

MathWalk

#2A) It's "Stairing" You in the Face ... Or is it?



Figure 3. The stairs by the Duck Ponds

The stairs on the trellis by the Duck Pond are only a small portion of the entire structure, but they take quite a bit of lumber (let's assume it's pressure treated). It is a nice place to sit, relax and have lunch. Let us look at a small piece of these structure and do some math with it. In Fig 3, you notice some steps with a highlighted circle around them. Those 4 steps and their handrails are facing the River street. Here are some measurements about that part of the trellis:

Handrails: composed of 2x4's, 2 short ones (each 13" long) and 2 long ones (each 42.5" long).

Steps: composed of 8 planks - 2x6x48.

Posts: four made up of 8 planks of 2x4s (each 30.5" long).

Tasks:

Grades K – 12:

- Suppose you had to buy 2x4s and 2x6's in 8' lengths. How many of each would you have to buy to build those stairs?
- Suppose the 2x4's cost \$3.07 for each 8' length and the 2x6's cost \$5.27 for each 8' length. How much would it cost to build the stairs?

Did You Know?

Wood commonly comes in 2"x4", 4"x4", 2"x6" and 2"x8" sizes (plus some other ones) thus the common terms 2 by 4's, 4 by 4's etc. However, the actual sizes of those dimensions are approximately $\frac{1}{2}$ " smaller making the 2 x 4, for example, actually 1.5" x 3.5".

#2B) The Duck Pond



Figure 4: The Duck Pond

Every student who desires to earn a chemistry degree from Appalachian State University must complete a course in quantitative analysis. While in this course these students complete many experiments that deal with “Duck Pond and Boone Creek” most of the students do not realize that the duck pond has a purpose other than aesthetics. It is actual a sediment retention pond that filters out debris and other harmful contaminants. One of the contaminants that is tested each semester is paraben level. Parabens are found in many products such as soaps, lotions and cosmetic products. The levels are checked in both the Duck Pond and Boone Creek to determine the effectiveness of the retention pond. So, let us do some math. The quantitative analysis class here at Appalachian State University conducted an experiment during the Spring of 2017 semester and found that there was 1 ppm of methylparaben in the duck pond and 0.3 ppm in the Boone Creek. This shows that the Duck Pond is doing its job.

Note: concentrations of chemicals in water are typically measured in units of the mass(milligrams) per volume of water (liter). For water, 1 ppm = approximately 1 mg/L, or 1g/m³, of contaminant in water.

Task:

Grades 9 – 12:

If the duck pond has 35,000 gallons of water how many grams of methylparaben are in the duck pond?

Some equivalencies you may need:

$$1 \text{ ppm} = 1 \text{ g/m}^3$$

$$1 \text{ mL} = 1 \text{ cm}^3$$

$$1 \text{ gallon} = 3.79 \text{ L}$$

$$1 \text{ m} = 100 \text{ cm}$$