• Total probability :

* ~~Ex~~-1 Let, A, B and C three bags.

A	B	C
2G, 2R	1G, 4R	3G, 2R

probability of picking bag A, B ~~[illegible]~~ and C,

$$P(A) = P(B) = P(C) = 1/3$$

[Probability of picking a ~~Green~~ ball that actually depends which bag choose.

Prov of picking a green ball, given bag A picked -

$$P(G/A) = 2/5$$

$$P(G/B) = 1/5$$

$$P(G/C) = 3/5$$

$\boxed{P(G) = ?}$ → Total probability.

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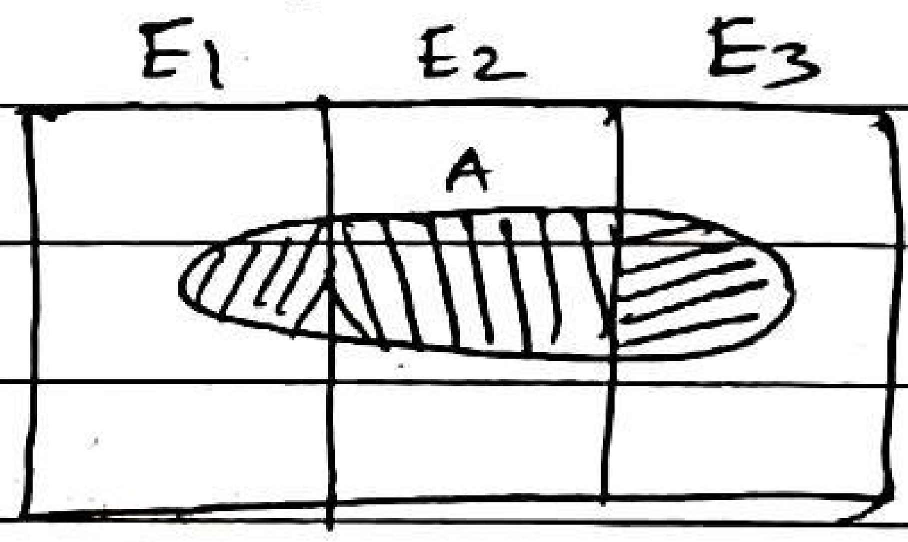
(AG)	B(G)	(CG)
(AR)	(BR)	(CR)



→ devide sample space into mutual exclusive events.

$$A = (E_1 \cap A) \cup (E_2 \cap A) \cup (E_3 \cap A)$$

$$P(A) = P((E_1 \cap A) \cup (E_2 \cap A) \cup (E_3 \cap A))$$

$$\Rightarrow P(A) = P(E_1 \cap A) + P(E_2 \cap A) + P(E_3 \cap A)$$

~~proby~~

probability of getting green ball are,

* $$\boxed{P(G) = P(A\cap G) + P(B\cap G) + P(C\cap G)} \rightarrow \text{Total probability}$$

$$\left[P(G) = P(A)\,P(G/A) + P(B)\,P(G/B) + P(C)\,P(G/C)\right]$$

$$= (1/3)(2/5) + \left(\frac{1}{3}\right)\left(\frac{1}{5}\right) + (1/3)\times\left(\frac{3}{5}\right)$$

