

Construction 12: Construct a circle circumscribed about a triangle.

1. Draw any triangle, $\triangle ABC$.
2. Construct the perpendicular bisector of two sides of the triangle and call their point of intersection D.
3. Measure the distance from D to one of the vertices and construct a circle with this radius and center D.

Construction 13: Construct a Circle inscribed in a given triangle.

1. Draw any triangle, $\triangle ABC$.
2. Construct the angle bisector of two of the angles of the triangle. Call their point of intersection D.
3. Construct a perpendicular segment from point D to one of the sides of the triangle.
4. Measure the distance from point D to the side where the perpendicular segment intersects the side.
5. Construct a circle with this radius and center.

Construction 14: Construct a regular pentagon.

1. Draw a circle M . Draw a diameter of circle M . and construct is perpendicular bisector.
2. Bisect one of the radii. Point X is the midpoint.
3. Measure \overline{XA} (midpoint of radius to the endpoint of another radius). Mark off the same length on the original diameter from the midpoint of the radius. Call this point Y .
4. Measure the length of \overline{AY} . Using this length, mark off consecutive arcs on the circle.
5. Connect consecutive marks with segments to form a regular pentagon.

Construction 15: Construct a regular $2n$ -gon from a regular n -gon.

1. Construct the perpendicular bisector of two sides.
2. The bisectors intersect at the center of the regular polygon.
3. Use the distance from the center to a vertex to construct the circumscribed circle.
4. Open your compass to measure the distance from the point where one perpendicular bisector intersects the circle to an adjacent vertex of original polygon.
5. Use this distance on your compass to mark off equal arcs all the way around the circle (you should obtain all the original vertices and the arc midpoints between them).
6. Connect consecutive marks to form a regular $2n$ -gon.

Remember:

perpendicular bisectors → circumcenter

angle bisectors → incenter

altitudes → orthocenter

medians → centroid

Chapter 9 Vocabulary:

arc (major, minor)

arc measure

center (circle, regular polygon)

central angle (circle, regular polygon)

common tangent (external, internal)

congruent arcs

congruent circles

corollary

externally tangent circles

inscribed angle

internally tangent circles

point of tangency

secant

sector of a circle

segment of a circle

semicircle

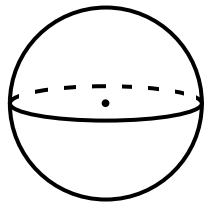
tangent (lines, circles)

Be able to draw the following figures:

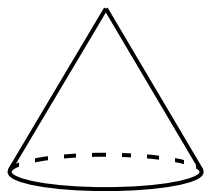
sphere
circular cone
circular cylinder
pyramid
prism

cube
parallel planes
intersecting planes
octahedron
plane cutting objects

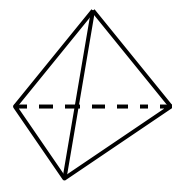
3-D Figures



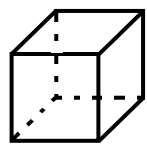
Sphere



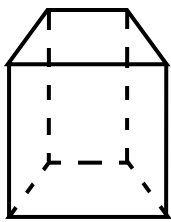
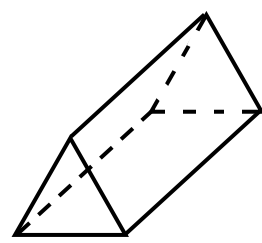
Cone



