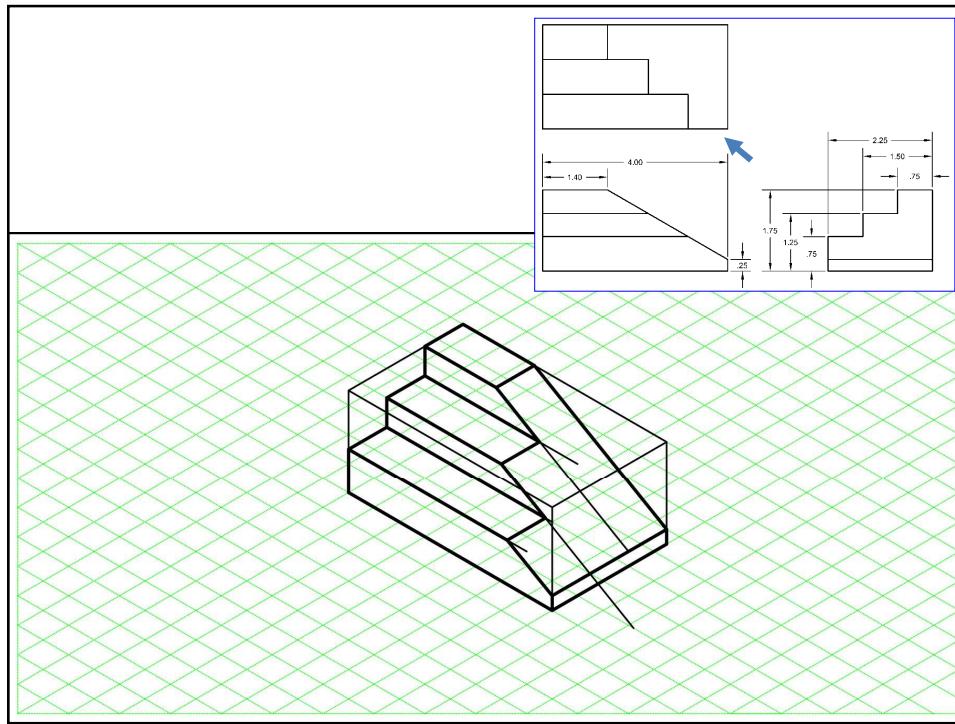
Step 4) The lines of the object that are not parallel to one of the axes are added by connecting the ends of existing lines.



