Category 2 – Geometry – Meet #5 March 2007 – Study Guide
Topics: Solid geometry (volume and surface area), Diagonals (surface and space)

Cube:

Rectangular Prism:

Triangular Prism:

Hexagonal Prism:

Octagonal Prism:

Trapezoidal Prism:

Square Pyramid:

Tetrahedron (equilateral pyramid)

Sphere:

Cylinder:

Cone:

13 cm = slant height
Finding Surface Area:

Prisms by definition consist of 2 parallel polygons with rectangles connecting the sides of the polygons. To find the Surface Area of a prism you just need to find the area of the two polygons and of each rectangle and add up all the areas.

Pyramids (and Tetrahedron): Pyramids consist of a Polygon at the base with each vertex of the pyramid connected to the same point somewhere not on the polygon's plane. Those connections form several triangles. To find the Surface area of a pyramid you need to find the area of the polygon base and the area of all the triangles and add up all the areas.

Sphere: Formula for Surface Area of a Sphere is $4\pi r^2$

Cone: Surface area of a cone consists of two pieces: the base circle and the actual cone. Area of the base circle is $\pi r^2$ and the area of the cone part is $\pi rs$ where $s$ is the slant height. The slant height is the distance along the cone from the vertex to any point of the circumference of the circle. So Surface Area of a cone is $\pi r^2 + \pi rs$.

Cylinder: The Surface of a cylinder comes in 3 pieces. Two circles and the "tube". The area of each circle is $\pi r^2$ of course, but the tube is a little different. If you could imagine taking a poster that is rolled into a tube, you can see how unrolling it produces a rectangle. The Circumference of the tube ($2\pi r$ or $\pi d$) becomes the base of the rectangle and the height (or length) of the "tube" becomes the height of the rectangle. So the Surface Area of a cylinder is $2\pi r^2 + (2\pi r)H$ (where $H$ is the height of the tube).

Be careful to note that some of the lengths you need might not be given to you. You may need to work backwards with one formula to find what's missing, but more often than not the Pythagorean Theorem will help you find the missing length you need!!

**Note, when finding surface area of half a sphere make sure you don't just divide the SA by 2, but that you also add in the circle at the bottom of the half sphere.

Finding Volume:

All prisms and cylinders have the same volume formula. You multiply the AREA of the base times the height. The height is the distance between the two polygons or circles that are used as the bases. For cylinders that means $V = \pi r^2H$. For a rectangular prism it is just $V = l \times w \times H$.

Pyramids and Cones: Like prisms and cylinders, pyramids and cones have the same volume formula and is similar to the prism/cylinder formula as well. You need to find the Area of the Base, multiply by the Height, and then divide by 3 (or multiply by one third). So Volume of a cone $= \frac{\pi \cdot r^2 \cdot H}{3}$ or $\frac{1}{3} \cdot \pi \cdot r^2 \cdot H$.

Volume of a pyramid is just $\frac{1}{3} BH$ or $\frac{BH}{3}$.

Spheres: The formula for finding volume of a sphere is $\frac{4}{3} \pi r^3$. 
Diagonals –

A surface diagonal of a prism is a diagonal of any of the polygons on the surface of the prism. Diagonals connect vertices of a prism not already connected by a side. A surface diagonal as it is named lies only on the SURFACE of the prism.

A space diagonal of a prism connects two vertices of the prism as long as the two vertices are not already on the same polygonal face(side). A space diagonal must travel through the middle of a polygon, not on its surface.