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<u>Problem 2.1 a</u>

Event A_1 : Ace first card
Event A_2 : Ace second card
Event A_3 : Ace third card
Event A_4 : Ace fourth card

$Pr(A_1) = \frac{4}{52}$ (four cards out of 52)

$Pr(A_2) = \frac{4}{52}$ (again four out of 52)

$Pr(A_3) = \frac{4}{52}$

$Pr(A_4) = \frac{4}{52}$

$Pr(A_1 \cap A_2 \cap A_4 \cap A_5) =$

Probability of drawing Ace in first

<u>and</u> probability of drawing Ace in second

<u>and</u> ....

because of replacement, events are independent, we have:

$Pr(A_1 \cap A_2 \cap A_3 \cap A_4) = Pr(A_1)\,Pr(A_2)\,Pr(A_3) \cdot Pr(A_4)$

thus

$Pr(A_1 \cap A_2 \cap A_3 \cap A_4) = \frac{4}{52} \cdot \frac{4}{52} \cdot \frac{4}{52} \cdot \frac{4}{52} = \underline{3{,}5 \cdot 10^{-5}}$

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Problem 2.1b

Because of no - replacement

$$Pr(A_1 \cap A_2 \cap A_3 \cap A_4) = Pr(A_1)\, Pr(A_2 | A_1) \cdot Pr(A_3 | A_2, A_1)\, Pr(A_4 | A_3, A_2, A_1)$$

$Pr(A_1)$ - ace in first card

$Pr(A_2 | A_1)$ - ace in second when an ace was drawn in first card

$Pr(A_3 | A_2, A_1)$ - ace in third when an ace was drawn in both first and second card

$Pr(A_4 | A_1 A_2 A_3)$ - ace in fourth when an ace was drawn in both first, second and third.

$Pr(A_1) = \frac{4}{52}$ (four out of 52 are aces)

$Pr(A_2 | A_1) = \frac{3}{51}$ (only 3 aces left and 51 cards left)

$Pr(A_3 | A_1, A_2) = \frac{2}{50}$.

$Pr(A_4 | A_3, A_2, A_1) = \frac{1}{49}$

Problem 2.1b (continued)

thus

$$Pr(A_1 \wedge A_2 \wedge A_3 \wedge A_4) = \frac{4}{52} \cdot \frac{3}{51} \cdot \frac{2}{50} \cdot \frac{1}{49}$$

$$= \underline{\underline{3{,}69 \cdot 10^{-6}}}$$

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Problem 2.2 a

Die tossing:

Event A_1 : Dots $= 3$

Event A_2 : Dots $=$ even

Event A_3 : Dots $=$ odd

$Pr(A_1) = \frac{1}{6}$ (one of 6 sides on the die has 3 dots)

$Pr(A_1 \cap A_3) = \frac{1}{6}$ (one of 6 sides has 3 dots and are odd)

Problem 2.2 b

$Pr(A_2 \cup A_3) = 1$ sides that are <u>either</u> odd or even. $\frac{6}{6} = 1$

$Pr(A_2 \cap A_3) = 0$ empty set, sides that are <u>both</u> odd and even.

$Pr(A_1 | A_3) = \frac{1}{3}$ given the side are odd, what is the chance of a 3. 3 odd sides, 1 three.

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Problem 2.2 c

Are A_2 and A_3 disjoint?

Yes, no overlap for even and odd

Problem 2.2. d

Are A_2 and A_3 independant?

No, since $Pr(A_2 \cap A_3) = 0$

and $Pr(A_2) Pr(A_3) = \frac{1}{4}$

as $Pr(A_2) = \frac{1}{2}$

$Pr(A_3) = \frac{1}{2}$

for independence, we have

$$Pr(A_2 \cap A_3) = Pr(A_2) Pr(A_3)$$