Probability Questions

$$P\left(\begin{matrix}\text{birth of}\\ \text{non}\\ \text{identical}\end{matrix}\right) = \frac{1}{125}$$

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$$P\left(\begin{matrix}\text{birth of}\\ \text{identical}\end{matrix}\right) = \frac{1}{300}$$

$$P\left(\begin{matrix}\text{identical}\\ \text{twin}\end{matrix} \Big/ \text{twin}\right) = \frac{P(\text{identical} \cap \text{twin})}{P(\text{twin})} = \frac{\frac{5}{17}}{\frac{5}{17} + \frac{1}{2} \cdot \frac{12}{17}} = \boxed{\frac{5}{11}}$$

$$P\left(\begin{matrix}\text{picking}\\ \text{chocolate}\\ \text{cookie from 1}\end{matrix}\right) = \frac{3}{4} \cdot \frac{1}{2} = \frac{3}{8}$$

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$$P\left(\begin{matrix}\text{picking chocolate}\\ \text{cookie from 2}\end{matrix}\right) = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4} = \frac{2}{8}$$

$$P\left(\begin{matrix}\text{picked bowl}\\ 1\end{matrix} \Big/ \begin{matrix}\text{chocolate}\\ \text{cookie}\end{matrix}\right) = \frac{\frac{1}{2} \cdot \frac{3}{4}}{\frac{1}{2} \cdot \frac{3}{4} + \frac{1}{4}} = \boxed{\frac{3}{5}}$$

$$P\left(\begin{matrix}\text{yellow from}\\ 1996\end{matrix}\right) = 0.14 \cdot 0.1 = 0.014$$

(2

$$P(\text{yellow}/1996) * P(\text{green}/1994) = 0.014$$

$$P\left(\begin{matrix}\text{yellow from}\\ 1994\end{matrix}\right) = 0.2 \cdot 0.2$$

$$P(\text{yellow}/1994) * P(\text{green}/1996) = 0.04$$

$$P\left(\begin{matrix}\text{yellow from}\\ 1994\end{matrix} \Big/ \begin{matrix}\text{one yellow}\\ \text{one green}\end{matrix}\right) = \frac{\frac{1}{2} \cdot 0.2 \cdot \frac{1}{2} \cdot 0.2}{(0.5 \cdot 0.2 \cdot 0.5 \cdot 0.2) + (0.5 \cdot 0.1 \cdot 0.5 \cdot 0.14)} =$$

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$$\frac{0.01}{0.01+\frac{7}{2000}} = \frac{20}{27} \approx \boxed{0.74}.$$

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3) .א

$$P\left(\begin{matrix}\text{false}\\ \text{positive}\end{matrix}\right) = \frac{9999}{10{,}000} \cdot \frac{1}{100} = \frac{99.99}{10{,}000}$$

$$P\left(\begin{matrix}\text{sick}-\\ \text{positive}\end{matrix}\right) = \frac{1}{10{,}000}$$

$$P\left(\text{positive} \middle/ \begin{matrix}\text{identified}\\ \text{positive in}\\ \text{test}\end{matrix}\right) = \frac{P\left(\text{positive} \cap \begin{matrix}\text{identified}\\ \text{positive}\end{matrix}\right)}{P\left(\begin{matrix}\text{identified}\\ \text{positive}\end{matrix}\right)}$$

$$= \frac{1}{1+99.99} \approx \boxed{\frac{1}{101}}.$$

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$$P\left(\begin{matrix}\text{fixed false}\\ \text{positive}\end{matrix}\right) = \frac{199}{200} \cdot \frac{1}{100}$$

$$P\left(\begin{matrix}\text{fixed}\\ \text{positive}\end{matrix}\right) = \frac{1}{200}$$

$$P\left(\begin{matrix}\text{fixed}\\ \text{positive}\end{matrix} \middle/ \text{identified}\right) = \frac{1}{1.99+1} \approx \boxed{\frac{1}{3}}.$$

the same answer as in question 1: $\frac{5}{11}$.

4)

Random Variables

$E(X) = 6 * \frac{1}{3} - 3 * \frac{2}{3} = \boxed{0\$}$ (1

because:

$p(\text{divisive by } 3) = \frac{1}{3}, \quad p(\text{not divise by } 3) = \frac{2}{3}.$

$E(X) = 5 * \frac{6}{25} + 0 * \frac{4}{25} - 6 * \frac{15}{25} = \boxed{-\frac{12}{5}\$}$ (2

because: $p(\text{add up to more than } 12) = \frac{6}{25}$

$p(\text{add up to less than } 12) = \frac{15}{25} \rightarrow p(\text{break even}) = \frac{4}{25}.$

mean $= 8 * 0.4 = 3.2$ (3

$std = \sqrt{8 * 0.4 * 0.6} = 1.38 \approx \boxed{1.4}$

mean $= 26$, $\sigma = 2$ (4

$p(26 < X < 30) = p(X < 30) - p(X < 26) = 0.97725 - 0.5 = 0.47725.$

$p(X > 3) = \frac{0.4 \cdot 2}{2} = \frac{4}{10} = 0.4.$ (5

$p(\text{3 out of 4 have children}) = 4 * (0.6^3 * 0.4) = \boxed{0.3456}$ (6

c) each positive have a negative value so that their sum is 0:

$E(X) = (-10) * 0.1 - 5 * 0.35 + 0 * 0.1 +$

$5 * 0.35 + 10 * 0.1 = 0$