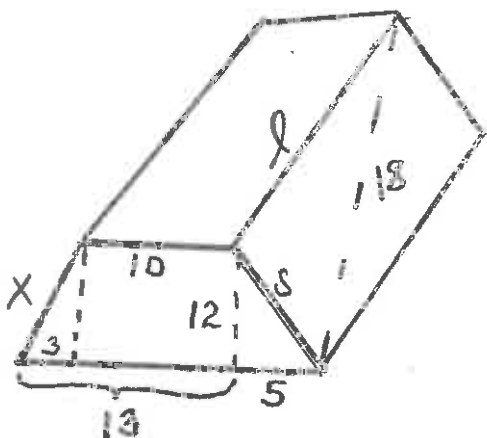


All necessary work must be shown for credit. Your work must represent the question asked. You may NOT use computers. You may use your notes or text. Your work must be neat or I will not grade your test.

I have neither received nor given help on this exam. Don Key  
(Signature) (1 point)

1. Give the surface area and volume of the box below. (12 points)



$$x^2 = 3^2 + 12^2 = 153$$

$$x = \sqrt{153}$$

$$s^2 = 5^2 + 12^2 = 169$$

$$s = 13$$

$$l^2 + 13^2 = 18^2$$

$$l^2 = 18^2 - 13^2 = 155$$

$$l = \sqrt{155}$$

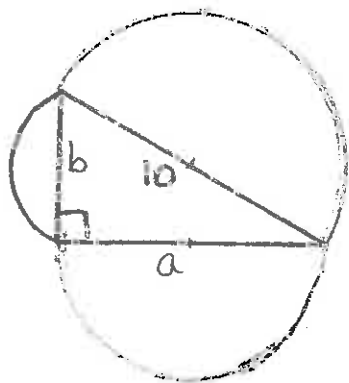
$$V = l \cdot \frac{10+18}{2} \cdot 12 = 168 \sqrt{155} \approx 2091.6$$

$$SA = 2 \left[ \frac{10+18}{2} \cdot 12 \right] + 10l + 18l + 13l + \sqrt{153}l$$

$$= 28 \cdot 12 + l(10 + 18 + 13 + \sqrt{153})$$

$$= 336 + \sqrt{155}(41 + \sqrt{153}) \approx 1000.4$$

2. Give the area and perimeter of the following region. Three semi-circles and a right triangle. (6 points)

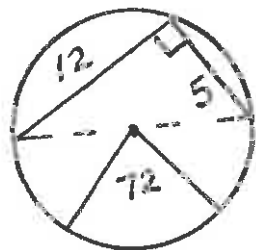


$$a^2 + b^2 = 10^2$$

$$\begin{aligned} A &= \frac{1}{2} \pi \left(\frac{a}{2}\right)^2 + \frac{1}{2} \pi \left(\frac{b}{2}\right)^2 + \frac{1}{2} \pi \left(\frac{10}{2}\right)^2 + \frac{1}{2} ab \\ &= \frac{1}{8} \pi (a^2 + b^2 + 10^2) + \frac{1}{2} ab \\ &= \frac{\pi}{8} (200) = 25\pi + \frac{1}{2} ab \end{aligned}$$

$$\begin{aligned} P &= \frac{1}{2} \pi a + \frac{1}{2} \pi b + \frac{1}{2} \pi 10 \\ &= \frac{1}{2} \pi (a + b + 10) \end{aligned}$$

3. Give the area and perimeter of the 72 degree sector shown. (6 points)



$$d^2 = 5^2 + 12^2 = 169$$

$$d = 13 \quad r = \frac{13}{2}$$

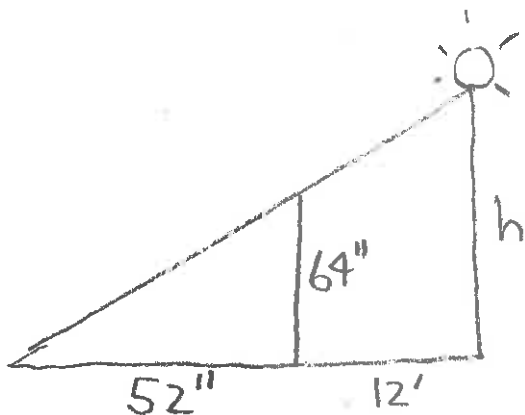
Sector is  $\frac{72}{360} = \frac{1}{5}$  circle

$$A_s = \frac{1}{5} \pi \left(\frac{13}{2}\right)^2$$

$$P_s = \frac{1}{5} \pi 13 + 2 \left(\frac{13}{2}\right)$$

4. Answer the two questions. (6 points each)

(a) Sally who is 64 inches tall is standing 12 feet from a light pole. Phil measures her shadow and it is 52 inches long. How tall is the light pole?