$$= \frac{6}{15} \Rightarrow \frac{2}{5}.$$

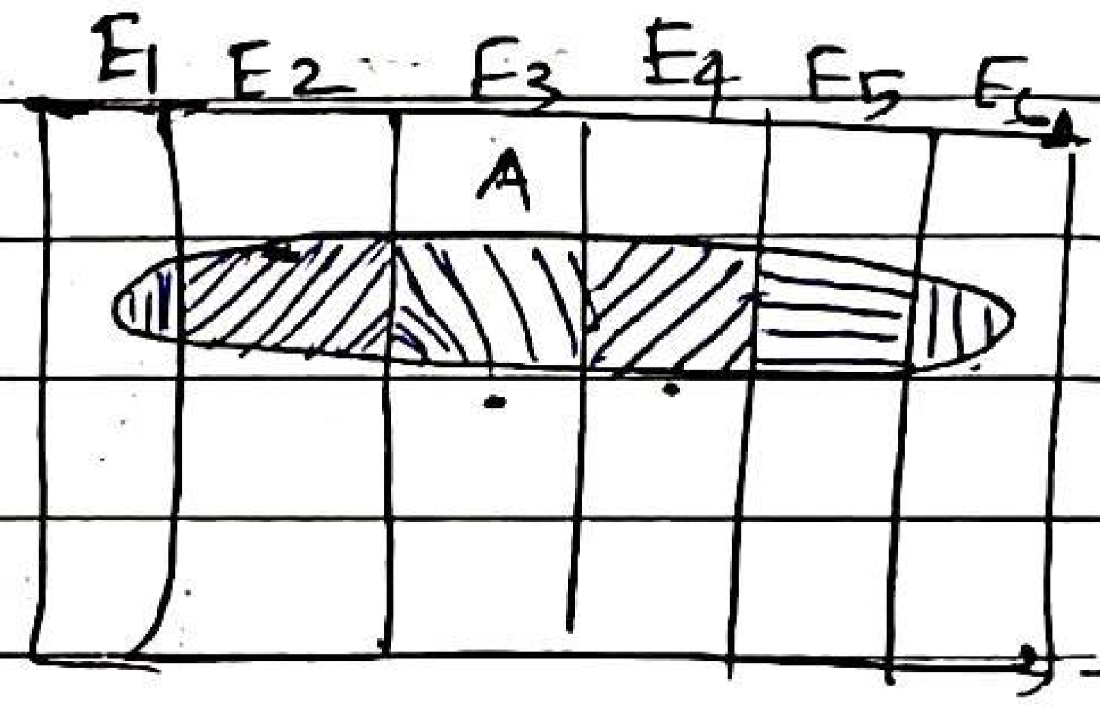
(here bag and balls are dependent events)

Ex-2 Rolling two dice.

sample space = {6 x 6} = {36}

sample space -

(1 1)	(2 1)	(3 1)	(4 1)	(5 1)	(6 1)
(1 2)	(2 2)	(3 2)	(4 2)	(5 2)	(6 2)
(1 3)	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮
(1 6)	(2 6)	(3 6)	(4 6)	(5 6)	(6 6)



$$A = (E_1\cap A) \cup (E_2\cap A) \cup \cdots \cup (E_6\cap A)$$

$$P(A) = P(E_1\cap A) + P(E_2\cap A) + \cdots + P(E_6\cap A)$$

Total probability of getting 2 in 2nd die, (Independent event.)

$$P(A) = P(E_1\cap A) + P(E_2\cap A) + P(E_3\cap A) + P(E_4\cap A) + P(E_5\cap A) + P(E_6\cap A)$$

$$= P(E_1)P(A) + P(E_2)P(A) + P(E_3)P(A) + P(E_4)P(A) + P(E_5)P(A) + P(E_6) + P(A)$$

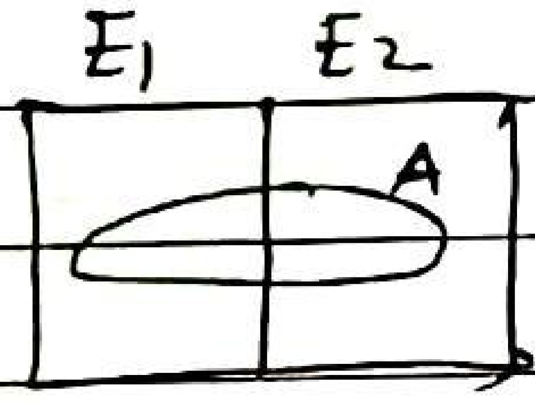
$$= (1/6)(1/6) + (1/6)(1/6) + (1/6)(1/6) + \cdots$$

$\boxed{\text{Ex-3}}$ We have 2 bags. Drawn a ball from A and add in bag B, then R_2 Drawn a ball from B. What is the total probability that the ~~bag~~ ball will be ~~red~~ R_2.

