ENGINEERING MATHEMATICS

ALL BRANCHES

Probability

Basic Probability, Method of counting

DPP-01 Solution

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Question - 01

The probability that a number selected at random between 100 and 999 (both inclusive) will not contain the digit 7 is

A. 16/25

B. $(9/10)^3$

C. 27/75

D. 18/25

100 - 999

Total numbers = 900

8	9	9
(0,7)	(7)	(7)

Favour-able = $8 \times 9 \times 9$

$$P(E) = \frac{8 \times 9 \times 9}{900} = \frac{18}{25}$$

0 1 2 3 4 5 6 7 8 9

10 digits

Question - 02

Four fair coins are tossed simultaneously. The probability that at least one heads and at least one tails turn up is

A 1/16

B 1/8

C 7/8

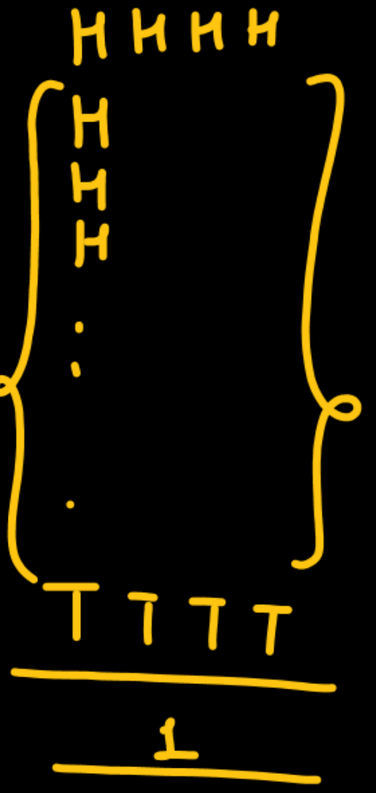
D 15/16

$$P(E) = 1 - P(HHHH) - P(TTTT)$$

$$= 1 - \frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2} - \frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$$

$$1 - \frac{1}{16} - \frac{1}{16}$$

$$7/8$$



Question - 03

The probability that a man who is x years old will die in a year is p. Then amongst n persons $A_1, A_2, \ldots\ldots, A_n$ each x years old now, the probability that, A_1 will die in one year is

A $\frac{1}{n^2}$

B $1-(1-p)^n$

C $\frac{1}{n^2}\left[1-(1-p)^n\right]$

D $\frac{1}{n}\left[1-(1-p)^n\right]$

$A_1, A_2, A_3, \ldots. A_n$.

P P P

$P(\text{none dies}) = (1-p)(1-p)(1-p)\ldots n = (1-p)^n$

$P(\text{at least one dies}) = 1-(1-p)^n$

$P(A_1 \text{ dies}) = \frac{1}{n}\left[1-(1-p)^n\right]$

Question - 04

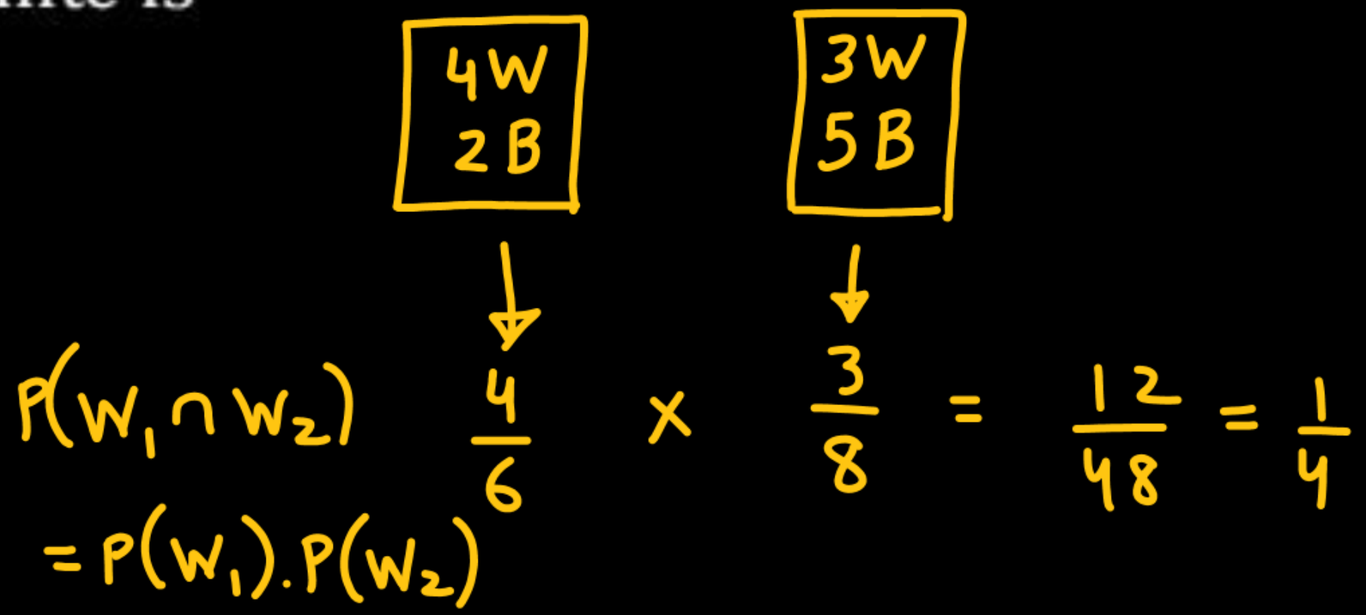
A bag contains 4 white and 2 black balls. Another bag contains 3 white and 5 black balls. If one ball is drawn from each bag, the probability that both are white is

