This scientist is collecting cylindrical snow cores to study snow density from the wall of a snow pit. This pit was carefully dug into the Taku Glacier, in the Juneau Icefield of the Tongass National Forest, Alaska.

The density of snow tells scientists a lot about the history of the snow, and whether it is safe for skiers.

Density is defined as the amount of mass that an object has compared to the volume that it takes up. On average, a cubic meter of freshly-fallen snow has an average mass of about 50 kilograms. Snow that has been compacted by its own weight at a depth of 3 meters can have 200 kilograms in the same volume.

Density is defined as mass/volume. Freshly-fallen snow has a density of 50 kg/meter^3 = 50 kg/m^3, while the compressed snow described above has a higher density of 200 kg/m^3. Let's explore some other examples of estimating snow density!

Problem 1 – A scientist uses a cylindrical gauge to sample the snow in a trench wall. The cylinder has a radius of 5 centimeters and a length of 60 centimeters, and it has a mass of 50 grams. After filling the cylinder with snow, the cylinder is again weighed and now has a mass of 520 grams. What is the density of the snow that was sampled?

Problem 2 – Two scientists measure the snow density from two different mountain locations using two different snow gauges: A and B. Gauge A has a radius of 6.3 cm and a height of 40 cm, while Gauge B has a radius of 8.0 cm and a height of 40 cm. To the nearest cubic centimeter, what are the volumes of the two gauges? (use $\pi = 3.141$)

Problem 3 – If 500 grams is collected by Gauge A and 804 grams is collected by Gauge B, what are the snow densities to the nearest tenth. Are the scientists sampling different kinds of snow, or similar kinds of snow at the two locations?

Problem 1 – A scientist uses a cylindrical gauge to sample the snow in a trench wall. The cylinder has a radius of 5 centimeters and a length of 60 centimeters, and it has a mass of 50 grams. After filling the cylinder with snow, the cylinder is again weighed and now has a mass of 520 grams. What is the density of the snow that was sampled?

Answer: For a cylinder, the volume is given by the formula $V = \pi r^2 h$,where r is the radius and h is the height. The snow gauge volume is then

$V = (3.141)(5cm)^2 (60\ cm) = 4{,}711\ cm^3$.

When empty, the snow gauge had a mass of 50 grams and when full of snow it had a mass of 520 grams, so the actual mass of the snow was

M = 520 gm - 50 gm = 470 grams.

The density of the snow is then $D = M/V = 470\ gms/4711\ cm^3 =$ **$0.1\ gm/cm^3$**

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Answer: The volume of a cylinder is given by $V = \pi R^2 h$, so

The volume of Gauge A is $V = (3.141) \times (6.3\ cm)^2 \times (40cm) = 4{,}987\ cm^3$.

The volume of Gauge B is $V = (3.141) \times (8.0\ cm)^2 \times (40cm) = 8{,}041\ cm^3$.

Problem 3 - If 500 grams is collected by Gauge A and 804 grams is collected by Gauge B, what are the snow densities to the nearest tenth, and are the scientists sampling different kinds of snow, or similar kinds of snow at the two locations?

Answer - The density measured by Gauge A is $D = 500\ gm/4987\ cm^3 =$ **$0.1\ gm/cm^3$**.

The density measured by Gauge B is $D = 804\ gm/8041\ cm^3 =$ **$0.1\ gm/cm^3$**

So the densities are the same and the kinds of snow are probably also the same at the two locations.