A	B
$2G_1$	$3R_2$
$3R_1$	$2G_2$

Sample space

$R_1 R_2$	$G_1 R_2$
$R_1 G_2$	$G_1 G_2$



$$\boxed{\begin{aligned} P(A) &= P(E_1 \cap A) + P(E_2 \cap A) \\ P(A) &= P(E_1)\, P(A/E_1) + P(E_2)\, P(A/E_2) \end{aligned}}$$

Probability of gettiong red ball second time

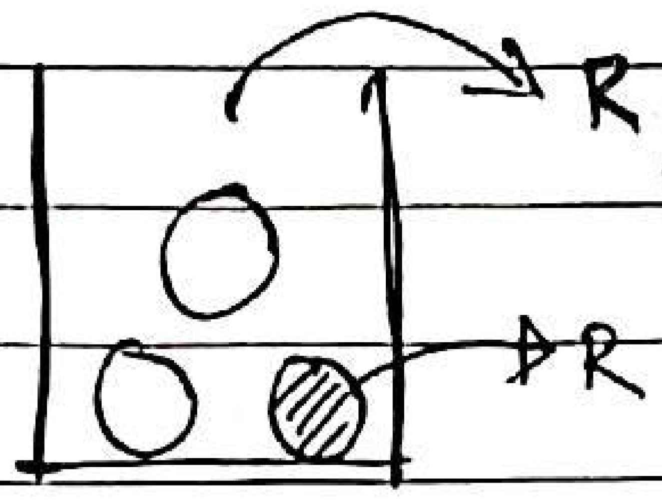
$$P(R_2) = P(G_1)\, P(R_2/G_1) + P(R_1)\, P(R_2/R_1)$$

$$P(R_2) = \left(\frac{2}{5}\right) \times \left(\frac{3}{6}\right) + \left(\frac{3}{5}\right) \times \left(\frac{4}{6}\right)$$

Total probability of gettiong red ball $P(R_2) = \left(\frac{1}{5} + \frac{2}{5}\right)$