A 1/24

B 1/4

C 5/24

D None



Question - 05

A bag contains 5 white and 4 red balls. Another bag contains 4 white and 2 red balls. If one ball is drawn from each bag, the probability that one is white and one red, is

A 13/27

B 5/27

C 8/27

D None

Case I + Case II

$P(W \cap R) + P(R \cap W)$

$P(W) \cdot P(R) + P(R) \cdot P(W)$

$\frac{5}{9} \cdot \frac{2}{6} + \frac{4}{9} \cdot \frac{4}{6} = \frac{26}{54} = \frac{13}{27}$

Question - 06

An anti-aircraft gun can take a maximum of 4 shots at an enemy plane moving away from it. The probabilities of hitting the plane at the first, second, third and fourth shot are 0.4, 0.3, 0.2 and 0.1 respectively. The probability that the gun hits the plane is

A 0.76

B 0.4096

C 0.6976

D None of these

$P_1 = 0.4$, $P_2 = 0.3$, $P_3 = 0.2$, $P_1 = 0.1$

P(At least plane hits) = 1 − P(plane is hit in none of the shots)

$= 1 - (1-P_1)(1-P_2)(1-P_3)(1-P_4)$

$1 - 0.6 \times 0.7 \times 0.8 \times 0.9$

$= 0.6976$

Question - 07

In a population of N families, 50% of the families have three children, 30% of the families have two children and the remaining families have one child. What is the probability that a randomly picked child belongs to a family with two children?

A 3/23

B 6/23

C 3/10

D 3/5

→ (50% of N) × 3 = $3N/2$

→ (30% of N) × 2 = $3N/5$

→ (20% of N) × 1 = $N/5$

} No. of children

$$= \frac{3N/5}{3N/2 + 3N/5 + N/5} = \frac{6}{23}$$

Question - 08

From a pack of regular playing cards, two cards are drawn at random. What is the probability that both cards will be Kings, if first card is NOT replaced?

A 1/26

B 1/52

C 1/169

D 1/221

4 Kings

$$\frac{4}{52} \times \frac{3}{51} = \frac{1}{221}$$

$$P(K_1 \cap K_2)$$

Question - 09

A fair dice is rolled twice. The probability that an odd number will follow an even number is

$P(\text{odd}) = 1, 3, 5 = 1/2$

$P(\text{Even}) = 2, 4, 6 = 1/2$

$P(\text{Even} \cap \text{odd}) = P(\text{E}) \cdot P(\text{odd})$

$= \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

A 1/2

B 1/6

C 1/3

D 1/4 ✓

Question - 10

A bag contains 10 blue marbles, 20 black marbles and 30 red marbles. A marble is drawn from the bag, its colour recorded and it is put back in the bag. This process is repeated 3 times. The probability that no two of the marble drawn have the same colour is

A 1/36

B 1/6

C 1/4

D 1/3

10 Blue
20 Bla.
30 Red

No. of ways of arranging 3 colours
$= 3! = 6$ — — —

No 2 marbles have same colour ⇒ all 3 are of diff. colors

$$P(\text{All colours are diff.}) = 6 \times \left(\frac{10}{60} \times \frac{20}{60} \times \frac{30}{60}\right) = \frac{1}{6}$$

R B Bl, R Bl B, Bl R B, Bl B R, B R Bl, B Bl R

Thank you

GW

Soldiers !