***Geometry***

**Chapter 9: Three-Dimensional Figures**

**9-1: Points, Lines, and Planes in Space**

1. **Point-Line-Plane Postulate**
	1. **Unique Plane Assumption**: Through any three noncollinear points there is exactly one plane
	2. **Intersection Assumption**: Two different planes either do not intersect or intersect at exactly one line
2. **Line-Plane Perpendicular Theorem**: If a line is perpendicular to two different lines at their point of intersection, then it is perpendicular to the plane that contains those lines
	1. **Foot of a segment**: the point of intersection of a segment perpendicular to a plane and the plane itself
3. **Parallel planes** are either identical or have no points in common
	1. **Distance between parallel planes:** length of a segment perpendicular to both planes
4. **Skew Lines**: lines that do not intersect and are not in the same plane
5. **Dihedral angles**: the angles that are formed when two planes intersect
	1. **Edge of dihedral angle**: line of intersection of the planes

**9-2: Prisms and Cylinders**

1. Surfaces vs Solids:
	1. Surface has two parts: exterior and interior (ex. a balloon)
	2. Solid is the union of interior and exterior (ex. bowling ball)
2. Parts of a surface
	1. **Face**: a polygonal region
	2. **Edge**: sides of a polygonal region
	3. **Vertex**: vertices of the polygonal region
	4. **Bases**: the region that was translated and its image
	5. **Lateral surface**: the surfaces that aren’t the base
	6. **Altitude**: the perpendicular distance between bases
3. **Cylinder**: cylindrical surface whose base is a circle
4. **Prism**: cylindrical surface whose base is a polygon
	1. **Regular Prism**: prism with regular polygons for bases



**9-3: Pyramids and Cones**

1. **Conic Solid**: the set of points between a given point (the apex) and its base
2. **Pyramid**: a conic solid with a convex polygon for its base
	1. **Regular pyramid**: a pyramid whose base is a regular polygon
	2. **Right pyramid**: a pyramid that has a segment from the apex to the center of the base that is perpendicular to the base
	3. **Oblique pyramid**: a pyramid that is not a right pyramid
3. **Cone**: a conic solid with a circular region for its base
	1. **Axis of a cone**: the line from the apex of a cone to the center of the base

 

**9-4: Drawing in Perspective**

1. Artists draw in perspective to achieve realism
2. **Vanishing point**: the point at which several lines of a drawing appear to meet
3. **One-point perspective**: a perspective in which there is one vanishing point on the horizon
4. **Two-point perspective**: a perspective in which there are two vanishing points on the horizon

**9-5: Views of Solids and Surfaces**

1. Non-perspective drawings will take a three-dimensional object and represent it in two dimensions

**9-6: Spheres and Sections**

1. **Sphere**: set of points in space at a certain distance from a point
2. **Great Circle of a Sphere:** the intersection of a plane that contains the center and the sphere
	1. The great circle splits the sphere into two **hemispheres**
3. **Small Circle of a Sphere**: the intersection of a plane that doesn’t contain the center and the sphere.
4. **Plane Section**: intersection of a 3-dimensional figure and a plane

**9-7: Reflections in Space**

1. **Reflecting over a plane**: the plane is the perpendicular bisector of the segments between every point in the preimage and image
2. Figures are **congruent** if and only if they are the preimage and image under a reflection or composite of reflections
3. **Reflection Symmetric Figure:** a figure that can be divided evenly with a plane

**9-8: Making Polyhedra and Other Surfaces**

1. **Polyhedron**: 3-dimensional surface that is a union of polygons
2. Polyhedra are classified by the number of faces:
	1. 4 faces: tetrahedron
	2. 6 faces: hexahedron
	3. 8 faces: octahedron
	4. 12 faces: dodecahedron
	5. 20 faces: isosahedron
3. **Net:** a 2-dimensional figure that can be folded to form a 3-dimensional surface

**9-9: Surface Areas of Prisms and Cylinders**

1. Lateral Area (L.A.) = ph
	1. p = perimeter of the base
	2. h = height of the cylindrical solid
2. Surface Area (S.A.) = L.A. + 2B
	1. B = area of the base

**9-10: Surface Areas of Pyramids and Cones**

1. L.A. = ½ l p
	1. l = slant height
2. S.A. = L.A. + B