Answer on Question #58134 – Math – Geometry
Question

1. The lateral edge of a regular hexagonal pyramid is two times the length of the base edge. If the apothem of the base is 8 cm, find the altitude and the volume of a cone inscribed in the pyramid.

Solution

Base edge $a = \frac{apothem}{cos30^0} = \frac{16}{\sqrt{3}}$;

$Lateral\ edge\ l = \frac{16}{\sqrt{3}} * 2 = \frac{32}{\sqrt{3}}$;

radius of the cone $r = apothem = 8$;

altitude of the cone $h = \sqrt{l^2 - r^2} = \sqrt{\frac{4*16^2}{3} - \frac{16^2}{3}} = 16\ cm$;

volume of a cone is

$V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi * 8^2 * 16 = \frac{1024\pi}{3} \approx 1072.33\ cm^3$.

Answer: $16\ cm, 1072.33\ cm^3$.

Question

2. If the diameter of the base remains constant, by what factor should the altitude be multiplied to produce a cone with twice volume as the original.

Solution

$V = \frac{1}{3}\pi r^2 h \rightarrow\ \ 2V = \frac{1}{3}\pi r^2 (ah) \rightarrow\ \ \frac{1}{3}\pi r^2 h = \frac{1}{6}\pi r^2 (ah) \rightarrow a = 2$;

$altitude\ should\ be\ doubled.$

Answer: 2.

Question

3.If the altitude of a cone remains constant, by what factor should the diameter be multiplied in order to construct a cone with a volume that is triple the original.

Solution

$$V = \frac{1}{3}\pi r^2 h \rightarrow \ \ 3V = \frac{1}{3}\pi (ar)^2 h \rightarrow \ \frac{1}{3}\pi r^2 h = \frac{1}{9}\pi (ar)^2 h \rightarrow \ a = \sqrt{3}.$$

Radius (and diameter) should be multiplied by $\sqrt{3}$.

Answer: $\sqrt{3}$.