Q3. Q1. (a) P (at least 1 gold ticket)

$= 1 - P$ (no gold ticket)

$$= \cancel{X/} 1 - \frac{\binom{955}{5}\binom{5}{0}}{\binom{1000}{5}}$$

(b) P (get 5 gold tickets) $= \dfrac{\binom{855}{0}\binom{5}{5}}{\binom{1000}{5}}$

Q2. 3 Hats $\begin{cases} Y & (\frac{1}{3}) \\ B & (\frac{1}{3}) \\ G & (\frac{1}{3}) \end{cases}$ 9 Shirts $\begin{cases} 3Y & (\frac{1}{3}) \\ 6G & (\frac{2}{3}) \end{cases}$

P(hat and shirt have different color)

= 1 − P(hat and shirt have same color)

$= 1 - (\frac{1}{3} \times \frac{1}{3} + \frac{1}{3} \times \frac{2}{3}) = \frac{6}{9} = \frac{2}{3}$

Q3. $1 \times \frac{5}{6} \times \frac{4}{6} \times \frac{3}{6} \times \frac{2}{6} \times \frac{1}{6} = \frac{120}{6^5}$

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Q4. let E = all 5 are females

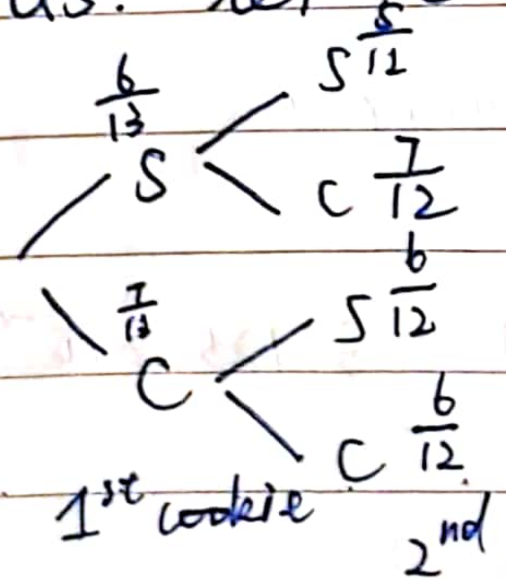
$$P(E) = \frac{1}{2^5} = P(E \cap F)$$

where F = at least 4 are females

$$P(F) = \frac{\binom{5}{4} + \binom{5}{5}}{2^5} = \frac{6}{32} = \frac{3}{16}$$

$$\therefore P(E|F) = \cancel{\frac{6}{32}} \; \frac{\frac{1}{32}}{\frac{6}{32}} = \frac{1}{6}$$

Q5. let C represents chocolate and S for snickerdoodle



∴ Probability distribution:

X	0	1	2
$P(X)$	$\frac{7}{13}\times\frac{1}{2}$	$\frac{7}{13}\times\frac{1}{2}+\frac{6}{13}\times\frac{7}{12}$	$\frac{6}{13}\times\frac{5}{12}$
	↓ $\frac{7}{26}$	↓ $\frac{7}{13}$	↓ $\frac{5}{26}$

$\therefore$ Expected value of $X = 0 \times \frac{7}{26} + \frac{7}{13} + 2 \times \frac{5}{26} \approx 0.9231$