Growing Pains – July 29, 2019

Problems & Solutions

On September 28th, at Ciara's appointment for her annual physical exam, she measured 3 feet 11.5 inches tall. At her last appointment on May 31st, she measured 4 feet 3 inches. Based on this, what was the average number of inches Ciara grew each day from September 28th to May 31st? Express your answer as a common fraction.

*First let's determine how many inches Ciara grew from September 28th to May 31st. We know that 3 feet 11½ inches is ½ inch less than 4 feet. So, Ciara grew ½ + 3 = 3½ inches. We are asked to determine the average daily rate of growth. Thus, we need to count the number of days from September 28th to May 31st. There are 2 more days in September. There are 31 days in each of October, December, January, March and May. November and April each have 30 days and February has 28 days, assuming it's not a leap year. That adds up to 2 + 5(31) + 2(30) + 28 = 245 days. Ciara grew, on average, 3½ ÷ 245 = 7/2 × 1/245 = **1/70** inch per day. (Note: The difference in the average daily inches of growth in a non-leap year and a leap year is neglegible since 3.5/245 = 1/70 ≈ 0.143, and 3.5/246 = 7/492 ≈ 0.142. The exact difference is 1/70 – 7/492 = 246/17,220 – 245/17,220 = 1/17,220 inch.)*

School ends on June 20th this year, and Ciara wants to ride the Shocker roller coaster at least once before returning to school in the fall. Unfortunately, that roller coaster has a minimum height restriction of 4.5 feet. Assuming that Ciara maintained the same average rate of growth as in the previous problem from June 1st to June 20th, how many more inches does she need to grow during her summer break in order to meet the minimum height restriction and ride the Shocker? Express your answer as a mixed number in simplest form.

*On May 31st Ciara's height was 4 feet 3 inches. From the date of her last doctor's visit to the last day of school there are 20 full days (1 full day = 1 twenty-four hour period) so, using the result from the previous problem, we can determine that she will have grown 1/70 (20) = 20/70 = 2/7 inch during that time. Thus, when school ends her heigh will be 4 feet 3 2/7 inches. Since the minimum height required to ride the shocker is 4 feet 6 inches and since 3 2/7 inches = 23/7 inches, Ciara will need to grow an additional 6 – 23/7 = 42/7 – 23/7 = 19/7 = **2 5/7** inches.*

Ciara really wants to ride the Shocker before school begins on September 6th. Maggie told Ciara that her brother's girlfriend's best friend's sister said that practicing Yoga makes you taller. Assume that Ciara grows the expected number of inches from June 20th to September 5th. How many more inches will Ciara need to grow from practicing Yoga to meet the minimum height restrictions and ride the Shocker before September 6th? Express your answer as a decimal to the nearest tenth.

*From the last day of school to the last day of summer break there are 10 + 2(31) + 5 = 77 full days. Again, using the result of the first problem we see that during that time, Ciara can expect to grow 1/70 × 77 = 77/70 = 1.1 inches. We also know from the previous problem that she needs to increase her height by 2 5/7 ≈ 2.714286 inches to meet the minimum height required to ride the Shocker. So, she needs practicing yoga to help her grow an additional 2.714286 – 1.1 = 1.614286 ≈ **1.6** inches.*

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