ULTIMATE KCET

CRASH COURSE 2026

Mathematics | One Shot

Total Probability

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Topics to be covered

1. Total Probability
2.
3.
4.

Let A → The event which tells us what job to perform

Let $E_1, E_2, E_3, \ldots E_n$ be the events which gives us the information about the options available to Perform the Job

∴ Total Probability is given by

$$P(A) = P(E_1)\,P(A|E_1) + P(E_2)\,P(A|E_2) + P(E_3)\,P(A|E_3) + \cdots + P(E_n)\,P(A|E_n)$$

$P(A|E_1) = \frac{5}{11}$ ⇑ 5B 6R — I Bag

$P(A|E_2) = \frac{4}{11}$ ⇑ 4B 7R — II Bag

A → To pick Black ball

Let E_1 → Pick the ball form Bag I

E_2 → — ″ — ″ — Bag II

QUESTION

#Q. A person has undertaken a construction job. The probabilities are 0.65 that there will be strike, 0.80 that the construction job will be completed on time if there is no strike, and 0.32 that the construction job will be completed on time if there is a strike. Determine the probability that the construction job will be completed on time.

A. 0.488 ✓

B. 0.8

C. 0.589

D. None of these

$P(\text{strike}) = 0.65 = P(E_1)$

$\Rightarrow P(\text{No Strike}) = 0.35 = P(E_2)$

Let A → Construction Job is completed on Time

$P(A|E_1) = 0.32$

$P(A|E_2) = 0.8$

$$P(A) = P(E_1)\,P(A|E_1) + P(E_2)\,P(A|E_2)$$

$$= (0.65)(0.32) + (0.35)(0.8)$$

$$= 0.2080 + 0.280$$

$$= 0.4880$$

QUESTION

#Q. Two thirds of the students in a class are boys and the rest girls. It is known that the probability of a girl getting a first class is 0.25 and that of a boy getting a first class is 0.28 . Find the probability that a student chosen at random will get first class marks in the subject.

A 0.28

B 0.3

C 0.27 ✓

D None of these

$P(\text{Boys}) = \frac{2}{3} = P(E_1)$

$P(\text{Girls}) = \frac{1}{3} = P(E_2)$

Let A → student getting first class

$P(A|E_1) = 0.28$

$P(A|E_2) = 0.25$

$$P(A) = P(E_1)\,P(A|E_1) + P(E_2)\,P(A|E_2)$$

$$= \frac{2}{3}(0.28) + \frac{1}{3}(0.25)$$

$$= \frac{0.56 + 0.25}{3}$$

$$= \frac{0.81}{3}$$

$$= \underline{0.27}$$

① Fair Coin:- (unbiased coin)

$$P(H) = P(T) = \frac{1}{2}$$

② Biased Coins (unfair coins)

① 2 headed coin:-

$P(H) = 1$

$P(T) = 0$

② 2 Tailed coin:-

$P(H) = 0$

$P(T) = 1$

There can be other examples also such that

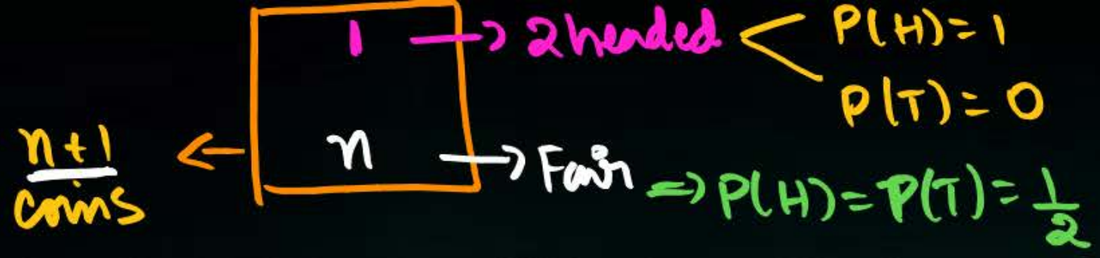
$P(H) \neq P(T)$

Ex:-

$P(H) = \frac{2}{3}$

$P(T) = \frac{1}{3}$

QUESTION



#Q. A bag contains $(n+1)$ coins. It is given that among $(n+1)$ coins, one coin has head on its both side, whereas rest coins are usual. This coin is randomly selected and gets thrown. If the probability of getting head is $\frac{7}{12}$, then n is