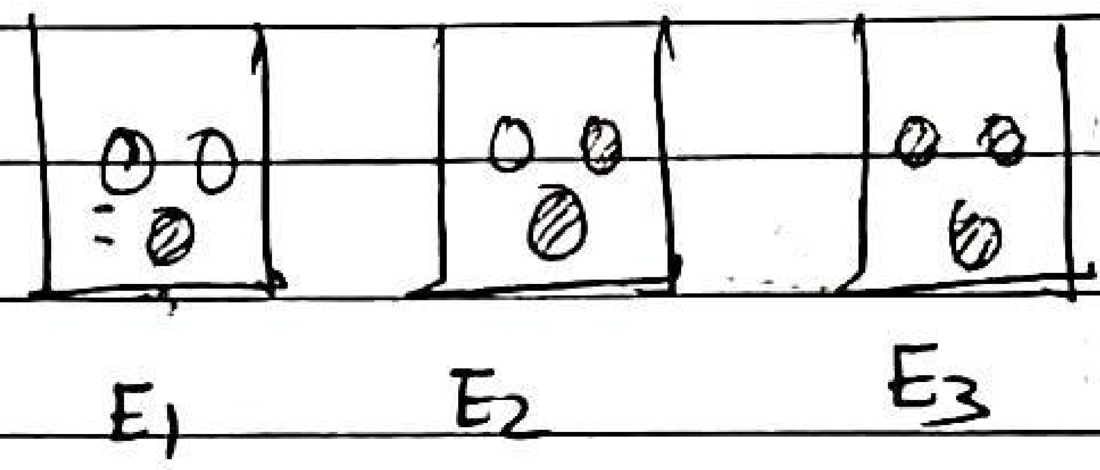
$$= \left(\frac{3}{5}\right)$$

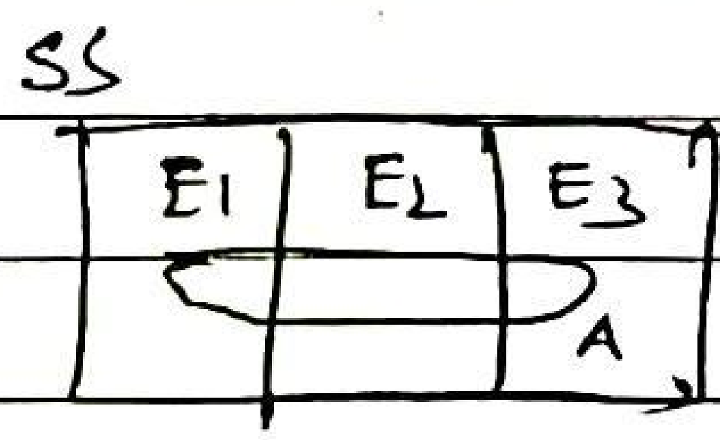
$\boxed{\text{Ex-4}}$



A Bag contain 3 balls. ~~Best~~ one of this ball are known Red and the colours of other two balls unknown, they can be Red or not. What is probability that If you draw a ball, It will be Red.

→





$$P(A) = P(E_1 \cap A) + P(E_2 \cap A) + P(E_3 \cap A)$$

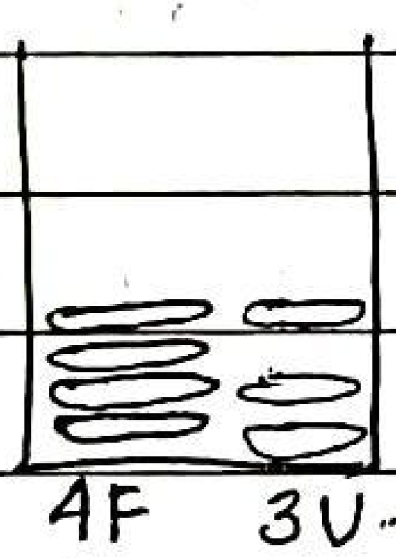
$$= P(E_1)\, P(A/E_1) + P(E_2)\, P(A/E_2) + P(E_3)\, P(A/E_3)$$

$$= (1/3)\,(1/3) + (1/3)\,(2/3) + (1/3)\,(3/3)$$

$$= \frac{1}{9}\,(1+2+3)$$

$$= \frac{2}{3}.$$

$\boxed{\text{Ex-5}}$ A bag contain 4 fair coin and 3 un-fair coin.
(1) Then Draw a coin from bag and toss it. What is the probability of ~~of~~ getting head.



4F   3U-coin
↓   ↓
$P(H)=1/2$ $P(H)=1/3$
$P(T)=1/2$ $P(T)=1/3$

FH	UH
FT	UT

$$P(H) = P(F)\, P(H/F) + P(U)\, P(H/U)$$

$$= (4/7) \times (1/2) + (3/7) \times (1/3)$$

$$= \frac{2}{7} + \frac{1}{7} \Rightarrow \frac{3}{7}.$$

[Ex-5] (ii) Drawn 2 coin from bag and flip it. Then, what is the probability of getting two head.

