MATHCOUNTS® Problem of the Week Archive

Snow Water Equivalence – February 6, 2023

Problems & Solutions

Winter weather can result in snowstorms dumping large amounts of snow in a short time. The Snow Water Equivalent (SWE) is a common snow pack measurement to tell the amount of water contained within the snow pack. It is the depth of water that would result if the entire snow pack melted.

For example, if an empty wading pool filled with 20 inches of new powdery snow at 0.15 snow water density and the snow is melted, you would be left with a pool of water 3 inches deep. In this case, the SWE of your snow pack would equal 20 × 0.15 = 3 inches.

To determine snow depth from SWE, you need to know the density of the snow. The density of new snow ranges from about 0.05 when the air temperature is 14° F, to about 0.20 when the air temperature is 32° F. After the snow falls, its density increases due to gravitational settling, wind packing, melting and recrystallization.

The relationship between the snow water equivalent, snow density and snow depth is modeled with the following formula: snow water equivalent ÷ snow density = snow depth.

Snow from a recent snowstorm filled an empty cylindrical trash can 28 inches tall. When the snow was melted, the height of the water in the trash can was 6.4 inches. What was the density of the snow? Express your answer as a decimal to the nearest hundredth.

We are told that snow with a depth of 28 inches melted to the water with a depth of 6.4 inches. Rearranging the formula, we see that the snow density = snow water equivalent ÷ snow depth. Substituting the given values into the formula, we determine that the snow density = 6.4 ÷ 28 ≈ ***0.23****.*

What is the SWE, in inches, of a 12-foot snowfall with a snow density of 0.125?

Again, rearranging the original formula, we see that snow water equivalent = snow depth × snow density. We are told that 12 feet, or 144 inches, of snow fell, with a density of 0.125. Substituting this information into the formula, we get an SWE of 144 × 0.125 = ***18*** *inches.*

In inches, what was the estimated depth of snow if the SWE is measured to be 37.9 inches, and the snow density is approximately 0.40? Express your answer as a decimal to the nearest tenth.

Again, rearranging the original formula, we see that the snow depth = snow water equivalent ÷ snow density. We are told that the SWE is 37.9 inches with a density of 0.40. It follows, then, that the snow depth is about 37.9 ÷ 0.40 ≈ ***94.8*** *inches.*

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In inches, what was the estimated depth of snow if the SWE is measured to be 37.9 inches, and the snow density is approximately 0.40? Express your answer as a decimal to the nearest tenth.