Let A → Getting head

E_1 → Choosing a 2 headed coin $\Rightarrow P(E_1) = \frac{1}{n+1}$

E_2 → choosing a fair coin $\Rightarrow P(E_2) = \frac{n}{n+1}$

$P(A|E_1) = 1$

$P(A|E_2) = \frac{1}{2}$

A 2

B 4

C ✓ 5

D None of these

$$P(A) = P(E_1)P(A|E_1) + P(E_2)P(A|E_2)$$

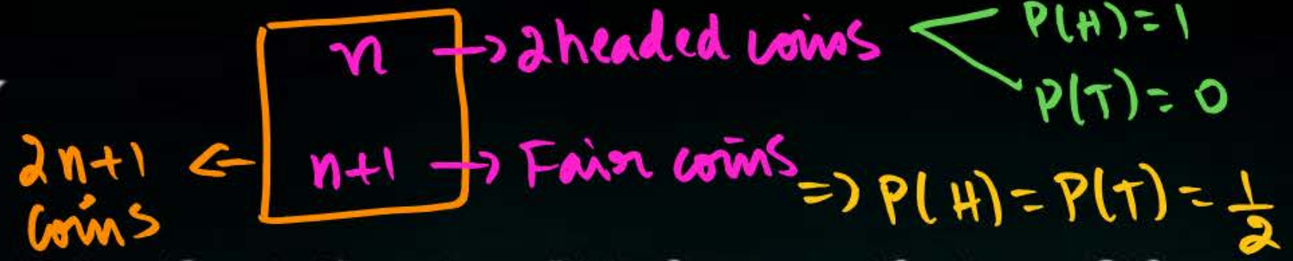
$$\frac{7}{12} = \frac{1}{n+1}(1) + \frac{n}{n+1}\cdot\frac{1}{2}$$

$$\frac{7}{\cancel{12}\,6} = \frac{2+n}{\cancel{2}(n+1)}$$

$$7n+7 = 12+6n$$

$$\boxed{n = 5}$$

QUESTION



#Q. A bag contains $2n + 1$ coins. It is known that n of these coins have head on both sides whereas the other $n + 1$ coins are fair. One coin is selected at random and tossed. If the probability that toss results in heads is $\frac{31}{42}$, then the value of n is

(PYQ of KCET)

Let A → getting head

E_1 → Selecting 2 headed coin ⇒ $P(E_1) = \frac{n}{2n+1}$

E_2 → Selecting Fair coin ⇒ $P(E_2) = \frac{n+1}{2n+1}$

$P(A/E_1) = 1$

$P(A/E_2) = \frac{1}{2}$

A 8

B 5

C ✓ 10

D 6

$$P(A) = P(E_1)\,P(A|E_1) + P(E_2)\,P(A|E_2)$$

$$\frac{31}{42} = \frac{n}{2n+1}(1) + \frac{n+1}{2n+1}\frac{1}{2}$$

$$\frac{31}{\cancel{42}\,21} = \frac{2n+(n+1)}{\cancel{2}(2n+1)}$$

$$31(2n+1) = 21(3n+1)$$

$$62n + 31 = 63n + 21$$

$$n = 10$$

QUESTION

(HW)

#Q. A pandamic has been spreading all over the world. The probabilities are 0.7 that there will be a lockdown, 0.8 that the pandemic is controlled in one month if there is a lockdown and 0.3 that it is controlled in one month if there is no lockdown. The probability that the pandemic will be controlled in one month is

(PYQ of KCET (2023))

A 0.65

B 1.46

C 1.65

D 0.46

QUESTION

3W
5B
I

5W
3B
II (old)