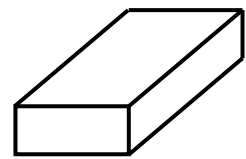
Pyramid

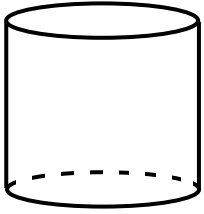


Cube

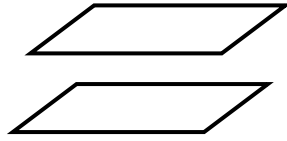


Prisms

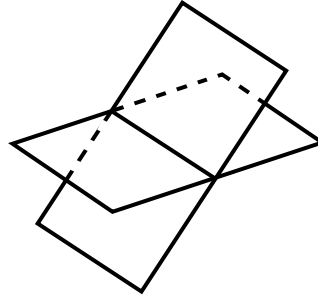




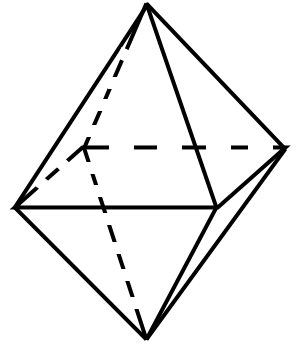
Cylinder



Parallel
Planes

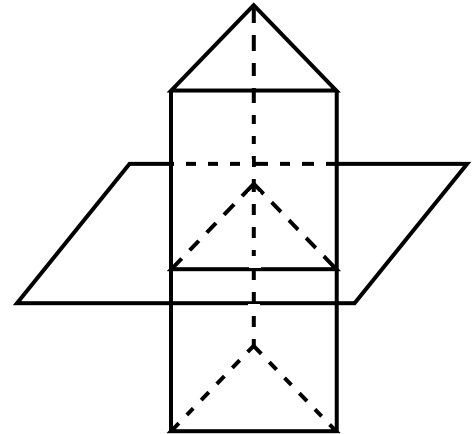
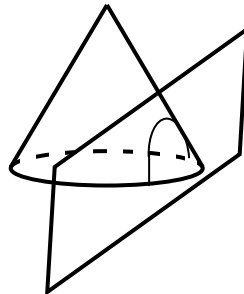
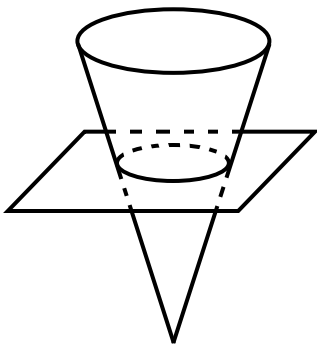


Intersecting
Planes



Octahedron

Planes Cutting Through Objects



Two Components of Perspective Drawings:

1. horizon – eye level of the observer
2. vanishing point – point(s) where parallel lines meet

Three Types of Perspective Drawings:

1. One point perspective
2. Two point perspective
3. Three point perspective

One Point Perspective – only the lines going into the distance meet at the vanishing point. Other pairs of lines (horizontal or vertical) are drawn parallel.

To draw in one point perspective:

1. Draw a horizon and vanishing point.
2. Draw the face of the figure.
3. Draw a line from each vertex to the vanishing point. Draw the figure's edges along the sight lines.
4. Draw remaining vertical and horizontal edges within the sight lines.

Two Point Perspective – two types of parallel lines meet at vanishing points and one type is drawn parallel.

To draw in two point perspective:

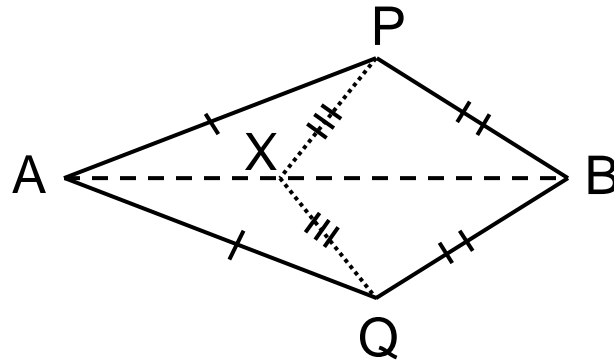
1. Draw horizon and 2 vanishing points.
2. Draw the front vertical edge of your figure.
3. Connect both ends of the edge to both vanishing points. Draw the figure's edges along the sight lines.
4. Within the sight lines draw the rest of the vertical edges parallel to the front edge.
5. Connect all vertices with both vanishing points. Draw the remaining edges of the figure.

Three Point Perspective – all parallel lines meet at a vanishing point.

To draw in two point perspective:

1. Draw horizontal and 2 vanishing points on the horizontal. Pick a third vanishing point below the horizon.
2. Draw the point that will be the top corner of your figure.
3. Connect this point with all 3 vanishing points.
4. Mark off the edge lengths along these three lines.
5. Connect the 3 new vertices to all 3 vanishing points. Draw remaining edges along the sightlines.

Theorem 10.1: If the endpoints of a segment are equidistant from two other points, then every point between the endpoints is also equidistant from two other points.



If P and Q are equidistant from A, and P and Q are equidistant from B, then any other point, X, is also equidistant from P and Q.

section 10.2

Line Separation Postulate: A point separates a line into 3 distinct disjoint sets: the point and 2 half-lines.

Plane Separation Postulate: A line separates a plane into 3 distinct disjoint sets: the line and 2 half-planes.

Space Separation Postulate: Every plane separates space into 3 distinct disjoint sets: the plane and 2 half-spaces.

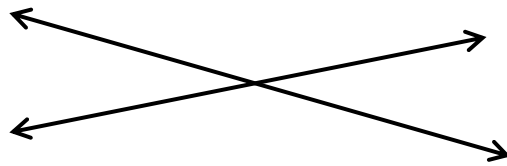
Terminology:

The plane is called the face of the half-space.

