

Main Questions Part 5

Grace Gadsby
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a) blue, blue

blue, green

blue, yellow

green, green

green yellow

b) blue, blue = $\frac{5}{10} \times \frac{4}{9} =$ ~~$\frac{2}{9}$~~ $\boxed{\frac{2}{9}}$

blue, green = $\frac{5}{10} \times \frac{4}{9} + \frac{4}{10} \times \frac{5}{9} = \boxed{\frac{4}{9}}$

blue, yellow = $\frac{5}{10} \times \frac{1}{9} + \frac{1}{10} \times \frac{5}{9} = \boxed{\frac{1}{9}}$

green, green = $\frac{4}{10} \times \frac{3}{10} = \boxed{\frac{2}{15}}$

green, yellow = $\frac{4}{10} \times \frac{1}{9} =$ ~~$\frac{2}{45}$~~ $+ \frac{1}{10} \times \frac{4}{9} = \boxed{\frac{4}{45}}$

(2)

$$P(B|A) = \frac{P(B \cap A)}{P(A)} = \frac{\frac{2}{100}}{\frac{12}{100}} = \boxed{\frac{1}{6}}$$

(2)

(3) Probability of sharing a birthday

$$= \frac{1}{366}$$

Prob of not sharing a birthday with 1 other

$$= \frac{365}{366}$$

Prob of 3 people not sharing birth

$$= \frac{365^3}{366}$$

Prob of 4

$$= \frac{365^4}{366}$$

12 13 14 23 24 34
12 13 14 25
25

7

(4)

(3)

$$a) \frac{6}{9} = \frac{2}{3}$$

$$b) \frac{5}{8}$$

$$c) \frac{6}{8}$$

b) Chance of ~~you~~ winning a prize if you go second

$$= \cancel{\frac{6}{9} P(\text{Prize} | \text{I doesn't win})} + P(\text{Prize} | \text{I does win})$$

$$= \frac{6}{9} \times \frac{5}{8} + \frac{3}{9} \times \frac{6}{8} = \boxed{\frac{2}{3}}$$

→ There is no difference

$$(5) \quad \cancel{P(\text{Plain from A}) = \frac{3}{4}}$$

$$\cancel{P(\text{Plain from B}) = \frac{1}{2} = \frac{2}{4}}$$

$$P(\text{Jar A} | \text{Plain}) = \frac{P(\text{Jar A}) \times P(\text{Plain} | \text{Jar A})}{P(\text{Plain})}$$

$$= \frac{\frac{40}{80} \times \frac{3}{4}}{\frac{60}{80}} = \boxed{\frac{3}{5}}$$

b

(9)

$$\bullet a) \frac{p}{2} + 4p + 2p = 6.5p$$

$$6.5p = 1$$

$$p = \frac{2}{13}$$

$$b) E(X) = \frac{1}{13} \times 1 + \frac{2}{13} \times 2 + \frac{2}{13} \times 3 + \frac{2}{13} \times 4 + \frac{2}{13} \times 5 + \frac{4}{13} \times 6$$

$$= \boxed{\frac{53}{13}}$$

$$c) P(X=5) + P(X=6)$$

$$= \frac{2}{13} + \frac{4}{13} = \boxed{\frac{6}{13}}$$

$$d) E(X^2) = \frac{1}{13} \times 1^2 + \frac{2}{13} \times 2^2 + \frac{2}{13} \times 3^2 + \frac{2}{13} \times 4^2 + \frac{2}{13} \times 5^2 + \frac{4}{13} \times 6^2$$

$$= \frac{253}{13}$$

$$\sigma^2 = E(X^2) - E(X)^2 = \frac{253}{13} - \left(\frac{53}{13}\right)^2 = \boxed{\frac{480}{169}}$$

• e) ? Unsure how to get variance without using formula ind)

7

9

a) $P_1 = \alpha$

b) ~~$P_2 = P(A \text{ hits} \cap B \text{ misses})$~~
 ~~$= \frac{P(A \text{ hits}) \cdot P(B \text{ misses} | A \text{ hits})}{P(B \text{ misses})}$~~
 ~~$= \frac{\alpha \cdot (1-\beta)}{1-\beta}$~~

$P_2 = P(B \text{ misses} \cap A \text{ hits})$
 $= (1-\beta)\alpha$

c) $P_3 = P(B \text{ misses} \cap A \text{ hits})$
 $= (1-\beta)\alpha = P_2?$

8

a) $= \frac{1}{49} \times \frac{1}{48} \times \frac{1}{47} \times \frac{1}{46} \times \frac{1}{45} \times \frac{1}{44} \approx 9.93 \times 10^{-11}$

b) ~~$= \sum_{i=0}^r \frac{1}{49-i}$~~ ~~$= \sum_{i=1}^r \frac{1}{50-i}$~~ ?

c) $= \frac{1}{49} \times \frac{1}{48} \times \frac{1}{47} \times \frac{1}{46} \times \frac{1}{45} \times \frac{1}{44} \approx 1.01 \times 10^{-10}$