This is a diagram of a panel from a spacecraft showing all of the openings. All units are in centimeters. The panel is 190 centimeters wide and 150 centimeters tall. The diameters of each circular opening is also given. The small holes around the circumference are for the screws that fasten the panels together.

Problem 1 - To the nearest square-centimeter, what is the total area of the panel in square-centimeters before the openings were made?

Problem 2 - To the nearest square-centimeter, what is the total area of all of the openings in the panel? (Use $\pi = 3.1415$)

Problem 3 - To the nearest square-centimeter, what is the area of the panel after the openings were made?

Problem 4 - The panel is 1.5 centimeters thick. To the nearest cubic-centimeter, what is the volume of the finished panel?

Problem 5 - To the nearest cubic-centimeter, what is the volume of the material that was removed to make the holes?

Problem 6 - If the density of the aluminum in the panel is 2.7 grams/cm^3, to the nearest tenth of a kilogram, what is the mass of the finished panel?

Problem 7 - To the nearest tenth of a kilogram, how many grams of aluminum were removed to make all of the openings?

Space Math   http://spacemath.gsfc.nasa.gov

Problem 1 - To the nearest square-centimeter, what is the total area of the panel in square-centimeters before the openings were made?

Answer: A = w x h so A = 190 x 150 = **28,500 cm^2**

Problem 2 - To the nearest square-centimeter, what is the total area of all of the openings in the panel?

Answer:

A = (30 x 50) + 3 (12 x 75) + 1 (3.1415)(40/2)^2 + 3 x (3.1415)(10/2)^2 + 90x(3.1415)(0.5/2)^2
A =   1500 + 2700 + 1256.6000 + 235.6125 + 17.6709
A = 5709.8834
A = 5710 cm^2.

Problem 3 - To the nearest square-centimeter, what is the area of the panel after the openings were made?

Answer: 28,500 - 5710 = **22,790 cm^2**

Problem 4 - The panel is 1.5 centimeters thick. To the nearest cubic-centimeter, what is the volume of the finished panel?
Answer: Volume = Area x Thickness
= 22,790 cm^2 x 1.5 cm
= **34,185 cm^3**

Problem 5 - To the nearest cubic-centimeter, what is the volume of the material that was removed to make the holes?

Answer: Volume = 5710 cm^2 x 1.5 cm = **8,565 cm^3**

Problem 6 - If the density of the aluminum in the panel is 2.7 grams/cm^3, to the nearest tenth of a kilogram, what is the mass of the finished panel?

Answer: Mass = Density x volume
= 2.7 grams/cm^3 x 34,185 cm^3
= 92,299.5 grams
= **92.3 kilograms**

Problem 7 - To the nearest tenth of a kilogram, how many grams of aluminum were removed to make all of the openings?

Answer: Mass = 2.7 grams/cm^3 x 8,565 cm^3
= 23,125.5 grams
= **23.1 kilograms**