

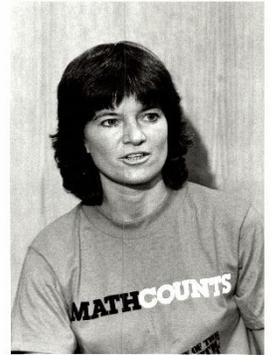
MATHCOUNTS® Problem of the Week Archive

The Sally Ride Quarter – November 15, 2021

Problems



In honor of Sally Ride's accomplishments and contributions to inspiring women in STEM, the U.S. Mint is releasing a quarter with her likeness in 2022 as part of the American Women Quarters Program.



On June 18, 1983, Sally K. Ride became the first American woman in space. Her first mission to space was aboard the Space Shuttle Challenger. It took 6 days, 2 hours, 23 minutes, 59 seconds for the shuttle to travel a total of 4,072,533 kilometers (about 2.5 million miles) during 97 orbits of the Earth. If the Sally Ride quarter will be 1.75 millimeters thick, how many of her quarters stacked have a height equal to 4,072,533 kilometers? Express your answer in scientific notation to three significant figures.

Her first mission to space was 4,072,533 kilometers, or $4,072,533 \text{ km} \times 1,000,000 \text{ mm/km} = 4.072533 \times 10^{12}$ millimeters. A Sally Ride quarter is 1.75 millimeters thick. So, in order for a stack of these quarters to have a height equal to 4,072,533 kilometers, it would need to contain $(4.072533 \times 10^{12}) \div (1.75 \times 10^1) \approx 2.33 \times 10^{11}$ quarters.

Sally Ride will be honored with a quarter through the American Women Quarters Program, along with Maya Angelou, Wilma Mankiller, Nina Otero-Warren and Anna May Wong. These five new quarter designs will be released consecutively throughout the year. If the order in which the coins are released is completely random, what is the probability that Sally Ride's quarter will be released second? Express your answer as a common fraction.

There are $5 \times 4 \times 3 \times 2 \times 1 = 120$ total orders in which the quarters could be released. In looking for how many ways they could be released with Sally Ride's quarter coming out second, we can "fix" this quarter in the second position. This means there are 4 options for the first quarter to be released, 3 options for the third, 2 options for the fourth and 1 option for the fifth (so, $4 \times 3 \times 2 \times 1 = 24$ ways). Therefore, the probability of Sally Ride's quarter being released second is $24/120 = 1/5$.

Suppose that about 800 million quarters are added to circulation in the U.S. over 10 weeks. If approximately 60 million Sally Ride quarters will be added to circulation over 6 weeks, what percent of quarters added to circulation each week, on average, will be Sally Ride quarters? Express your answer to the nearest whole number.

If 800 million quarters are added to circulation over 10 weeks, then about $800 \text{ million} \div 10 \text{ weeks} = 80$ million total quarters would be added to circulation each week. Approximately $60 \text{ million} \div 6 \text{ weeks} = 10$ million Sally Ride quarters will be added to circulation each week. So, on average, $(10 \text{ million} \div 80 \text{ million}) \times 100 = 12.5\% \approx 13\%$ of the quarters added to circulation each week will be Sally Ride quarters.

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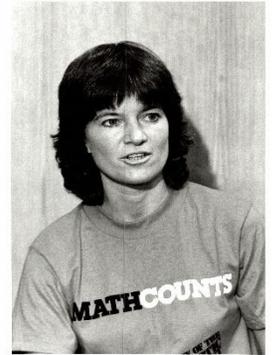
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