CSCI 104 Probability Problems

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① Probability of getting picked for 1 question is $\frac{1}{15}$ & $\frac{14}{15}$ for not getting picked.

~~$15\left(\frac{1}{15}\right)\cdot 15\cdot 7\left(\frac{14}{15}\right)$~~

$$\frac{15}{15}\times\frac{14}{15}\times\frac{13}{15}\times\frac{12}{15}\times\frac{11}{15}\times\frac{10}{15}\times\frac{9}{15}\times\frac{8}{15}$$

1st Q 2nd Q

$= .101 = 10.1\%$ probability

② Total number of possibilities: 10^5 - each digit has 10 possibilities, 5 digits
Numbers 0-100 are excluded bc can't have 2 odd digits and be even
Numbers 110-999 are possible so to calculate $5_{odd}\cdot 4_{odd}\cdot 5_{even} = 100$

Numbers 1000 - 9,999 are possible so calculate $5_{odd}\cdot 4_{odd}\cdot 7_{other\ digits}\cdot 5_{even} = 700$

Numbers 10,000-99,999 are possible so calculate $5_{odd}\cdot 4_{odd}\cdot 7_{other}\cdot 6_{other}\cdot 5_{even} = 4{,}200$

Total number of outcomes: $100+700+4{,}200 = 5{,}000$

Probability of getting 1 number randomly: $\frac{5{,}000}{10^5} = .05$

For generating 8 numbers and 5 meeting criteria ${}_8C_5\,(.05)^5(.95)^3$

$$\frac{8!}{5!(8-5)!}\cdot(.05)^5(.95)^3 = 1.5004E\text{-}5$$

③ A = At least 2 dice show ≥4 $P(A \cap B) = P(A) \cdot P(B)$
B = All dice same value

$P(\text{Just 2 dice} \geq 4) = \binom{3}{2}(0.5)^2(.5)^1 = 3/8$
$P(\text{All 3 show} \geq 4) = \binom{3}{2}(.5)^3(.5)^0 = 1/8$ $P(A) = 3/8 + 1/8 = 1/2$

$P(B) = \frac{6}{216} = \frac{1}{36}$ $P(A \cap B) = 1/2 \cdot 1/36 = 1/72$ Independent

④ 13 cards for 4 suits in a deck of 52 cards.

$\frac{4\binom{13}{5}}{\binom{52}{5}} \approx .00198$ $E(x) = \frac{1}{.198} =$ 504.849

⑤ Probability of winning With superstar = .7
Probability of winning w/ = .5

Prob superstar plays = .75
P(win 4/5 games with superstar) = $_5C_4 \cdot .7^4 \cdot .3 = .36$
P(win 4/5 games w/ superstar) = $_5C_4 \cdot 5^5 = .156$

Probability of winning 4/5 regardless of superstar = $.156 \cdot .25 + .36 \cdot .75 = .31$

Probability of winning 4/5 with superstar = $.36 \cdot .75 / .31 = .87$

87%