Problem Set #4

Wednesday, September 14, 2022 8:33 AM

1. Phasing out gas cars
    a.

Leaning	**Favor**	**Oppose**	
Liberals	99	29	128
Moderates	57	46	103
Conservatives	20	98	118
	176	173	349

    b. 57/103=0.5534, 55.34%
    c. No it's different because there are more people in total so the percentage is a lot less
    d. They are different since the number of liberals that oppose remain constant but the size of the group changes
        i. 29/173=0.1676, 29/349=0.0831, not the same
    e. Favor: 20/118=0.1695 , Oppose: 98/118=0.8305, sum is 1, makes sense because together they include 100% of the conservatives
2. Conditional Probability: Let L be liberal, M be moderate, C be conservative, F be favor and O be oppose
    a.

Leaning	**Favor**	**Oppose**	
Liberals	0.2837	0.0831	0.3668
Moderates	0.1633	0.1318	0.2951
Conservatives	0.0573	0.2808	0.3381
	0.5043	0.4957	1

    b. $P(F|M) = \frac{0.1633}{0.2951} = 0.5534 = 55.34\%, \text{same as before}$
    c. No because the proportion that favor and are moderates remain at 0.1633 but the group we are looking at changes from 0.2951 of the total to the entire total so it would be very different. As in the proportion of moderates that favor to the total proportion of moderates is different from that proportion to the total amount of people
    d. They are different since the proportion of liberals that oppose remain constant but the size of the group changes, or the proportion of liberals that oppose to the total number of liberals is different from the proportion of liberals that oppose compared to the total number of people
        i. 0.0831/0.4957=0.1676, 0.0831/1=0.0831, not the same
3. Example in my life: Let R be Rain and W be finishing 2 bottles of water
    a. $P(R) = 0.05, P(W) = 0.8, P(R \text{ and } W) = 0.01$
    b.

	R	!R	
W	0.01	0.79	0.8
!W	0.04	0.16	0.2
	0.05	0.95	1

    c. $P(W|R) = \frac{0.01}{0.05} = \frac{1}{5} = 0.2 = 20\%, P(!W|R) = \frac{0.04}{0.05} = \frac{4}{5} = 0.8 = 80\%$
4. Algebra and Notation
    a. $P(A|B) = \frac{a}{a+b}, P(!A|!B) = \frac{d}{c+d}$

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   a. $P(A|B) = \frac{a}{a+b}, P(!A|!B) = \frac{d}{c+d}$
      i.

	A	!A	
B	a	b	a + b
!B	c	d	c + d
	a + c	b + d	a + b + c + d = 1

   b. $\frac{\frac{a}{a+b+c+d}}{\frac{a+b}{a+b+c+d}} = \frac{a}{a+b}$
   c. Sum of all probabilities is 1