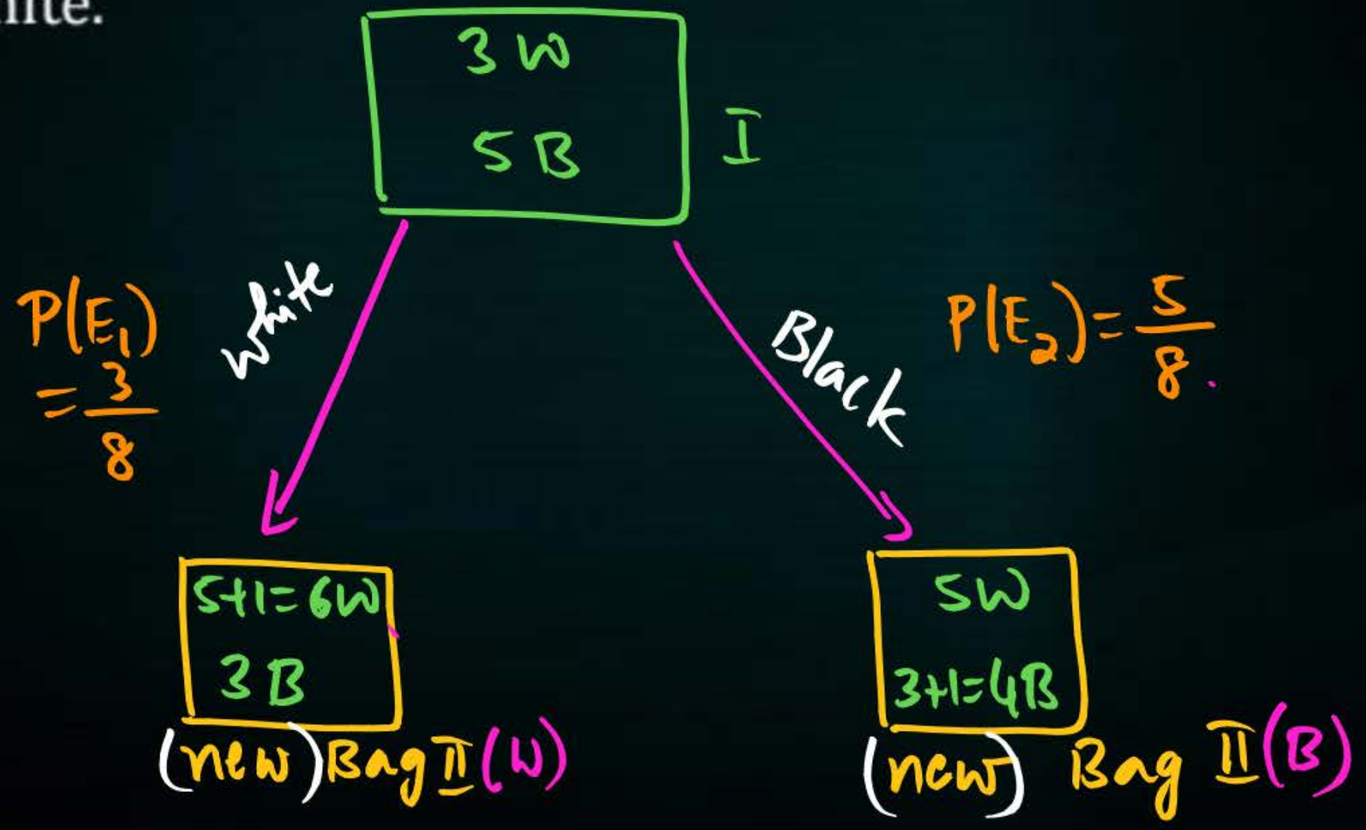
#Q. A bag contains 3 white and 5 black balls and a second bag contains 5 white and 3 black balls. One ball is transferred from first bag to the second bag and then a ball is drawn from the second bag. Find the probability that the ball drawn is white.

A 42/72

B 43/72

C 5/9

D 7/9



Let A = Drawing a white Ball

$E_1 \rightarrow$ Selecting from new Bag II(W), when a white Ball is transferred from Bag I

$E_2 \rightarrow$ Selecting from new Bag II(B), when a Black Ball is transferred from Bag I

$$P(E_1) = \frac{3}{8} \quad | \quad P(E_2) = \frac{5}{8}$$

$$P(A|E_1) = \frac{6}{9} \quad | \quad P(A|E_2) = \frac{5}{9}$$

$$P(A) = \frac{3}{8}\frac{6}{9} + \frac{5}{8}\frac{5}{9} = \frac{18+25}{72} = \frac{43}{72}$$

