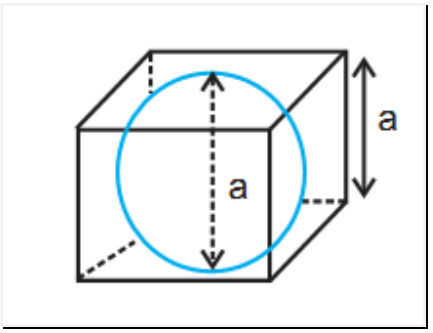
Mensuration II (Important results)

The following results are very important to solve various mensuration problems.

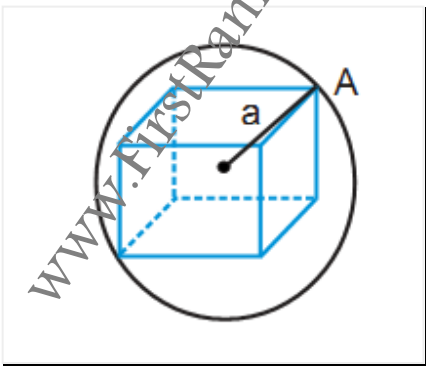
1. The largest possible sphere that can be chiseled out from a cube of side "a" cm.



Diagonal of the sphere is a, so radius = a/2.

Remaining empty space in the cube = $a^3 - \frac{\pi a^3}{6}$

2. The largest possible cube that can be chiseled out from a sphere of radius "a" cm



Here OA = radius of the sphere. So diagonal of the sphere = 2a.

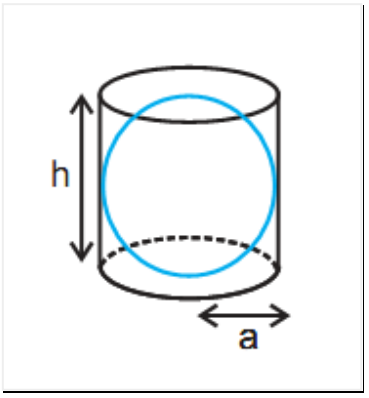
Therefore side of the square = $\frac{2a}{\sqrt{3}}$ [if side of the square is x cm, diagonal = $\sqrt{3}x$]

Remaining empty space in the sphere = $\frac{4}{3}\pi(a)^3 - (\frac{2a}{\sqrt{3}})^3 = \frac{4a^3}{3}[\pi - \frac{2\sqrt{3}}{3}]$

3. The largest possible sphere that can be chiselled out from a cylinder of radius 'a' cm and height 'h' cm. then

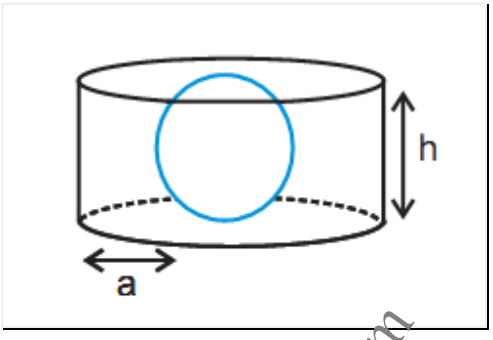
Case 1: for h>A

Radius of the sphere is equal to radius of the cylinder.

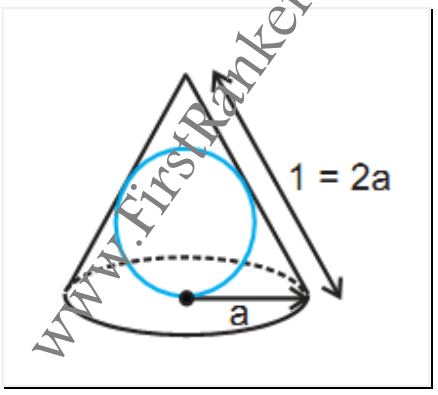


Case 2: a>h

Radius of the sphere = $\frac{h}{2}$

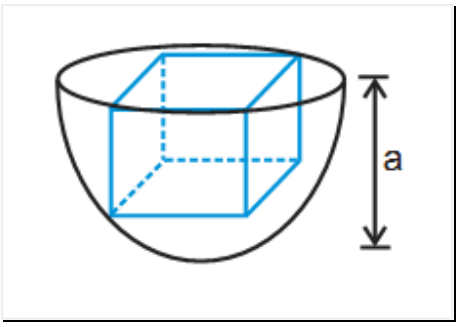


4. The largest possible sphere that can be inscribed in a cone of radius 'a' cm and slant height equal to the diameter of the base (L = 2a)



