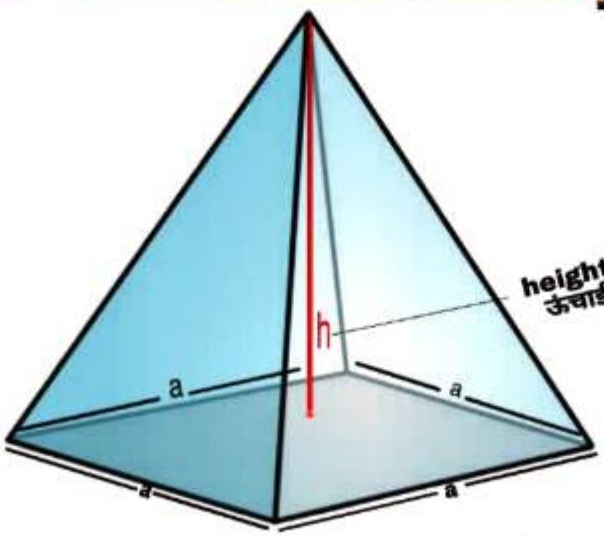
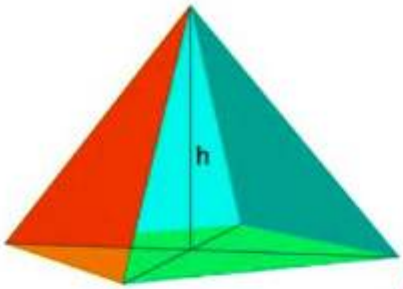
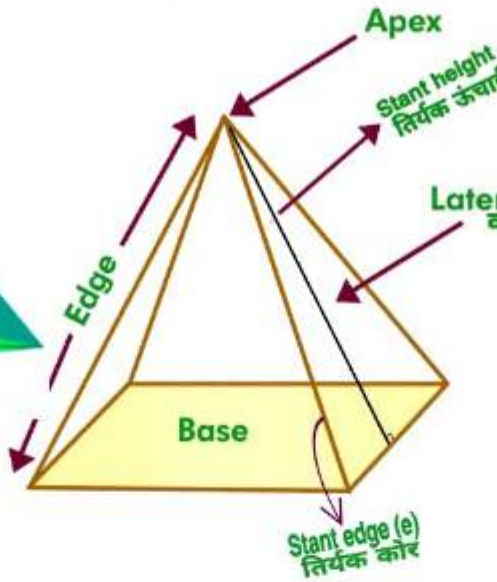
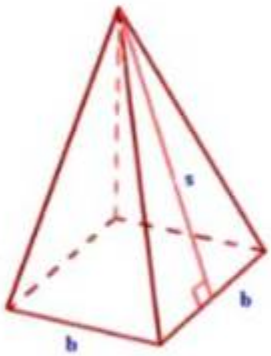
MENSURATION 3D

PYRAMID पिरामिड

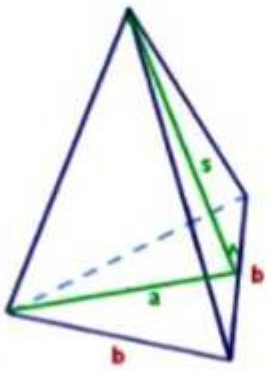




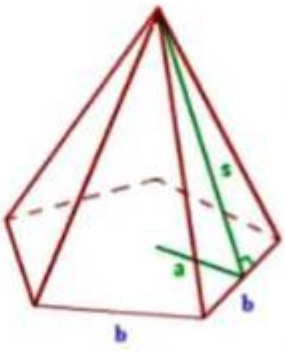




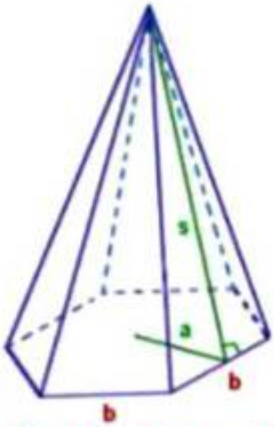
Square Pyramid



Triangular Pyramid



Pentagonal Pyramid



Hexagonal Pyramid

* VOLUME (आयतन) (V)