SS

FF	UU	FU
HH	HH	HH
HT	HT	HT
TH	TH	TH
TT	TT	TT

$$P(HH) = P(FF \cap HH) + P(UU \cap HH) + P(FU \cap HH)$$

$$= P(FF)\, P\left(\frac{HH}{FF}\right) + P(UU)\, P\left(\frac{HH}{UU}\right) + P(FU)\, P\left(\frac{HH}{FU}\right)$$

$$\boxed{P(HH) = \left(\frac{{}^4C_2}{{}^7C_2}\right)(1/2)(1/2) + \left(\frac{{}^3C_2}{{}^7C_2}\right)(1/3)(1/3) + \left(\frac{{}^4C_1 \times {}^3C_1}{{}^7C_2}\right)(1/2)(1/3)}$$

[Ex-6] In answering a question on a multiple-choice test, a student either knows the answer or guesses. Let 'P' be a probability that she knows the answer and (1-P) be the probability that she guesses. Assume that a student who guesses at the ~~an~~ answer will be correct with probability 1/m, where 'm' is the number of multiple choice alternatives. What is the probability that she answer the question correct.

$\rightarrow$ $P(C) = P(K \cap C) + P(G \cap C)$

Know correct (KC)	G correct (GC)
	G wrong (GW)

$$= P(K)\, P(C/K) + P(G)\, P(C/G)$$

$$= (P)(1) + (1-P)(1/m)$$

$$= P + \frac{1}{m} - \frac{P}{m}$$

$$= P + \frac{(1-P)}{m}$$

$\boxed{\text{Ex-7}}$ A person 'A' in the final level, and B, C another person in semifinal. assuming that ~~the~~ the of probability of B will win in semifinal $1/3$ and C will win in semifinal $2/3$. In case if A fits with B the prov that 'A' will be win $2/3$ and if A fits with C then prov that 'A' will be win $1/4$. ~~wit~~ what is the probability that 'A' wins the game.

$\rightarrow$ $P(A) = ?$

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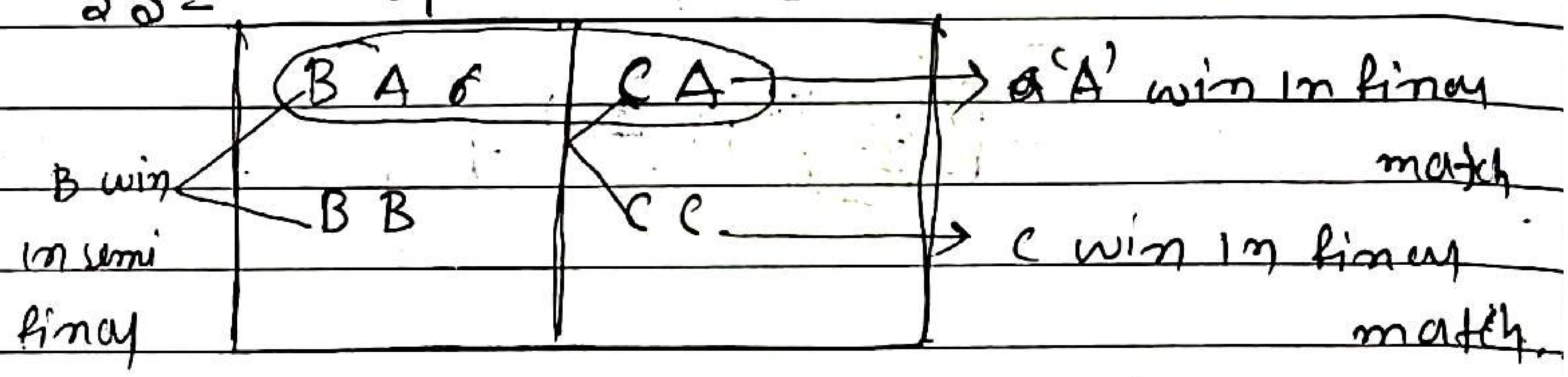

$$P(A) = P(B \cap A) + \underbrace{P(C \cap A)}_{\text{win final}}$$

C win semifinal

$$= P(B)\,P(A/B) + P(C)\,P(A/C) \longrightarrow \text{independent}$$

$$= (1/3)(2/3) + (2/3)(1/4)$$

$$= \left(\frac{2}{9} + \frac{1}{6}\right)$$