QUESTION

$^5C_2 = \frac{5}{2} \times 4 = 10$

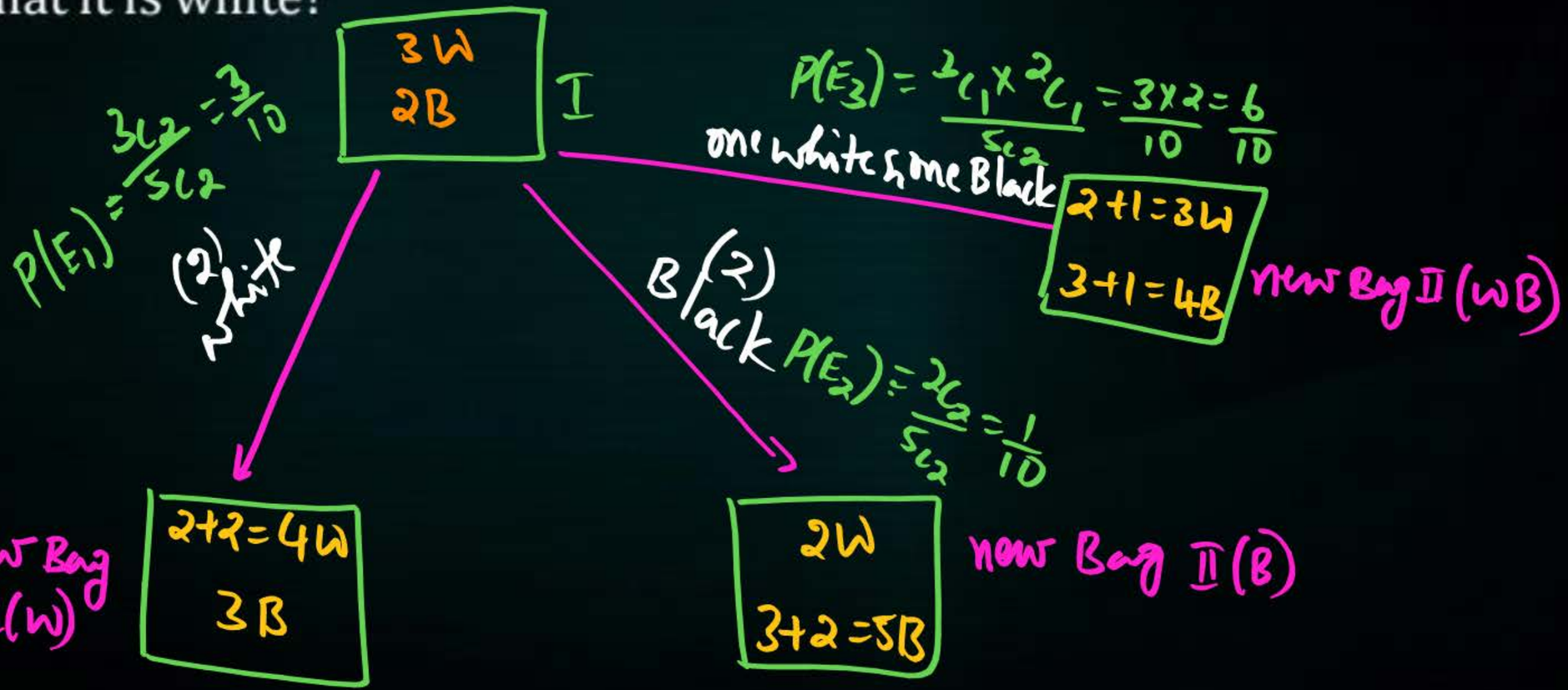
#Q. One bag contains 3 white and 2 black balls. Another bag contains 2 white and 3 black balls. Two balls are drawn from the first bag and put it into the second hag and then a ball is drawn from the second bag. What is the probability that it is white?