$\frac{1}{3}$ × Base area × height

आधार का क्षेत्रफल × ऊंचाई

* CURVED SURFACE AREA (C.S.A) (वक्र पृष्ठीय क्षेत्रफल)

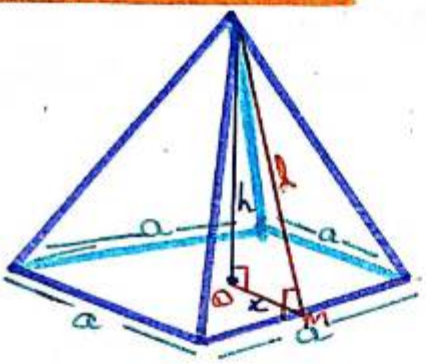
$\frac{1}{2}$ × Base perimeter × Slant height

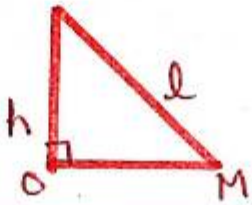
आधार का परिमाप × तिर्यक ऊंचाई (l)

* TOTAL SURFACE AREA (T.S.A) (कुल पृष्ठीय क्षेत्रफल)

C.S.A + Base area

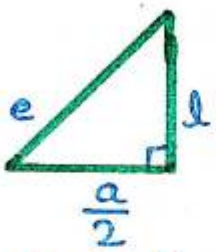
* SLANT HEIGHT



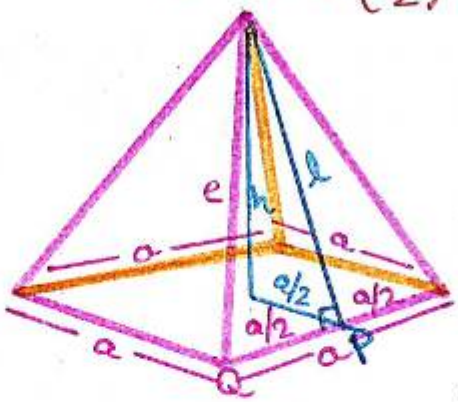


$$l^2 = h^2 + OM^2$$

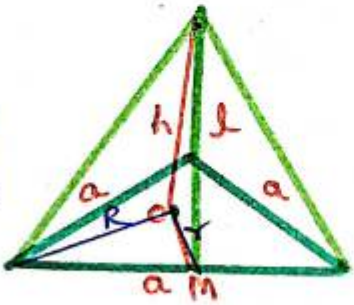
$$l^2 = h^2 + \left(\frac{a}{2}\right)^2$$



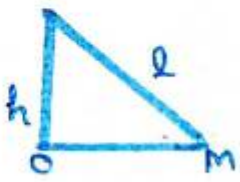
$$e^2 = l^2 + \left(\frac{a}{2}\right)^2$$



$$R = \frac{a}{\sqrt{3}}$$



$$OM = \frac{a}{2\sqrt{3}}$$



$$l^2 = h^2 + OM^2$$

$$r = \frac{a}{2\sqrt{3}}$$

Q) Area of the base of a pyramid is 57 sq. cm and height is 10 cm, then its volume (in cm^3), is

पिरामिड के आधार का क्षेत्रफल $57\,cm^2$ तथा ऊँचाई 10 cm है। आयतन ज्ञात करें?

$$\text{Vol.} = \frac{1}{3} \times \text{Base Area} \times h$$

$$\frac{1}{\cancel{3}} \times \cancel{57}^{19} \times 10$$

$$190\,cm^3$$

Q) The base of a pyramid is a square of side 40 cm. If the volume of a pyramid is 8000 cm^3. Find the height of the pyramid?

किसी पिरामिड का आधार 40 सेमी. भुजा वाला वर्ग है। यदि किसी पिरामिड का आयतन 8000 सेमी.^{3} है। पिरामिड की ऊँचाई ज्ञात करें?

