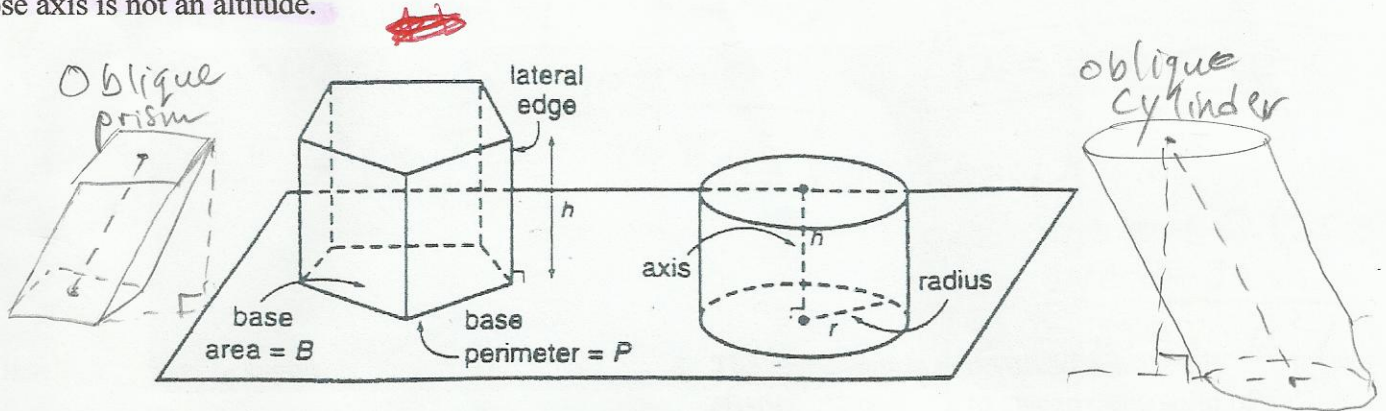


11-2 Surface Area of Prisms and Cylinders

Prisms are polyhedrons with congruent polygonal bases in parallel planes. **Cylinders** have congruent and parallel circular bases. An **altitude** is a perpendicular segment joining the planes of the bases. The length of an altitude is the height of the figure. **Right prisms** have lateral edges that are altitudes. The lateral faces of a right prism are rectangles. An **oblique prism** is a prism whose edges are not altitudes. The lateral faces of an oblique prism are parallelograms. A **right cylinder** is one whose axis (segment joining the centers of the two circular bases) is an altitude. An **oblique cylinder** is one whose axis is not an altitude.



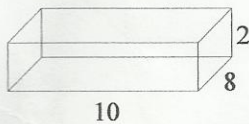
In the following formulas, L is lateral and SA is total surface area.

Prisms: $L = Ph$
 $SA = Ph + 2B$

Cylinders: $L = Ph$
 $SA = Ph + 2B$

Where P is the perimeter of the base, h is the height of the solid, and B is the area of the base.

1. Base is a rectangle



$$LA = Ph$$

$$LA = (36)(2) = 72$$

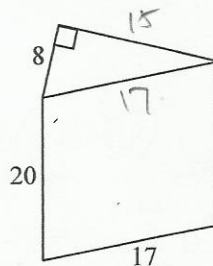
$$LA = 72 u^2$$

$$SA = LA + 2B$$

$$SA = 72 + 2(80)$$

$$SA = 232 u^2$$

2. Base is a right triangle



$$LA = Ph$$

$$LA = 40(20)$$

$$LA = 800 u^2$$

$$B = \frac{1}{2}bh$$

$$B = \frac{1}{2}(8)(15)$$

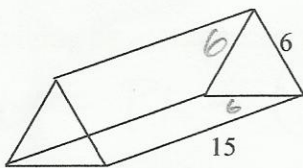
$$B = 60$$

$$SA = LA + 2B$$

$$SA = 800 + 2(60)$$

$$SA = 920 u^2$$

3. Base is an equilateral triangle



$$LA = Ph$$

$$LA = (18)(15)$$

$$LA = 270 u^2$$



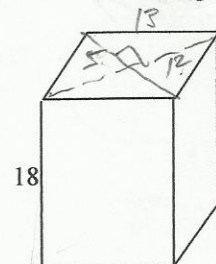
$$B = \frac{(6)(3\sqrt{3})}{2} = 9\sqrt{3}$$

