Cavalieri's Principle

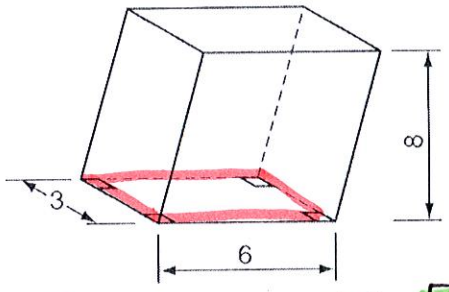
Consider This

Cavalieri's Principle states that the same formula, $V = Bh$, can be used to find the volume of a prism, whether it is a right prism or an oblique prism. The principle can be extended to right and oblique cylinders.

Cavalieri's Principle: If two prisms (solids) having the same height lie between parallel planes and have all cross sections equal distances from the bases with congruent areas, the solids have the same volume.

Find each volume. Use 3.14 for π. Round answers to the nearest cubic unit.

1

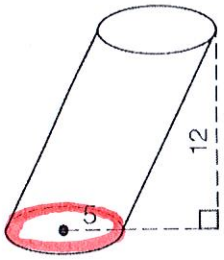


$B = 3 \cdot 6$

$B = 18$

$V = 18(8) = 144$

2



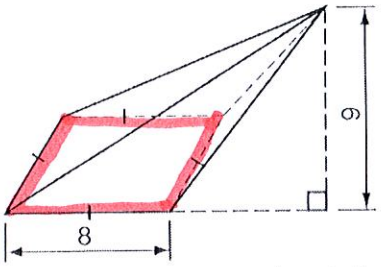
$B = \pi 5^2$

$B = 25\pi$

$V = 25\pi(12)$

$V = 300\pi$

3

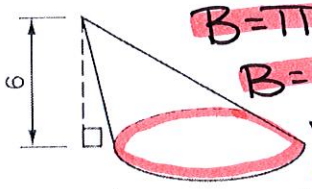


$B = 8 \cdot 8$

$B = 64$

$V = \frac{1}{3}(64)(9) = 192$

4



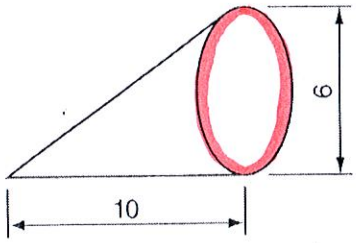
$B = \pi 5^2$

$B = 25\pi$

$V = \frac{1}{3}(25\pi)(6)$

$V = 50\pi$

5



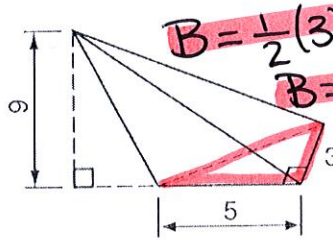
$B = \pi 6^2$

$B = 36\pi$

$V = \frac{1}{3}(36\pi)(10)$

$V = 120\pi$

6

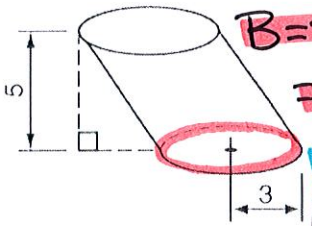


$B = \frac{1}{2}(3)(5)$

$B = 7.5$

$V = \frac{1}{3}(7.5)9 = 22.5$

7



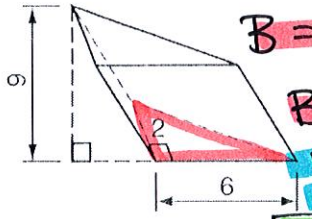
$B=\pi 3^2$

$=9\pi$

$V=(9\pi)(5)$

$V=45\pi$

8



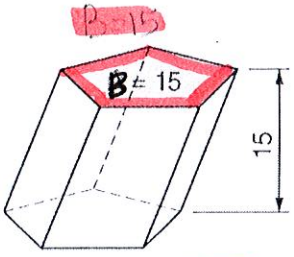
$B=\frac{1}{2}(2)(6)$

$B=6$

$V=(6)(9)$

$V=54$

9

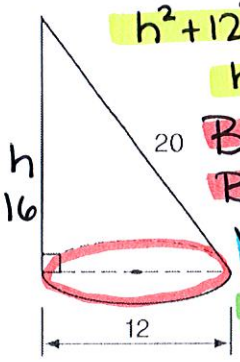


$B=15$

$V=(15)(15)$

$V=225$

10



$h^2+12^2=20^2$

$h=16$

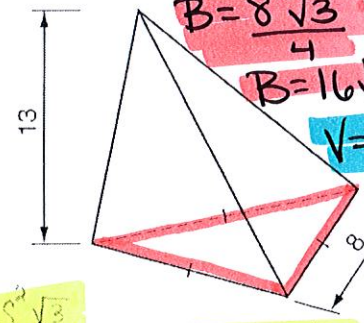
$B=\pi 6^2$

$B=36\pi$

$V=\frac{1}{3}(36\pi)(16)$

$V=192\pi$

11



$B=\frac{8^2\sqrt{3}}{4}$

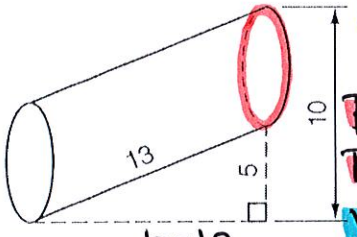
$B=16\sqrt{3}$

$V=\frac{1}{3}(16\sqrt{3})(13)$

$V=120.1$

$B=\frac{s^2\sqrt{3}}{4}$ where s is the side length

12



$h^2+5^2=13^2$

$h=12$

$B=\pi 2.5^2$

$B=6.25\pi$

$V=(6.25\pi)12$

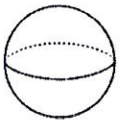
