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CS - 556 - Assignment 3

Q1) $P(4 \text{ diff. outcomes}) = \dfrac{6 \times 5 \times 4 \times 3}{6 \times 6 \times 6 \times 6} = \dfrac{10}{36} = \boxed{\dfrac{5}{18}}$

Q2)(i) $P(Ace) = \dfrac{4}{52} = \boxed{1/13}$

P(all hearts together) = Let's consider all hearts as 1.

∴ Total cards = 40

Ways of arranging 40 cards = 40!

Total ways of arranging cards = 52!

Ways of arranging hearts together = 13!

(ii) ∴ $P(\text{all hearts together}) = \boxed{\dfrac{40! \times 13!}{52!} = 6.3 \times 10^{-11}}$

Q3) Total No. of outcomes $= 2^{20}$

No. of (7 heads) $= {}^{20}C_7$

∴ $P(7 \text{ heads}) = {}^{20}C_7 / 2^{20} = \boxed{\dfrac{77520}{1048576} = 0.073}$

Q4) (i) Total ways of choosing 25 balls $= 80C_{25}$

Ways of selecting all Numbers $= 15C_{15}$

Rest of the balls $= 65C_{10}$

$\therefore P(\text{all nos}) = \boxed{\dfrac{15C_{15} \times 65C_{10}}{80C_{25}}}$

$= \dfrac{1.8 \times 10^{11}}{3.63 \times 10^{20}} \approx 5 \times 10^{-10}$

(ii) Ways of selecting 4 balls $= 15C_4$

Rest of the balls $= 65C_{21}$

$\therefore P(4 \text{ nos.}) = \boxed{\dfrac{15C_4 \times 65C_{21}}{80C_{25}}} = \dfrac{8.3 \times 10^{19}}{3.63 \times 10^{20}}$

$= 0.2280$

Q5) Let Pos is event of test being positive
Let CGN is Even of person having the disorder

$\therefore P(Pos/CGN) = 0.999$
$P(Pos/-CGN) = 0.005$
$P(CGN) = 0.02$
$P(-CGN) = 0.98$

Find $P(CGN/Pos)$

$$P\left(CGN/Pos\right) = \frac{P\left(Pos/GGN\right)P\left(CGN\right)}{P\left(Pos\right)}$$

$$= \frac{P\left(Pos/CGN\right)P\left(CGN\right)}{P\left(Pos/GGN\right)P\left(CGN\right) + P\left(Pos/-CGN\right) \times P\left(-CGN\right)}$$

$$\therefore P\left(CGN/Pos\right) = \frac{0.999 \times 0.02}{0.999 \times 0.02 + 0.005 \times 0.98}$$

$$\boxed{P\left(CGN/Pos\right) = 0.803}$$