आधार का Area $= (40)^2$

$= 1600$

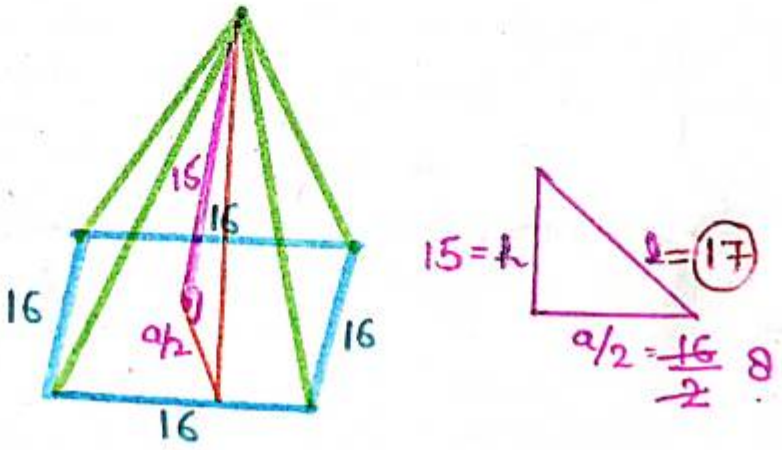
$$\text{Vol.} = \frac{1}{3} \times \cancel{1600} \times h = \cancel{8000}^{5}$$

$$h = 15\,cm$$

Q) The base of a right pyramid is a square of side 16 cm. long. If its height be 15 cm, then the area of the lateral surface in square cm is:

किसी पिरामिड का आधार 16 cm भुजा वाला वर्ग है। यदि उसकी ऊँचाई 15 cm. हो, तब तिर्यक पृष्ठ क्षेत्रफल ज्ञात करें?

$$\text{L.S.A} = \frac{1}{2} \text{ Base perimeter} \times l$$



$L.S.A = \frac{1}{2} \times 16 \times 4 \times 17$

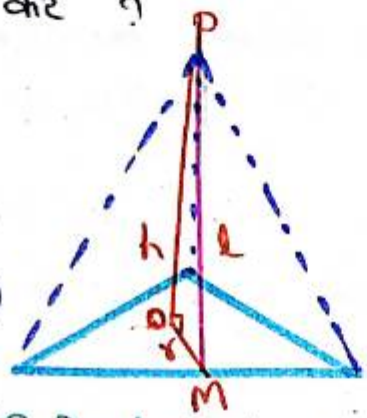
32

$\cancel{64} \times 17 \times \frac{1}{\cancel{2}}$

544

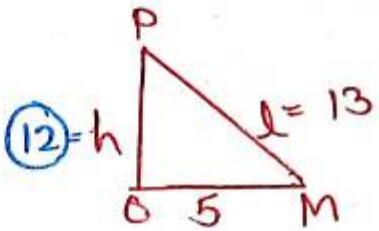
Q) The base of a right pyramid is equilateral triangle of side $10\sqrt{3}$ cm. If the total surface area of the pyramid is $270\sqrt{3}$ sq. cm. its height is

किसी पिरामिड का आधार $10\sqrt{3}$ cm भुजा वाला समबाहु त्रिभुज है। यदि पिरामिड का सम्पूर्ण पृष्ठीय क्षेत्रफल $270\sqrt{3}$ cm^2 है, तब ऊँचाई ज्ञात करें ?



$r = \frac{a}{2\sqrt{3}}$

$\frac{\cancel{10\sqrt{3}}}{\cancel{2\sqrt{3}}}$ ⑤



$T.S.A = \frac{1}{2} \times$ Base perimeter $\times l$ + Base Area

$\frac{1}{2} \times 3 \times 10\sqrt{3} \times l + \frac{\sqrt{3}}{4}(10\sqrt{3})^2 = 270\sqrt{3}$

$\frac{1}{\cancel{2}} \times \overset{15}{\cancel{30}}\sqrt{3}\, l + \frac{\sqrt{3}}{\cancel{4}} \times \overset{75}{\cancel{300}} = 270\sqrt{3}$

$270\sqrt{3} - 75\sqrt{3}$

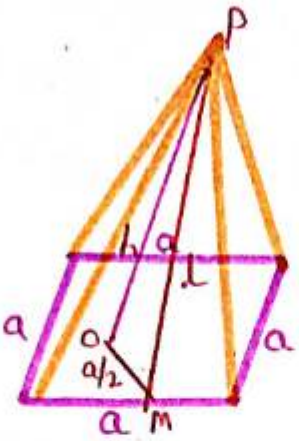
$\cancel{15\sqrt{3}}\, l = \cancel{+195\sqrt{3}}$