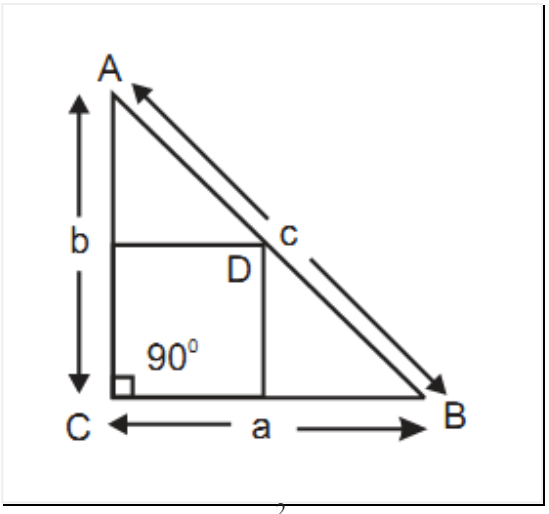
The radius of the sphere = $\frac{a}{\sqrt{3}}$

5. The largest possible cube that can be chiseled out from a hemisphere of radius 'a' cm.



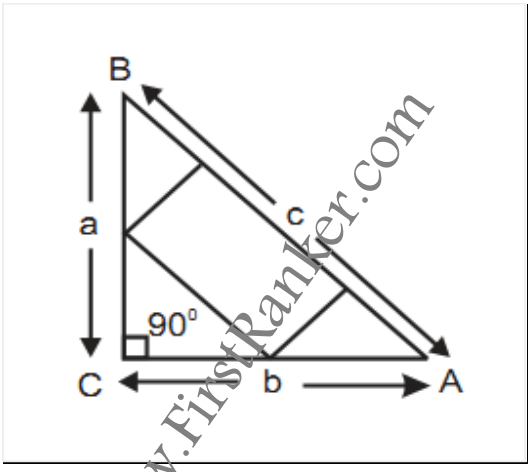
The edge of the cube = $a\sqrt{\frac{2}{3}}$

6. The largest square that can be inscribed in a right angled triangle ABC when one of its vertices coincide with the vertex of right of the triangle.



Side of the square = $\frac{ab}{a+b}$ and area of the square = $(\frac{ab}{a+b})^2$

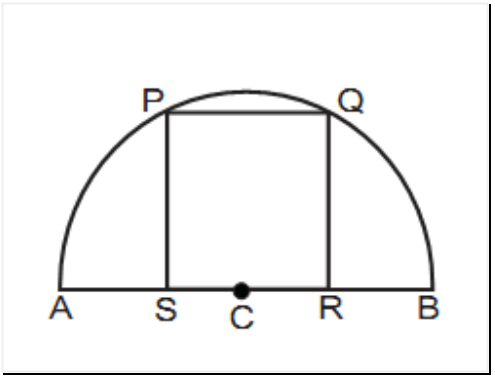
7. The largest square that can be inscribed in a right angled triangle ABC when one of its vertices lies on the hypotenuse of the triangle



Side of the square = $\frac{abc}{a^2+b^2+ab}$

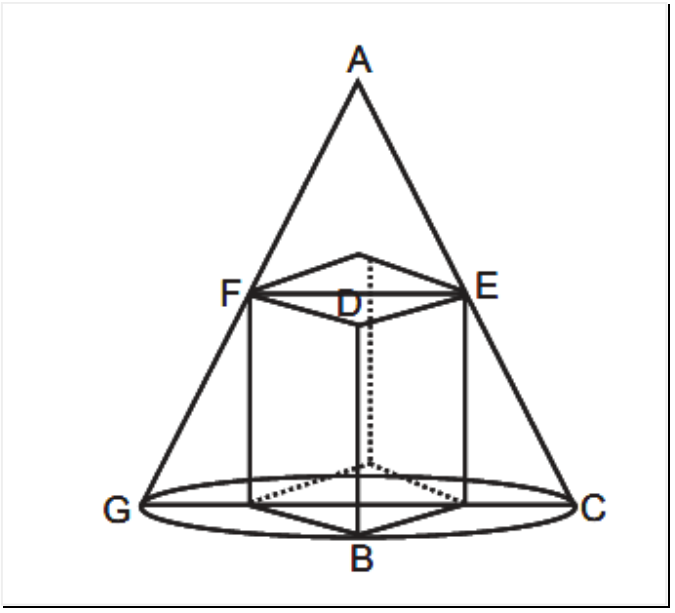
Area of the square = $(\frac{abc}{a^2+b^2+ab})^2$