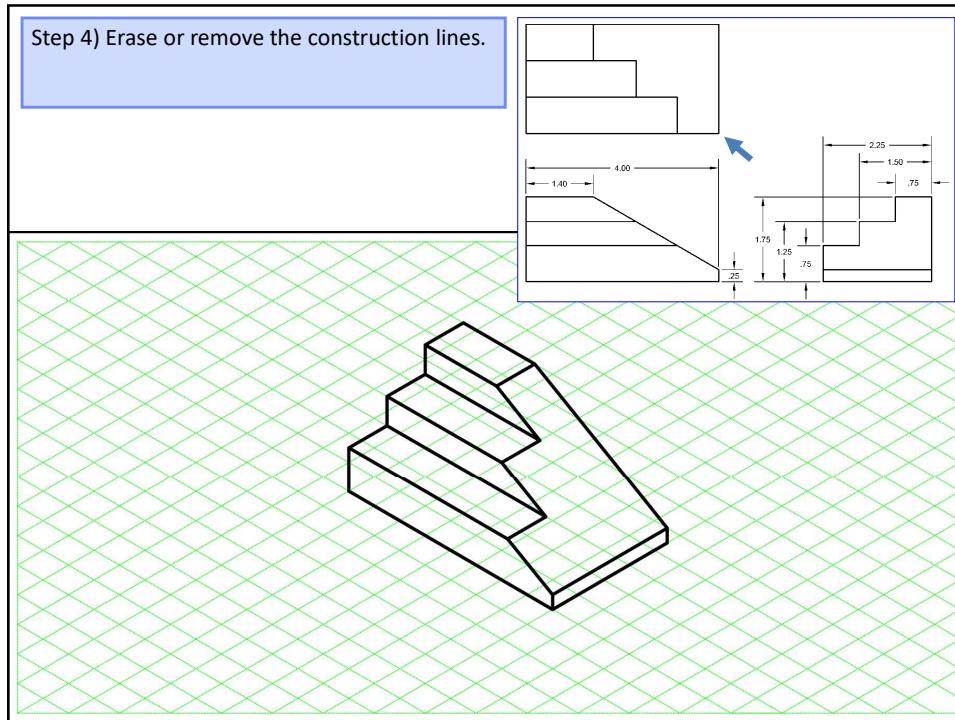
63



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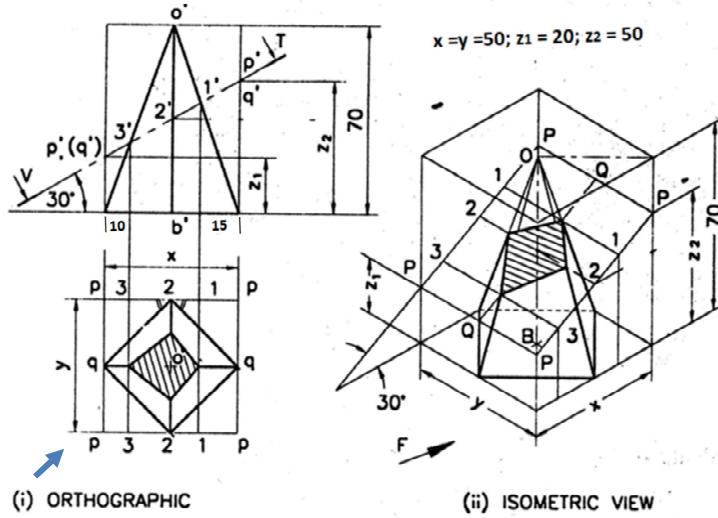


65



66

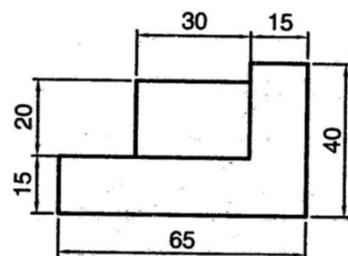
Problem 9



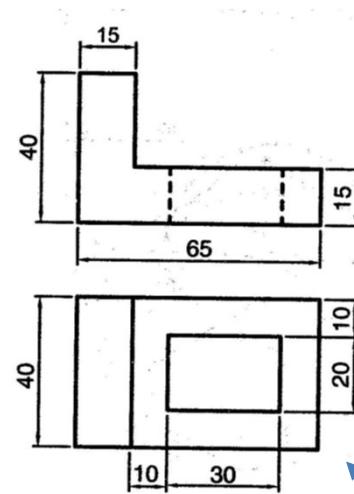
Truncated square pyramid

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Problem 10

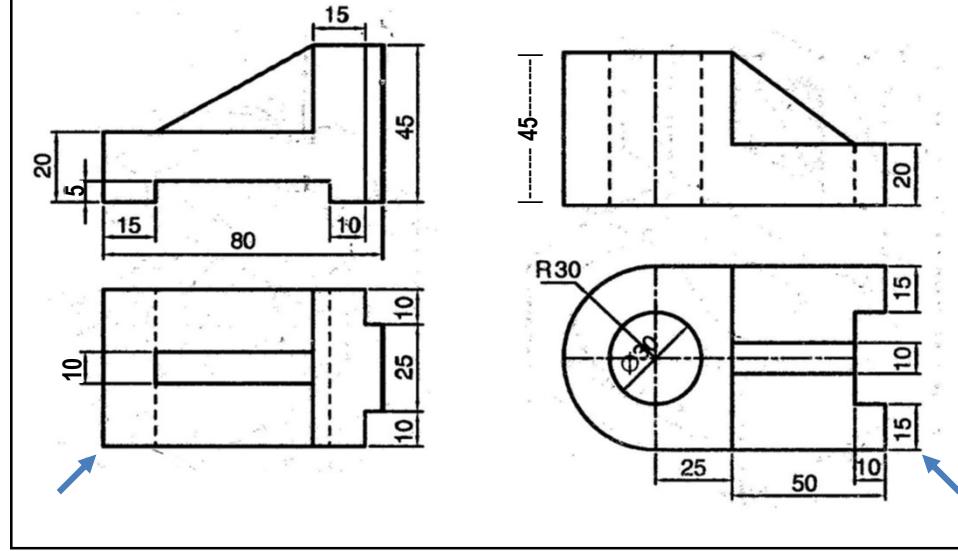


Problem 11



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Practice problems for home



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