

# Physics 10154 - Exam #1b

Please clearly indicate all of your answers with a box, and SHOW ALL WORK. You will not get full credit for any answer if I cannot tell how you arrived at that answer.

1. Human fingernails grow at an average rate of about 0.10 millimeters per day. At this rate, if a single fingernail were allowed to continue growing for an average human lifetime (75 years), how many feet long would the nail be?

$$\frac{0.10 \text{ mm}}{\text{day}} \cdot \frac{365 \text{ days}}{\text{yr}} \cdot 75 \text{ yrs} = 2737.5 \text{ mm}$$

$$2737.5 \text{ mm} \cdot \frac{1 \text{ m}}{1000 \text{ mm}} \cdot \frac{3.281 \text{ ft}}{\text{m}} = \boxed{9.0 \text{ ft}}$$

2. A hot-air balloon measures 25 feet in diameter.
- What is the volume of the balloon in cubic meters?
  - What is the volume of the balloon in liters?

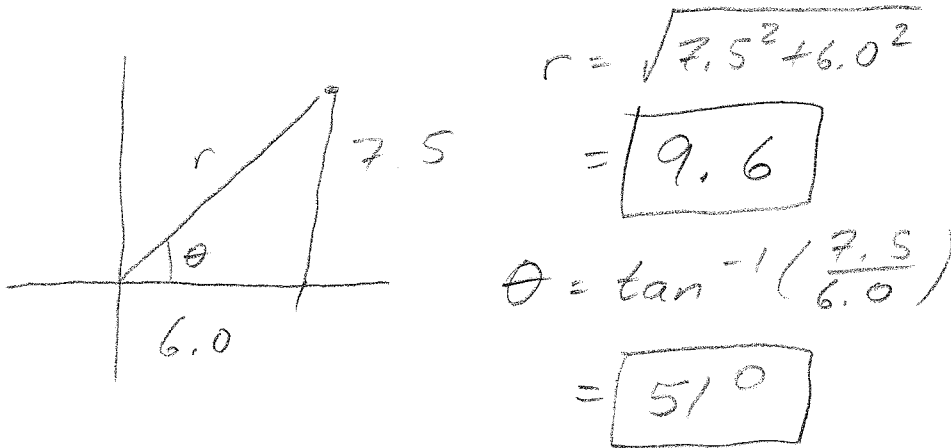
The volume of a sphere formula will be written on the board.

$$V = \frac{4}{3} \pi R^3 = \frac{4}{3} \pi (12.5)^3$$

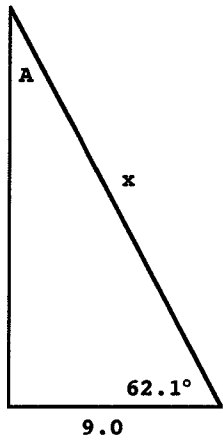
$$= 8181 \text{ ft}^3 \cdot \left( \frac{1 \text{ m}}{3.281 \text{ ft}} \right)^3 = \boxed{230 \text{ m}^3}$$

$$230 \text{ m}^3 \cdot \left( \frac{100 \text{ cm}}{1 \text{ m}} \right)^3 \cdot \frac{1 \text{ L}}{1000 \text{ cm}^3} = \boxed{230,000 \text{ L}}$$

3. Point P is located at the coordinates  $(x = 6.0, y = 7.5)$ . Express the location of point P in polar coordinates.



4. For the right triangle below, find the unknown angle A and the unknown side x.



$$A = 90 - 62.1 = \boxed{27.9^\circ}$$

$$x = \frac{9.0}{\cos 62.1^\circ} = \boxed{19.2}$$