8. The largest square that can be inscribed in a semi circle of radius 'r' units



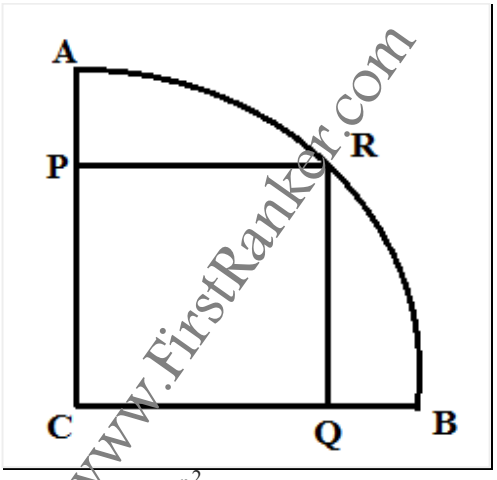
Area of the square = $\frac{3}{5}r^2$

9. The largest cube that can be chiseled out from a cone of height 'h' cm and radius of 'r' cm



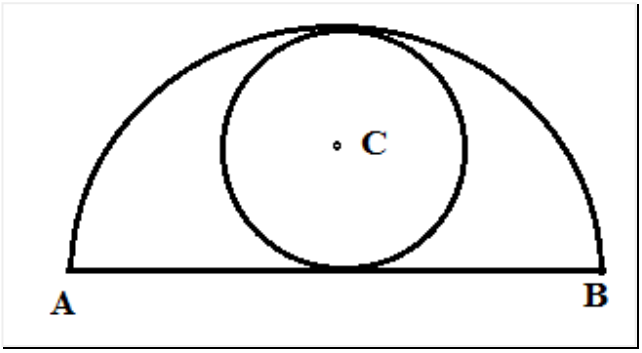
Square side = $\frac{\sqrt{2}.h.r}{h+\sqrt{2}.r}$

10. The largest square that can be inscribed in a quadrant of radius 'r' cm.



Side of the square = $\frac{r}{\sqrt{2}}$, and area of the square = $\frac{r^2}{2}$

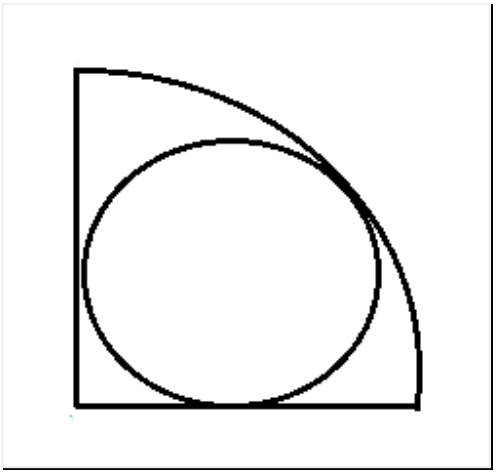
11. The largest circle that can be inscribed in the semi circle of radius 'r' cm is



Inscribed circle area = $\frac{\pi r^2}{4}$

(Rememeber: Inscribed circle area is half of the semi circle area)

12. The largest circle that can be inscribed in a quadrant of radius 'r' cm is



Area of the circle = $\frac{\pi r^2}{3+2\sqrt{2}}$

13. The ratio of the volumes of the cylinder and the largest cube chiseled out from it are in the ratio = **11:7** (here cube side is equal to height of the cylinder)

14. The ratio of the volumes of the cylinder and the largest cone chiseled out from it are in the ratio : **3:1** (here cone and cylinder have same base radius and heights)