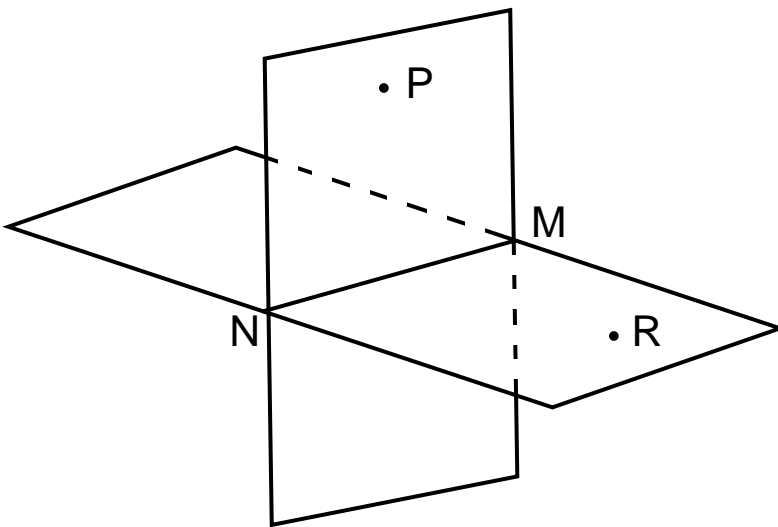
Each half-space is convex because for any two points in the half-space, the segment joining them will be in the half-space.

Intersections:

Two lines intersect at a point and form 4 angles.



Two planes intersect at a line and form 4 angles called *dihedral angles*.



Notation:

$\angle P-MN-R$

Definitions:

A dihedral angle is the union of any line and two half-planes that have the line as a common edge.

The edge of a dihedral angle is the common edge of two half-planes that form a dihedral angle.

The face of a dihedral angle is the union of the edge of the dihedral angle and one of the half-planes that form the dihedral angle.

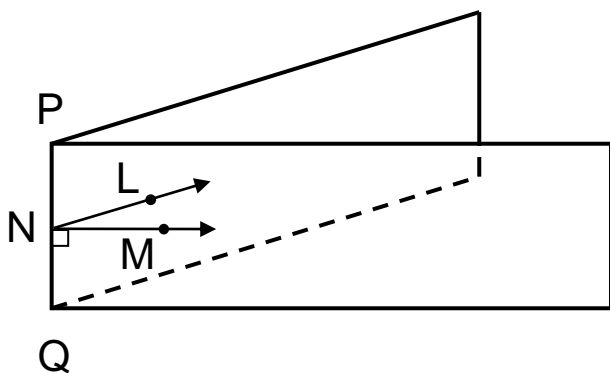
Dihedral Angles:

The interior of a dihedral angle is an infinite wedge formed by the intersection of two planes.

An angle is a plane angle if both of its rays are perpendicular to the edge of the dihedral angle.

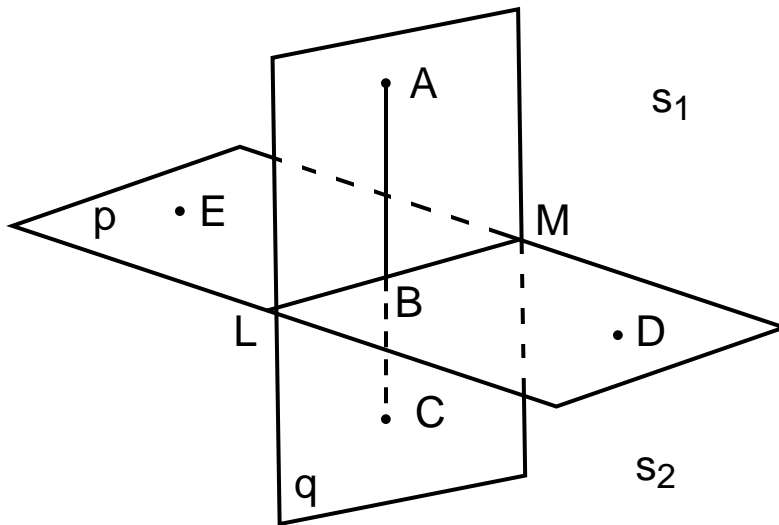
The measure of a dihedral angle is the measure of the plane angle.

Dihedral angles are congruent if they have equal measures.



$$m\angle L-PQ-M = m\angle LNM$$

Sample Problem: Given the following diagram, where plane p divides space into 2 half-spaces s_1 and s_2 , $p \perp q = LM$, $B \in LM$.



- | | |
|---------------------------------------|------------------------------------|
| 1. Find $q \cap s_1$ | half-plane ALM |
| 2. $\overline{AC} \cap s_1$ | \overline{AB} without endpoint B |
| 3. $\overleftrightarrow{AC} \cap s_2$ | half-line BC |
| 4. $\angle D-LM-A \cap s_2$ | empty set |