MATHCOUNTS® Problem of the Week Archive

Dive Right In – June 28, 2021

Problems & Solutions

Ms. Norton rented the pool at the recreation center to host an end-of-year party attended by her entire algebra class. This particular pool has three diving platforms. While all of the students were invited to take a swim, not everyone made use of the diving platforms. Ms. Norton had very strict rules:

(1) All students were permitted to dive from the lowest platform.

(2) Only students who demonstrated their diving ability on the lowest platform were permitted to dive from the mid-level platform.

(3) Only students who demonstrated their diving ability on the mid-level platform were permitted to dive from the highest platform.

(4) Students were only permitted to dive from each platform one time.

During the party, eight of Ms. Norton's students dove from the highest platform. This represents 40% of the students who dove at least once. If 10 students dove exactly twice, how many students dove exactly one time?

To determine the number of students who dove exactly one time, we first need to determine the total number of students who dove at least once. Let z represent the number of students who dove at least once. We are told that the eight students who dove from the highest platform represent 40% of the students who dove at least once, which results in the equation 0.4z = 8. Solving for z, we see that z = 8/0.4 = 20 students dove at least once. The eight students who dove from the highest platform each dove a total of three times. That means that the total number of students who dove more than once is 10 + 8 = 18. It follows that the total number of students who dove exactly one time is 20 – 18 = ***2*** *students.*

If 2/7 of the students did not dive at all, what is the total number of students in Ms. Norton's algebra class?

Let y represent the number of students in Ms. Norton's class. From the previous problem, we found that 20 students dove at least one time. If 2/7 of the students did not dive, then 1 – 2/7 = 5/7 of the students dove at least once. It follows that the total number of students in Ms. Norton's algebra class is (5/7)y = 20 → y = 20(7/5) = ***28*** *students.*

Suppose the height of the splash following each of Donya's dives is directly proportional to the height of the platform from which she dove. When Donya dove off the lowest platform, from a height of 4.8 m, the height of the splash produced was 1.5 m. If the height of the splash produced as a result of her dive from the mid-level platform was 2.2 m, what is the height of the mid-level platform? Express your answer as a decimal to the nearest tenth.

Since the height of Donya's splash is proportional to the height of the diving platform, we can set up a proportion to solve this problem. The ratio of the known platform height to the corresponding splash height is 4.8/1.5. The ratio of the unknown platform height, h, to its corresponding splash height is h/2.2. That means 4.8/1.5 = h/2.2, and cross-multiplying yields the equation 1.5h = 4.8(2.2). Solving for h, we see that the height of the mid-level platform must be 1.5h = 10.56 → h = 10.56/1.5 = 7.04 ≈ ***7.0*** *m.*

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