A ✓ 16/35

B 33/70

C 3/10

D 1/70



Let A = Selecting white Ball

E_1 = Selecting from new Bag II, when 2 white balls are transferred from Bag I

E_2 = Selecting from new Bag II, when 2 Black balls are transferred from Bag I

E_3 = —)) —)) —)) —)) — one Black & one white ball is transferred from Bag I

$P(E_1) = \frac{3}{10}$ | $P(E_2) = \frac{1}{10}$ | $P(E_3) = \frac{6}{10}$

$P(A|E_1) = \frac{4}{7}$ | $P(A|E_2) = \frac{2}{7}$ | $P(A|E_3) = \frac{3}{7}$

$$P(A) = \frac{3}{10}\left(\frac{4}{7}\right) + \frac{1}{10}\left(\frac{2}{7}\right) + \frac{6}{10}\left(\frac{3}{7}\right)$$

$$= \frac{12+2+18}{70} = \frac{32}{70}$$

$$= \frac{16}{35}$$

QUESTION

Hw

#Q. Bag A contains 6 white and 7 black balls and another bag B contains 4 white and 5 black balls.One ball is drawn from the bag A and without noticing its colour is put in the second bag B. A ball is then drawn from the second bag B. Find the probability that the ball drawn is white in colour.

A 29/65

B 33/65

C 4/5

D 6/13

QUESTION

HW

#Q. A bag contains 2 white and 4 black balls while another bag contains 6 white and 4 black balls. A bag is selected at random and a ball is drawn. Find the probability that the ball drawn is of white colour.

A 4/10

B 8/15

C 6/10

D 7/15

QUESTION

HW

#Q. Bag I contains 3 black and 2 white balls, bag II contains 2 black and 4 white balls. A bag and a ball is selected at random. Determine the probability of selecting a black ball.

A 8/15

B 7/15

C 2/15

D None of these

QUESTION

5B
4R

#Q. A box has 5 blue and 4 red balls. One ball is drawn at random and not replaced. Its colour is also not noted. Then, another ball is drawn at random. What is the probability of second ball being blue?

A ✓ 5/9

B 1/3

C 4/9

D 3/7

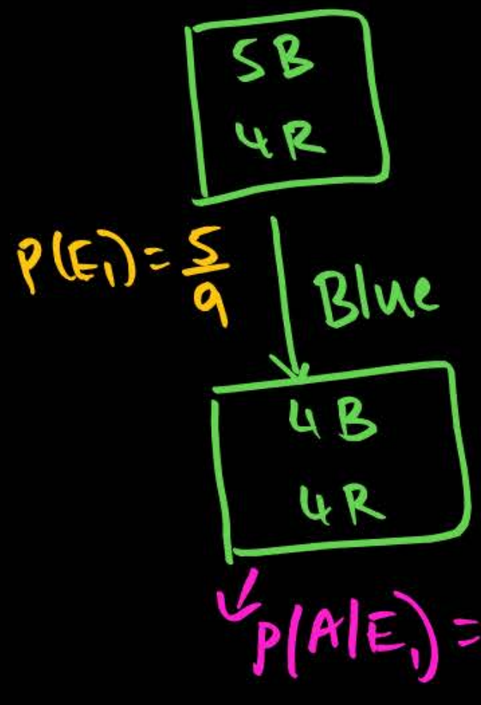
Let A → Selecting Blue Ball second time

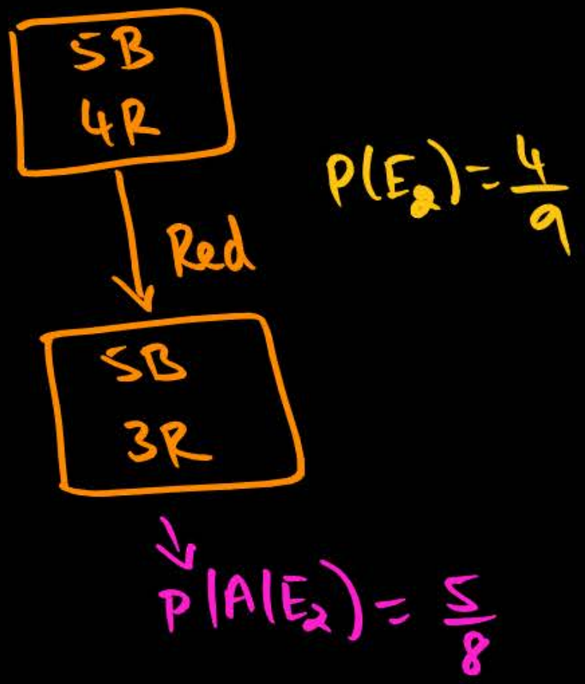
E_1 → Selecting Blue Ball 1st time ⇒ $P(E_1) = \frac{5}{9}$