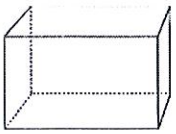
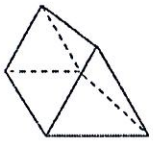
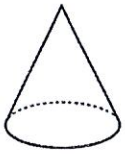
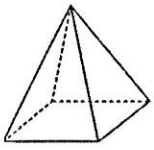
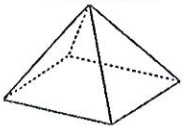
$V=75\pi$

Answer Box

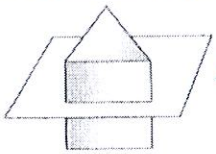
A	B	C	D	E	F
120	94	54	236	603	141
G	H	I	J	K	L
192	225	23	942	157	144

3-D Introduction & Cross Sections **Geometry**

Draw the vertical and horizontal cross sections. The base side should always be facing DOWN.

SHAPE	VERTICAL	HORIZONTAL
SPHERE 		
RECTANGULAR PRISM 		
TRIANGULAR PRISM 		
CYLINDER 		
CONE 		
SQUARE PYRAMID 		
RECTANGULAR PYRAMID 		

Directions: Name the cross section.

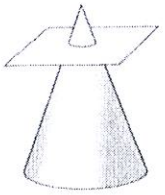
1)  triangle

2)  circle

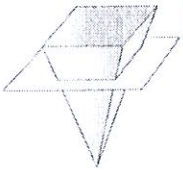
3)  rectangle

4)  triangle

5)  rectangle (or square)

6)  circle

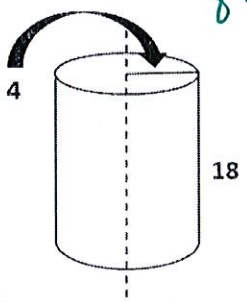
7)  rectangle

8)  rectangle (or square)

Directions: Sketch a drawing of the two-dimensional cross section of each 3-D figure. Then, find the area of the cross section.

9) Given: Cylinder

$8 \cdot 18 = 144$

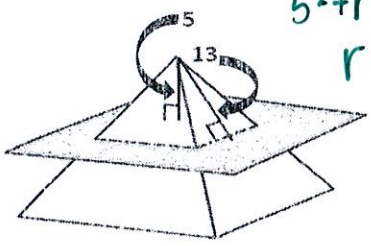


$A = 144 \text{ units}^2$

10) Given: Square Pyramid

$5^2 + r^2 = 13^2$

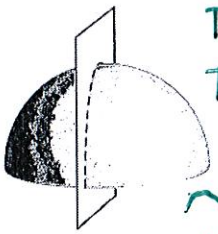
$r = 12$



$24 \cdot 24 = 576$

$A = 576 \text{ units}^2$

11) Given: Radius of the Original Sphere = 10



πr^2

$\pi (10^2)$

100π

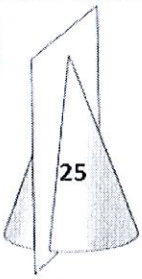
$100\pi / 2 = 50\pi$

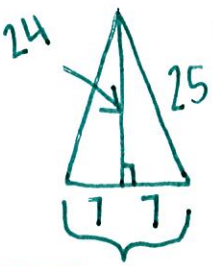
$A = 50\pi \text{ units}^2$

12) Given: Cone with a Base Radius of 7.

$A = \frac{1}{2}(14)(24)$

$= 168$





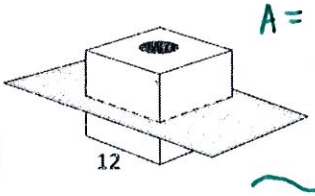
$7^2 + h^2 = 25^2$

$h = 24$

14

$A = 168 \text{ units}^2$

13) Given: A cube & the diameter of the circle is 1/3 the size of the cube side length.

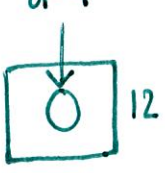


$A = \pi r^2$

$\pi 2^2$

4π

$d = 4$



$A = \ell \cdot w = 144$

$144 - 4\pi \approx 131.43$

$A \approx 131.43 \text{ units}^2$