Problem of the Week

Problem A and Solution

When were you born?

Problem

Have you ever thought about whether you were born on an even-numbered or an odd-numbered day of the month? In my family, the four of us were born on odd-numbered days: February 19th, March 15th, September 7th, and December 3rd. Our daughter was born on September 4th, an even-numbered day.

Our best friend just had a baby born in 2021.

(a) Is it more likely that the baby was born on an even-numbered day or an odd-numbered day? Justify your answer.

(b) What is the probability that their baby was born on a day that is a multiple of 5?

Solution

We assume that there is an equal probability of being born on any day of the year.

(a) One way to solve this problem is to count the number of even-numbered days in a year. We can make a table that records the number of even-numbered days for each month:

Month	Number of Even-numbered Days
Jan	15
Feb	14
Mar	15
Apr	15
May	15
Jun	15
Jul	15
Aug	15
Sep	15
Oct	15
Nov	15
Dec	15

Adding up the number of even-numbered days in each month, we see that there are 179 even-numbered days in the year. We might make the adding easier by noticing this is equal to $15 + 14 + (10 \times 15) = 29 + 150 = 179$.

Since 2021 is not a leap year, there are 365 days in that year. Since all days must be either even or odd, then the number of odd-numbered days in the year is $365 - 179 = 186$.

Since $186 > 179$, we can see that it is more likely for the baby to be born on an odd-numbered day.

(b) Again we can make a table recording the number of days that are multiples of 5 for each month of the year:

Month	**Number of Days that are Multiples of 5**
Jan	6
Feb	5
Mar	6
Apr	6
May	6
Jun	6
Jul	6
Aug	6
Sep	6
Oct	6
Nov	6
Dec	6

When we add these numbers together we get 71. To calculate the probability that the baby was born on a day that is a multiple of 5, we divide the number of days that are multiples of 5 by the total number of days in a year.

So the probability that the baby was born on a day that is a multiple of 5 is $\frac{71}{365}$.

Teacher's Notes

In the solution, we assumed that there is an equal probability of being born on any day of the year. However, if we look at real data we would conclude that assumption is not correct. Statistics Canada is a great resource for real data. The following link,

https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310041501

provides recent data listing the number of births in Canada by month.

When we look at the data, it is not surprising to see that there are fewer births during the month of February than during the month of March. We could predict this ourselves since there are only 28 or 29 days in February, but 31 days in March. However, we might be surprised to see that, in this data, there are consistently more births during the month of August than during the month of December. The difference is more than 10%, despite the fact that both months have 31 days.

Although we can make reasonable guesses based on probabilities, there may be factors that we cannot know or that we miss when making decisions. This does not mean we should ignore the statistical methods, it just means we have to realize there are limitations on what we can know for certain.