$\boxed{l = 13}$

$h = 12$ cm

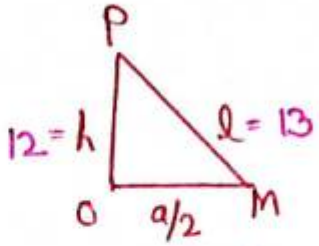
Q) A right pyramid stands on a square base of diagonal $10\sqrt{2}$ cm. If the height of the pyramid is 12 cm, the area (in cm^2) of its slant surface is :

$10\sqrt{2}$ cm विकर्ण वाले वर्ग को आधार मानकर एक पिरामिड बनाया गया। यदि पिरामिड की ऊँचाई 12 सेमी. है, तिर्यक पृष्ठ का क्षेत्रफल ज्ञात करें।



$\sqrt{2}a = 10\sqrt{2}$

$\boxed{a = 10}$



$\frac{10}{2}$ (5)

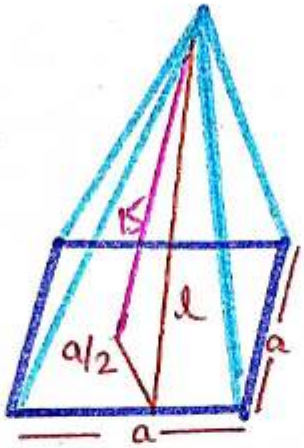
$C.S.A = \frac{1}{2} \times \text{Base } p \times l$

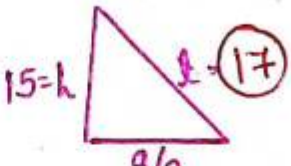
$\frac{1}{2} \times \overset{20}{40} \times 13$

260

Q) A right pyramid stands on a square base of side 16 cm and its height is 15 cm. The area (in cm^2) of its slant surface is:

किसी पिरामिड का आधार 16cm भुजा का वर्ग तथा ऊँचाई 15cm है। तिर्यक पृष्ठ का क्षेत्रफल ज्ञात करें?





$\frac{16}{2}$ 8

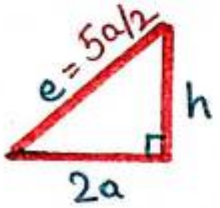
$L.S.A = \frac{1}{2} \times B.P \times l$

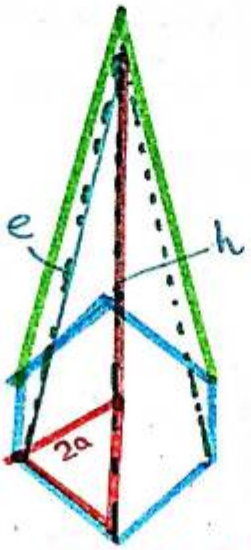
$\frac{1}{2} \times \overset{32}{64} \times 17$

544

Q) A pyramid is constructed taking a hexagon of side 2a cm as its base. If the of the pyramid is equal to the slant edge $\frac{5a}{2}$ cm. Find the volume of the pyramid?

किसी 2a सेमी. भुजा वाले षटभुज को आधार मानते हुए एक पिरामिड है। यदि पिरामिड की तिर्यक कोर $\frac{5a}{2}$ सेमी. है, पिरामिड का आयतन ज्ञात करें ?





$$\frac{25}{4}a^2 = h^2 + 4a^2$$

$$h^2 = \frac{25a^2}{4} - 4a^2 \Rightarrow \frac{9a^2}{4}$$

$$h = \sqrt{\frac{9a^2}{4}}$$

$$\boxed{h = \frac{3}{2}a}$$

$$V = \frac{1}{3} B.A \times h$$

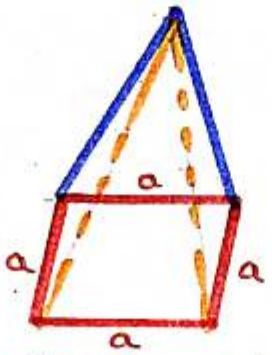
$$\frac{1}{\cancel{3}} \times \cancel{6}^{2} \times \frac{\sqrt{3}}{4}(2a)^2 \times \frac{3}{\cancel{2}}\, a$$

$$\frac{\sqrt{3}}{\cancel{4}} \times \cancel{4}a^2 \times 3a$$

$$3\sqrt{3}\, a^3$$

Q) If the slant height of a right pyramid with square base is 4 meter and the slant surface of the pyramid is 12 square meter, then the ratio of total slant surface and area of the base is :