E_2 → Selecting Red Ball 1st time ⇒ $P(E_2) = \frac{4}{9}$

$P(A|E_1) = \frac{4}{8}$

$P(A|E_2) = \frac{5}{8}$

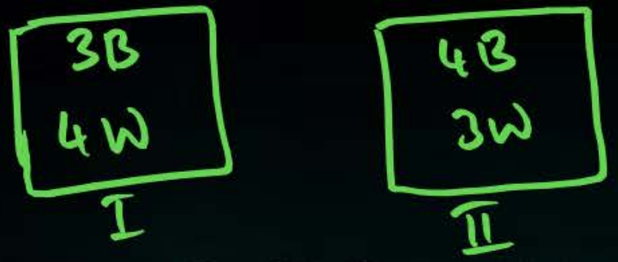




$$P(A) = \frac{5}{9}\frac{4}{8} + \frac{4}{9}\frac{5}{8}$$

$$= \frac{40}{72} = \frac{5}{9}$$

QUESTION



#Q. There are two bags, one of which contains 3 black and 4 white balls while the other contains 4 black and 3 white balls. A die is thrown. If it shows up 1 or 3, ball is taken from the Ist bag; but if it shows up any other number, a ball is chosen from the second bag. Find the probability of choosing a black ball.

Let A → choosing Black Ball

E_1 → Die shows 1 or 3 & moving near 1st Bag $\Rightarrow P(E_1) = \frac{2}{6}$

E_2 → Die shows 2, 4, 5, 6 & moving near 2nd Bag $\Rightarrow P(E_2) = \frac{4}{6}$

