MASSACHUSETTS MATHEMATICS LEAGUE
OCTOBER 2003
ROUND 1 VOLUMES & SURFACES

ANSWERS

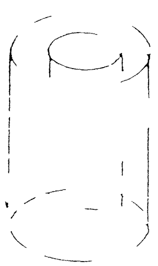
A) 132 π

B) 30 π

C) 2064 π

A) [illegible] drilled out of its center. Find the total surface area of solid remaining leaving the result in terms of pi.

$R = 4$, $r = 2$, $h = 9$



$2\pi r h$ … $2\pi \cdot 4 \cdot 9 = 72\pi$ … 108π (Total surface area)

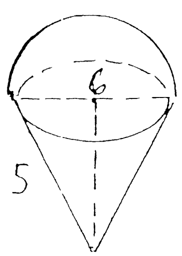
$2\pi \cdot 2 \cdot 9 = 36\pi$

$108\pi + 2\pi r^2$ …

$2\pi R^2 - 2\pi r^2 = 2\pi \cdot 16 - 2\pi \cdot 4 = 32\pi - 8\pi = 24\pi$

Ans $108\pi + 24\pi = 132\pi$

B) A right circular cone, apex down as shown, has a slant height of 5 cm and a base diameter of 6 cm. A hemisphere is sitting on top of the cone. Find the volume in terms of pi of the solid formed by the cone and the hemisphere.

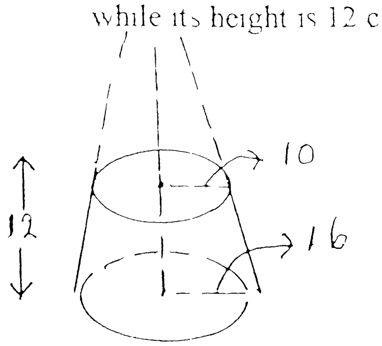


$V_S = \frac{4}{3}\pi r^3$ $V_C = \frac{1}{3}\pi r^2 h$ $V_C = \frac{1}{3}\pi \cdot 3^2 \cdot 4 = 12\pi$

$r = 3,\ h = \sqrt{5^2 - 3^2} = 4$

$V_S = \dfrac{\frac{4}{3}\pi\ 3^3}{2} = \frac{2}{3}\ 27 \cdot \pi = 18\pi$ ANS 30π

C) The truncated cone shown was formed by cutting off the top of a right circular cone with a plane parallel to its base. The radii of the bases of the truncated cone are 10 cm and 16 cm while its height is 12 cm. Calculate the volume of truncated cone in terms of pi.



$V = \frac{1}{3}\pi h(r_1^2 + r_1 r_2 + r_2^2)$

$= \frac{1}{3} 12\pi (100 + 160 + 256) = 4\pi \cdot 516$

$= 2064\pi$