The SpaceX Falcon 9 rocket soared into space from Space Launch Complex-40 on Cape Canaveral Air Force Station in Florida, carrying the Dragon capsule (left) to orbit on May 22, 2012.

During the flight, there were a series of check-out procedures to test and prove Dragon's systems, including rendezvous and berthing with the International Space Station. If the capsule performed as planned, the cargo and experiments it was carrying would be transferred to the station.

Problem 1 – The Dragon Capsule has the shape shown in the photo above (Courtesy NASA). The diameter of the base just above the curved head shield at its bottom is 3.2 meters. The diameter of the top is 2.2 meters. The capsule is 2.3 meters tall, and it would be 5.2 meters tall to its apex at the top if it were the shape of an upside-down ice cream cone.

The volume of an ice cream cone with a base radius of R and a height of h is given by the formula

$$V = \frac{1}{3}\pi R^2 h$$

From the information provided, what is the volume of the Dragon Capsule in cubic meters to the nearest tenth?

Problem 2 - Suppose you had a room in your house with an 8-foot (2.7 meter) ceiling. If the floor area were a perfect square, what would be the dimensions of the floor so that the volume of this room were the same as the volume of the Dragon Capsule A) in meters? B) in feet?

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Answer: Students should first compute the volume of the full 'ice cream cone' with a base radius of R = (3.2/2)=1.6 meters and a height h = 5.2 meters, then subtract the cone with a height of h = (5.2-2.3) = 2.9 meters and a base radius of R = (2.2/2)=1.1 meters. The difference is the volume of the capsule.

$$V = 1/3\ \pi\ (1.6)^2\ (5.2) - 1/3\ \pi\ (1.1)^2\ (2.9)$$

$$= 13.91 - 3.67$$

$$= \mathbf{10.2\ cubic\ meters}$$

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Answer: A) The volume of the room would be V = 2.7 x floor area, and since Area = L^2 for a square floor, the length would be given by $10.8 = 2.7 \times L^2$, so **L = 2 meters**.

B) 1 meter = 3 feet, so the length would be **L = 6 feet**. The dimensions of the room would be 2m x 2m x 2.7m or about 6 feet x 6 feet x 8 feet.

Note: Have the students try to imagine 5 astronauts lying on couches in this volume with computer equipment and spacesuits too!