$$SA = LA + 2B$$

$$SA = 270 + 2(9\sqrt{3})$$

$$SA = 270 + 18\sqrt{3} u^2$$

4. Base is a rhombus with diagonals 10 and 24



$$B = \frac{d_1 d_2}{2} = \frac{(10)(24)}{2}$$

$$B = 120$$

$$LA = Ph$$

$$LA = (52)(18)$$

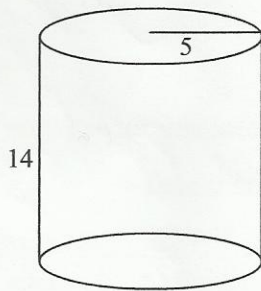
$$LA = 936 u^2$$

$$SA = LA + 2B$$

$$SA = 936 + 2(120)$$

$$SA = 1176 u^2$$

5. Cylinder



$$LA = 2\pi r h$$

$$LA = 2\pi(5)(14)$$

$$LA = 140\pi u^2$$

$$B = \pi r^2$$

$$B = 25\pi$$

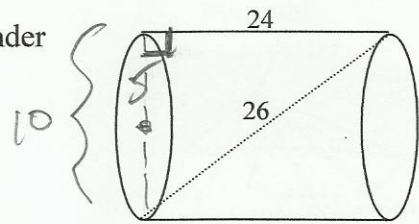
$$SA = LA + 2B$$

$$SA = 140\pi + 2(25\pi)$$

$$SA = 140\pi + 50\pi$$

$$SA = 190\pi u^2$$

6. Cylinder



$$B = 25\pi$$

$$LA = 2\pi r h$$

$$LA = 2\pi(5)(24)$$

$$LA = 240\pi u^2$$

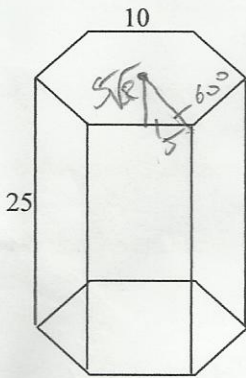
$$SA = LA + 2B$$

$$SA = 240\pi + 2(25\pi)$$

$$SA = 240\pi + 50\pi$$

$$SA = 290\pi u^2$$

7. Base is a regular hexagon



$$B = \frac{1}{2} a p$$

$$B = \frac{1}{2} (5\sqrt{3})(60)$$

$$B = 150\sqrt{3}$$

$$LA = Ph$$

$$LA = (60)(25)$$

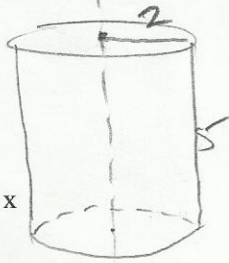
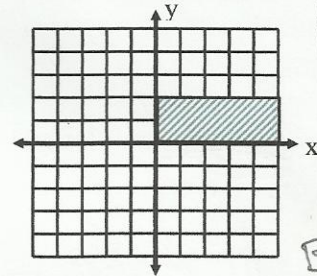
$$LA = 1500 u^2$$

$$SA = LA + 2B$$

$$SA = 1500 + 2(150\sqrt{3})$$

$$SA = 1500 + 300\sqrt{3} u^2$$

8. The plane region is revolved completely about the line $y = 2$ to sweep out a solid of revolution. Describe the solid and find its surface area in terms of π .



$$B = 4\pi$$

$$LA = 2\pi r h$$

$$LA = 2\pi(2)(5) = 20\pi u^2$$

$$SA = LA + 2B$$

$$SA = 20\pi + 2(4\pi)$$

$$SA = 28\pi$$

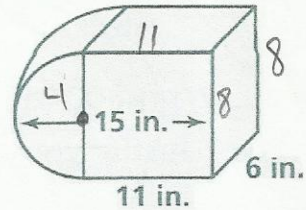
9. Judging by appearances, what is the surface area of the solid pictured?

$$LA = Ph = (30 + 4\pi)(6) = 180 + 24\pi$$

$$SA = (180 + 24\pi) + 2(8\pi + 88)$$

$$SA = 180 + 24\pi + 16\pi + 176$$

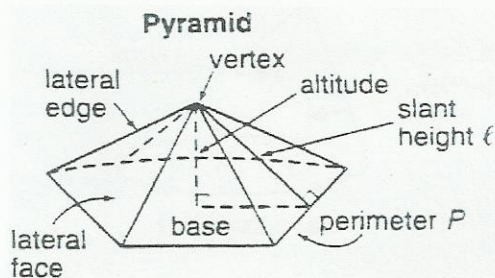
$$SA = 356 + 40\pi$$



$$B = 8\pi + 88$$

PYRAMID:

- All faces except one intersect at the vertex.
- base - face that doesn't intersect at vertex.
Is always a polygon
- lateral faces - faces that intersect at vertex
always triangles.
- lateral edges - edges that have the vertex as an endpoint.
- altitude - segment from the vertex perpendicular to the base.



REGULAR PYRAMID - base is a regular polygon and segment from vertex to center of base is an altitude

- all lateral faces are congruent isosceles triangles.
- slant height (l) - height of each lateral face.

Lateral Area of Regular Pyramid = $\frac{1}{2} P l$ where P is the perimeter of the base and l is the slant height.

Surface Area of Regular Pyramid = $\frac{1}{2} P l + B$

(1) Find the lateral area and surface area of the regular pyramid with altitude 15 cm. and edge of base 16 cm.

$$l = 17$$

$$LA = \frac{1}{2} P l$$

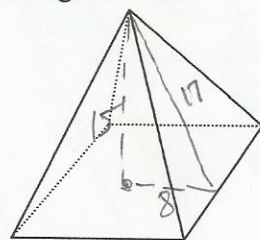
$$LA = \frac{1}{2} (64) (17)$$

$$LA = 544 \text{ cm}^2$$

$$SA = LA + B$$

$$SA = 544 + 256$$

$$SA = 800 \text{ cm}^2$$



(2) Find the lateral area and surface area of the regular triangular pyramid below.

$$l = 8$$

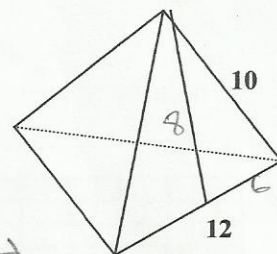
$$LA = \frac{1}{2} P l = \frac{1}{2} (36) (8) = 144 \text{ u}^2$$

$$SA = LA + B = 144 + 36\sqrt{3}$$

$$B = \frac{1}{2} b h$$

$$B = \frac{1}{2} (12) (6\sqrt{3})$$

$$B = 36\sqrt{3}$$



(3) Find the altitude of a regular square pyramid with base edge 12 cm. and lateral area of 240 cm².

$$LA = \frac{1}{2} P l$$

$$240 = \frac{1}{2} (48) l$$

$$240 = 24 l$$

$$l = 10$$

$$\text{altitude} = 8$$