किसी पिरामिड की तिर्यक ऊँचाई 4 मीटर तथा तिर्यक पृष्ठ क्षेत्रफल 12 m^2 तथा आधार एक वर्ग है। तब तिर्यक पृष्ठ क्षेत्रफल तथा आधार का क्षेत्रफल का अनुपात ज्ञात करें ?



$$C.S.A = \frac{1}{2} \times B.P \times l$$

$$\frac{1}{2} \times 4a \times 4 = 12$$

$$a = \frac{3}{2}$$

C.S.A	:	B.A
12	:	$\left(\frac{3}{2}\right)^2$
4 12	:	$\frac{9}{4}$
16	:	3

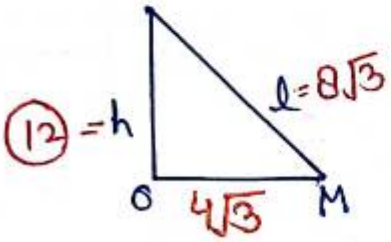
Q) If the area of the base of a regular hexagonal pyramid is $96\sqrt{3}\ m^2$ and the area of one of its side faces is $32\sqrt{3}\ m^2$ then the volume of the pyramid is :

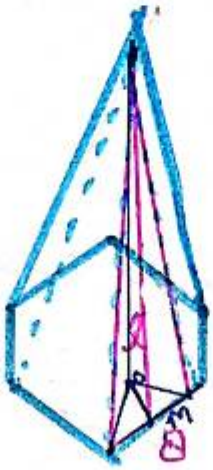
एक षष्ठभुजीय के आधार का क्षेत्रफल $96\sqrt{3}\ m^2$ और इसके किसी एक छोर का क्षेत्रफल $32\sqrt{3}\ m^2$ है तो पिरामिड का आयतन क्या होगा ?

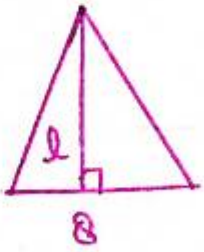
$$6 \times \frac{\sqrt{3}}{4} a^2 = 16\sqrt{3}$$

$$a^2 = 64$$

$$a = \sqrt{64} = 8$$

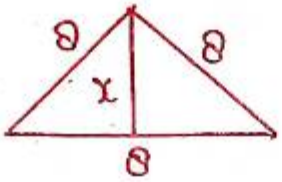






$$\frac{1}{2} \times 8 \times l = 32\sqrt{3}$$

$$\boxed{l = 8\sqrt{3}}$$



$$x = \frac{\sqrt{3}}{2} \times 8$$

$$4\sqrt{3}$$

$$h^2 + 48 = 192$$

$$h^2 = 192 - 48$$

$$= 144$$

$$h = \sqrt{144} = 12$$

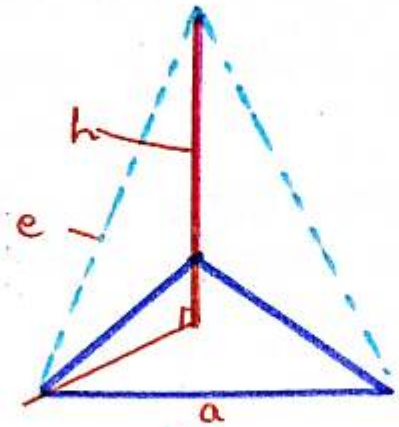
$$V = \frac{1}{3} \times 6 \times \frac{\sqrt{3}}{4} (8)^2 \times 12$$

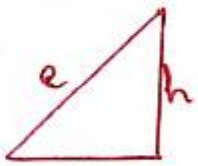
$$6 \times 64\sqrt{3}$$

$$384\sqrt{3}$$

Q) If 'h' be the height of a pyramid standing on a base which is an equilateral triangle of side 'a' units, then the slant edge is :

