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HW5 CSCI 104

Probability

1) $\underset{q1}{\frac{15}{15}} \cdot \underset{q2}{\frac{14}{15}} \cdot \underset{q3}{\frac{13}{15}} \cdot \underset{q4}{\frac{12}{15}} \cdot \underset{q5}{\frac{11}{15}} \cdot \underset{q6}{\frac{10}{15}} \cdot \underset{q7}{\frac{9}{15}} \cdot \underset{q8}{\frac{8}{15}} = 0.1012$

2) · possible odd digits: $|\{1, 3, 5, 7, 9\}| = 5$

· possible even digits: $|\{0, 2, 4, 6, 8\}| = 5$

· 00000 – 99999 } 100,000 ints

$$\left.\underset{odds}{\underline{5}} \times \underset{odds}{\underline{4}} \times \underbrace{\underline{7}}_{} \times \underbrace{\underline{6}}_{} \times \underset{even}{\underline{5}}\ \right\}\ \text{target num}$$

odds & evens that haven't been selected

$$\frac{5}{10} \cdot \frac{4}{10} \cdot \frac{7}{10} \cdot \frac{6}{10} \cdot \frac{5}{10} = \frac{4200}{100\,000} = \frac{21}{500}$$ = frequency of drawing target num = 4.2%

$$\sim \binom{8}{5} \cdot \left(\frac{21}{500}\right)^3 \cdot \underbrace{\left(\frac{479}{500}\right)^2}_{\text{chances of not getting target num}}$$

= 0.00381

3) A: the event that at least 2 dice show 4 or above

B: the event that all 3 dice show the same value

· if $p(A \mid B) = P(A)$, A & B are independent

$$p(A) = \binom{3}{2} \cdot \underbrace{\left(\frac{3}{6}\right)\left(\frac{3}{6}\right)}_{0-3}\underbrace{\left(\frac{3}{6}\right)}_{4-6} + \binom{3}{3}\left(\frac{3}{6}\right)^3 = \frac{1}{2}$$

$A = 1 - \bar{A} = 1 - 0.75 = 0.25$

$$P(B) = \left(\frac{1}{6}\cdot\frac{1}{6}\cdot\frac{1}{6}\right)\cdot \underbrace{6}_{\text{diff. ways to get the same value on all dice}} = \left(\frac{1}{216}\right)\cdot 6 \approx 1/36$$

Since there are 6 diff. ways to get B,

$P(A|B) = 3/6 = 1/2 = P(A)$ ✓

Independent

4) Frequency of a "flush": $\binom{13}{5}\binom{4}{1}$

number of ways to draw 5 cards: $\binom{52}{5}$

prob of drawing "flush" $= \dfrac{\binom{13}{5}\binom{4}{1}}{\binom{52}{5}}$

5) { g1 g2 g3 g4 g5 }

A = probability superstar plays ∴ $P(A) = 0.75$

$\bar{A}$ = $P(\bar{A}) = 0.25$ $\quad P(B|A) = 0.7$ # team wins if superstar plays

B = team wins

$$P(A|B) = \frac{P(B|A)\cdot P(A)}{P(B|A)\cdot P(A) + P(B|\bar{A})\cdot P(\bar{A})}$$

$$= \frac{0.75\binom{5}{4}(0.7)^4(0.3)}{0.75\cdot\binom{5}{4}(0.7)^4(0.3) + 0.25\binom{5}{4}(0.25)^3}$$