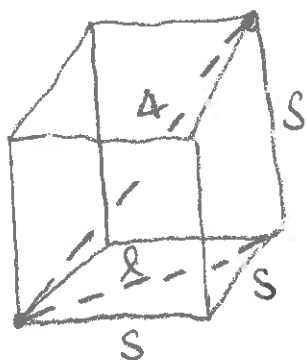
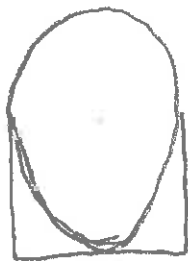
$$12' = 144''$$

$$\frac{64}{52} = \frac{h}{196} \Rightarrow h = \frac{64}{52} \cdot 196$$

$$= \frac{16}{13} \cdot 196''$$

$$= \frac{3136}{13} \approx 241'' \approx 20'$$

(b) Betty places a spherical decoration in a cubical box whose diagonal is 4 inches. The sphere fits exactly half in the box. How much volume is there between the box and the decoration?



$$d^2 = 2s^2$$

$$d^2 + s^2 = 4^2$$

$$3s^2 = 4^2$$

$$s^2 = \frac{4^2}{3}$$

$$s = \frac{4}{\sqrt{3}} = 2r$$

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

$$V_{HS} = \frac{2}{3} \pi \left(\frac{2}{\sqrt{3}}\right)^3$$

$$V_{Box} = s^3 = \left(\frac{4}{\sqrt{3}}\right)^3$$

$$V_{Box} - V_{HS} =$$

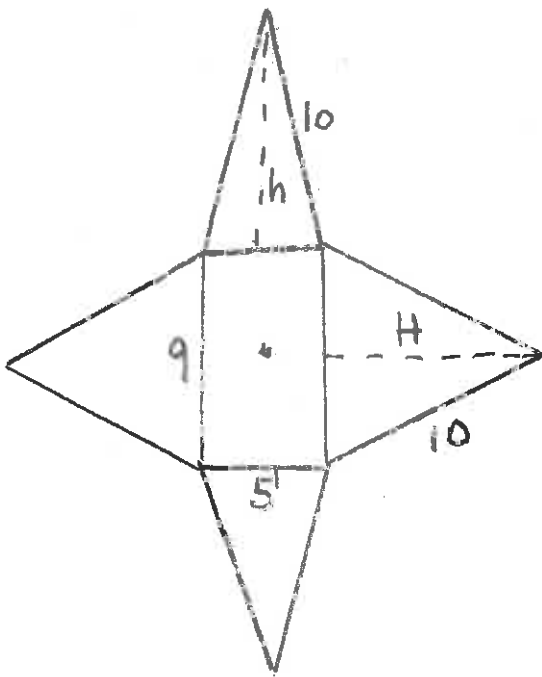
$$\left(\frac{4}{\sqrt{3}}\right)^3 - \frac{2}{3} \pi \left(\frac{2}{\sqrt{3}}\right)^3$$

$$= \left(\frac{1}{\sqrt{3}}\right)^3 \left(4^3 - \frac{2^4}{3} \pi\right)$$

OR

$$V = \frac{1}{2} V_{Box}$$

5. Give the volume and surface area of the solid formed by folding the following object into a pyramid. (Hint: Trace it out on another sheet of paper and fold it up.) (12 points)



$$V = \frac{1}{3} \text{ base} \cdot \text{height}$$

$$= \frac{1}{3} (45) \cdot l$$

$$l^2 + \left(\frac{5}{2}\right)^2 = H^2$$

$$l^2 + \left(\frac{9}{2}\right)^2 = h^2$$

$$l^2 = \frac{319}{4} - \frac{25}{4} = \frac{375}{4} - \frac{81}{4} = \frac{294}{4}$$

$$l = \frac{\sqrt{294}}{2}$$

$$V = \frac{1}{3} \cdot 45 \cdot \frac{\sqrt{294}}{2}$$

$$= \frac{15}{2} \sqrt{294} \approx 128.6$$

$$SA = 9 \cdot 5 + 2 \Delta_9 + 2 \Delta_5$$

$$h^2 + \left(\frac{5}{2}\right)^2 = 10^2$$

$$h^2 = 10^2 - \left(\frac{5}{2}\right)^2 = \frac{375}{4}$$

$$h = \frac{\sqrt{375}}{2}$$

$$H^2 + \left(\frac{9}{2}\right)^2 = 10^2$$

$$H^2 = 10^2 - \left(\frac{9}{2}\right)^2 = \frac{319}{4}$$

$$H = \frac{\sqrt{319}}{2}$$

$$SA = 45 + 2 \left( \frac{1}{2} \cdot 5 \cdot \frac{\sqrt{375}}{2} \right) +$$

$$2 \left( \frac{1}{2} \cdot 9 \cdot \frac{\sqrt{319}}{2} \right)$$

$$= 45 + \frac{5\sqrt{375}}{2} + \frac{9\sqrt{319}}{2}$$

$$\approx 173.78$$