$P(A/E_1) = \frac{3}{7}$ | $P(A/E_2) = \frac{4}{7}$

A 8/21

B 11/21 ✓

C 10/21

D 12/21

$$P(A) = \frac{2}{6}\,\frac{3}{7} + \frac{4}{6}\,\frac{4}{7}$$

$$= \frac{6+16}{42} = \frac{22}{42} = \frac{11}{21}$$

QUESTION

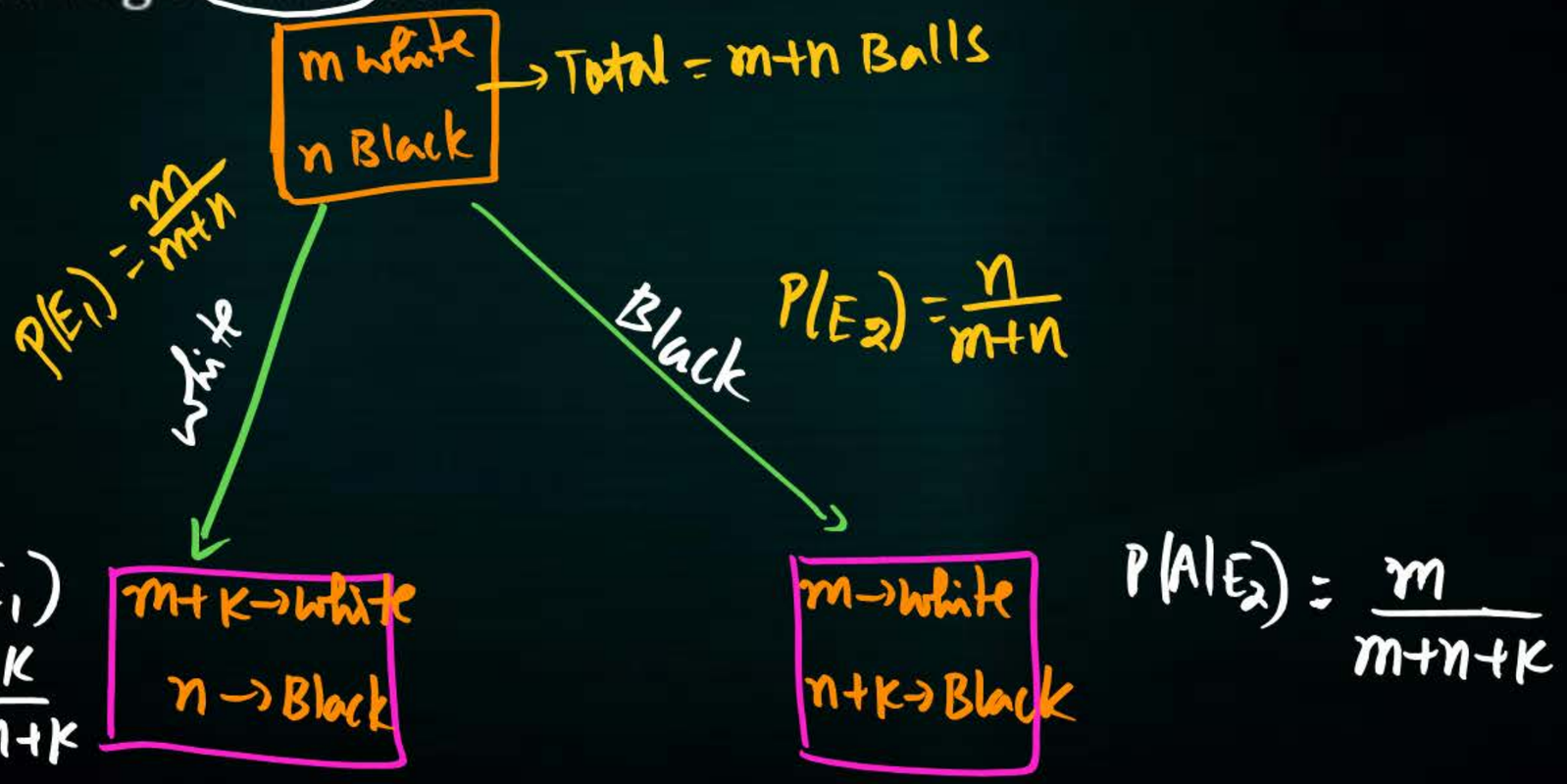
#Q. An urn contains m white and n black balls. A ball is drawn at random and is put back into the urn along with k additional balls of the same colour as that of the ball drawn. A ball is again drawn at random. What is the probability of drawing a white ball?

A $\frac{m}{m+n}$

B $\frac{n}{m+n}$

C $\frac{m+k}{m+n+k}$

D $\frac{m+k}{m+n+k}$



Let A → white Ball is selected

E_1 → when white is picked 1^{st} $\Rightarrow P(E_1) = \frac{m}{m+n}$

E_2 → when Black is Picked 1^{st} $\Rightarrow P(E_2) = \frac{n}{m+n}$

$$P(A|E_1) = \frac{m+k}{m+n+k} \quad \Big| \quad P(A|E_2) = \frac{m}{m+n+k}$$

$$P(A) = \frac{m}{m+n}\,\frac{m+k}{m+n+k} + \frac{n}{m+n}\,\frac{m}{m+n+k} = \frac{m}{(m+n)(m+n+k)}\,[m+k+n]$$

$$= \frac{m}{m+n}$$

QUESTION

5% = $\frac{5}{100}$

#Q. In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total bolts. Of their output 5,4 and 2 percent are respectively defective bolts. A bolt is drawn at random from the product. What is the probability that the bolt drawn is defective ?

A 0.1

B 0.034

C 0.2

D ✓ 0.0345

Let A → Defective bolt is drawn

E_1 → Bolt is selected from Machine A ⇒ $P(E_1) = \frac{25}{100}$

E_2 → —)|—)|— —)|— B ⇒ $P(E_2) = \frac{35}{100}$

E_3 → —)|—)|— C ⇒ $P(E_3) = \frac{40}{100}$

$P(A|E_1) = \frac{5}{100}$ | $P(A|E_2) = \frac{4}{100}$ | $P(A|E_3) = \frac{2}{100}$

$$P(A) = \frac{25}{100}\frac{5}{100} + \frac{35}{100}\frac{4}{100} + \frac{40}{100}\frac{2}{100}$$

$$= \frac{125 + 140 + 80}{10000}$$

$$= \frac{345}{10000}$$

$$= 0.0345$$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