किसी पिरामिड की ऊंचाई 'h' है जो कि 'a' भुजा वाले समबाहु त्रिभुज के आधार पर खड़ा हुआ है। तिर्यक किनारा ज्ञात करो।

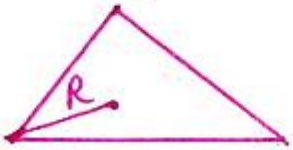




$\frac{a}{\sqrt{3}}$

$e^2 = \left(\frac{a}{\sqrt{3}}\right)^2 + h^2$

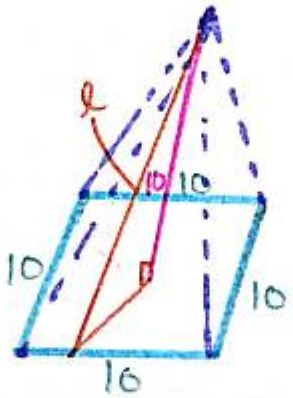
$e = \sqrt{\frac{a^2}{3} + h^2}$

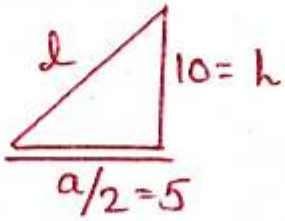


$\boxed{R = \frac{a}{\sqrt{3}}}$

Q) The base of right pyramid is a square of side 10cm. If its height is 10 cm. Then the area (in cm^2) of its lateral surface is.

किसी लम्ब पिरामिड का आधार 10 सेमी भुजा वाला वर्ग है। यदि उसकी ऊँचाई 10 सेमी है, तो इसका पार्श्व पृष्ठीय क्षेत्रफल (सेमी^{2} में) है।





$l^2 = 10^2 + 5^2$

$l = \sqrt{125}$

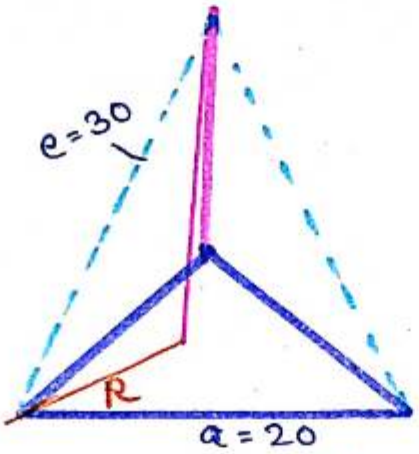
$= 5\sqrt{5}$

$$L.S.A = \frac{1}{2} \times 40 \times 5\sqrt{5}$$

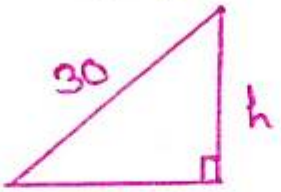
$$100\sqrt{5}$$

Q) The base of right pyramid is an equilateral triangle each side of which is 20 cm. Each slant edge is 30cm. The vertical height (in cm) of the pyramid is?

एक लम्ब पिरामिड का आधार एक ऐसा समबाहु त्रिभुज है, जिसकी प्रत्येक भुजा की लम्बाई 20 सेमी है। प्रत्येक तिर्यक कोर 30 सेमी है। पिरामिड की उर्ध्वाधर ऊँचाई (सेमी में) है।



$$\frac{a}{\sqrt{3}} = \frac{20}{\sqrt{3}} = R$$



$$\frac{20}{\sqrt{3}}$$

$$30^2 = h^2 + \left(\frac{20}{\sqrt{3}}\right)^2$$

$$900 - \frac{400}{3} = h^2$$

$$\sqrt{\frac{2300}{3}} = h$$

$$10\sqrt{\frac{23}{3}} = h$$

Q) The total surface area of a right pyramid, with base as a square of side 8 cm, is 208 cm^2. The slant height (in cm) of the pyramid is.

8 सेमी भुजा के वर्गाकार आधार वाले एक सम पिरामिड का सम्पूर्ण पृष्ठीय क्षेत्रफल 208 सेमी^{2} है। पिरामिड की तिर्यक ऊँचाई (सेमी में) है।

$$T.S.A = C.S.A + B.A$$

$$208 = \frac{1}{2} \times 32 \times l + (8)^2$$

$$208 - 64 = 16l$$

$$144 = 16l$$

$$l = 9$$