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Data 605
3-11-2018

HW #6

1. red = 54
white = 9
blue = 75

$$P(\text{red or blue}) = \frac{54+75}{54+75+9} = \frac{129}{138}$$

2. green = 19
red = 20
blue = 24
yellow = 17

$$P(\text{red}) = \frac{20}{17+19+20+24} = \frac{20}{80} = \frac{1}{4}$$

3. $P(\text{cust} \neq \text{male or live} \neq \text{w/ parents}) = 1 - P(\text{cust} = \text{male \& live} = \text{w/ parents})$

$$= 1 - \frac{215}{81+228+116+79+215+252+130+97+129+72} = \frac{215}{1399}$$

4. is P(lose weight) ind. of P(going to gym)

A: Dependent – if my goal is to lose weight ← more likely
Independent – if my goal is to gain muscle (ectomorph) ← less likely
however, taking prep as an hole more likely dependent.

5. City subs

3 veggies
3 condiments
1 wrap

options
8 veg
7 cond
3 w

$$\Rightarrow \binom{8}{3}\binom{7}{3}\binom{3}{1} = (8\times7\times6)(7\times6\times5)(3)$$

$$= 211{,}680$$

6. is P(runs out of gas to ride) ind of
P(Liz watches evening news)

A: independent – there should be no correlation of one event over another
only way dependent is if evening news → wake up late
→ runs out of gas for thinking she had enough.

7. 8 spots w/ 14 candidates. order matters.

$$\binom{14}{8} = 14\times13\times12\times11\times10\times9\times8\times7 = 121{,}080{,}960$$

8. 

$$P(\text{draw 4 jellybeans} \mid \{r=0,1,2,3\})$$

$$\binom{9}{3}\binom{4}{1} = \frac{9!}{3!(9-3)!}\cdot\frac{4!}{1!(4-1)!} = \frac{9\times8\times7}{3\times2}\cdot\frac{4}{1} = 84\times4 = 336$$

9. evaluate $\frac{11!}{7!}$; A: $\frac{11\times10\times9\times8\times7!}{7!} = 7{,}920$

10. Complement of P(subs. fitness mag & age > 34) = 67%

A: P(subs. fitness mags & age ≤ 34) = 33%

11. P(3 of 4 heads) = ?

$\binom{4}{3} = \frac{4!}{3!(4-3)!} = 4$ outcomes $\Omega = \{HHHT, HHTH, HTHH, THHH\}$

P(3 of 4 H) $\frac{1}{4}$

P(not 3 of 4 H) = 1 − P(3 of 4 H) = $\frac{3}{4}$

$E = \frac{1}{4}\cdot97 - 30\cdot\frac{3}{4} = 1.75$

$= 559\times1.75 = \$978.25$

A: Take bet you'd win ~$1K

12. P(T ≤ 4 or 9) = \$22 else \$26

$\binom{9}{4}+\binom{9}{5}+\binom{9}{8}+\binom{9}{1} = \frac{9!}{4!(5!)}+\frac{9!}{3!(6!)}+\frac{9!}{2!(7!)}+\frac{9!}{1!(8!)} = \frac{9\cdot8\cdot7\cdot6}{4\cdot3\cdot2}+\frac{9\cdot8\cdot7}{3\cdot2}+\frac{9\cdot8}{2}+9 = 243$ outcomes

$P(T\le4 \text{ or } 9) = \frac{243}{729} = 0.47$ / $P(\text{inv}) = 0.53$ ⇒

$E = 22\cdot0.47 - 26\cdot0.53 = -\$3$

$= 993\times-\$3 = -\$2979$

A: Do not take bet

13. experiment

$P(\text{liar}) = 20\%$

$P(\text{truth}) = 80\%$

Machine

$P(DL \mid L) = 0.59$

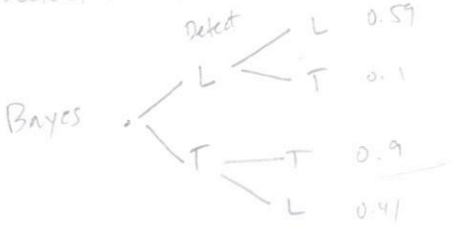
so $P(DT \mid L) = 0.41$

$P(DT \mid T) = 0.9$

$P(DL \mid T) = 0.1$

DL = detect liar

DT = detect truth



a. $P(L \mid DL) = \dfrac{P(DL \mid L) \cdot P(L)}{P(DL)} = \dfrac{P(DL \mid L) \cdot P(L)}{P(DL \mid L) \cdot P(L) + P(DL \mid T) \cdot P(T)}$

$= \dfrac{0.59 \cdot 0.2}{0.59 \cdot 2 + 0.1 \cdot 0.8} = \dfrac{0.118}{0.198} \approx 0.596$

b. $P(T \mid DT) = \dfrac{P(DT \mid T) \cdot P(T)}{P(DT)} = \dfrac{P(DT \mid T) \cdot P(T)}{P(DT \mid T) \cdot P(T) + P(DT \mid L) \cdot P(L)}$

$= \dfrac{0.9 \cdot 0.8}{0.9\,0.8 + 0.41 \cdot 0.2} = \dfrac{0.72}{0.802} \approx 0.898$

c. $P(L \cup DL) = P(L) + P(DL) - P(L \cap DL)$

$P(L) \cdot P(DL \mid L)$

$= PL + [P(DL \mid L) \cdot PL + P(DL \mid T) \cdot P(T)] - P(L) \cdot P(DL \mid L)$

$= 0.2 + 0.198 - 0.2(0.59)$

$= 0.28$