Probability, Permutation and Combination
Solution

Answer: (1 – 5): Let Number of Red balls be R, Blue balls be B, Green balls be G and Total balls be T

Box P:

Total number of balls = 32 – 10 – 10 = 12

Since the probability of choosing a Blue ball is 1/4 = 3/12

⇒ Number of blue balls = 3

Since the number of red balls is 2 more than the number of blue balls

⇒ R = B + 2 = 5

⇒ G = 12 – 3 – 5 = 4

Box Q:

Total number of balls = 10

Ratio of probability of getting a Blue and a Red ball is 2 : 3.

Suppose the number of Blue and red balls is 2x & 3x

Sum of Blue and Green balls is 4 more than the number of red balls

⇒ 2x + (10 – 5x) = 4 + 3x

⇒ 6x = 6

⇒ x = 1

⇒ R = 3, B = 2 and G = 10 – 3 – 2 = 5

Box R:

Total number of balls = 10

Since total number of blue balls in all the boxes is 9

⇒ Number of blue balls in box R

= 9 – 3 – 2 = 4

Since the probability of getting a red is 1/5 less than the probability of getting a blue

⇒ B/10 – R/10 = 1/5

⇒ B – R = 2

Hence, R = 2

⇒ G = 10 – 4 – 2 = 4

Box	Red Balls	Blue Balls	Green Balls	Total Balls
P	5	3	4	12
Q	3	2	5	10
R	2	4	4	10
Total	10	9	13	32

1. Answer: (B):

⇒ Number of red balls in Boxes P and R = 5 + 2 = 7

⇒ Number of green balls in boxes Q and R = 5 + 4 = 9

∴ Required ratio = 7 : 9

2. Answer: (C)

Total number of balls in box R = 10

Number of blue and green balls in box R is 4 and 4 respectively

∴ Probability of getting either a blue or a green ball from box R = (4 + 4) /10 = 8/10 = 4/5

3. Answer: (A)

Probability of drawing red ball from box P = 5/12

Probability of drawing red ball from box Q = 3/10

Probability of drawing red ball from box R = 2/10 = 1/5

∴ Probability of getting all the 3 balls red = 5/12 × 3/10 × 1/5 = 1/40

4. Answer: (D):

Probability of drawing a green ball from box Q = 5/10 = ½ = 0.5

Probability of drawing a blue ball from box R

= 4/10 = 2/5 = 0.4

∴ Required difference = 0.5 – 0.4 = 0.1

5. Answer: (E):

Probability of drawing a red ball from box Q = 3/10

Since the probability increases by 7/60

⇒ Increased probability = 3/10 + 7/60 = 25/60 = 5/12

⇒ Number of increased red balls in box Q = 5 – 3 = 2

∴ x = 2/2 = 1

6. Answer: (C):

Quantity I:

Probability of picking 2 tiles such that one is green and the other one is blue

$\Rightarrow (6 \times 9)/{}^{50}C_2$
$\Rightarrow 54/(50 \times 49/2)$
$\Rightarrow 54/1225$
$\Rightarrow 0.044$

Quantity II:

Probability of picking 3 balls such that at least one of them is red
$\Rightarrow 1 - {}^{45}C_3/{}^{50}C_3$
$\Rightarrow 1 - (45 \times 44 \times 43/3)/(50 \times 49 \times 48/3)$
$\Rightarrow 1 - (14190/19600)$
$\Rightarrow 541/1960$
$\Rightarrow 0.276$

Quantity III:

Probability of picking 3 balls such that at least one of them is blue
$\Rightarrow 1 - {}^{41}C_3/{}^{50}C_3$
$\Rightarrow 1 - (41 \times 40 \times 39/3)/(50 \times 49 \times 48/3)$
$\Rightarrow 1 - (10660/19600)$
$\Rightarrow 894/1960$
$\Rightarrow 0.456$

Quantity III > Quantity II > Quantity I

7. Answer:: (B)

Given:

A bag contains four white and six black balls.

Calculation:

Probability that the first ball chosen is white = 4/10
Probability that the second ball chosen is white = 3/9
Probability that the third ball chosen is white = 2/8
Probability that all are white
= 4/10 × 3/9 × 2/8 = 1/30

8. Answer: (D)

Vowels = A, U and E
We need to consider that all A, U and E come together thus consider them as a single group
⇒ Number of words that can be formed = 5! × 3!
Total number of words that can be formed = 7!
∴ Required probability = (Total number of words when vowels occur together)/(Total number of words formed) = (5! × 3!)/7!
= (5 × 4 × 3 × 2 × 1) × (3 × 2 × 1) / (7 × 6 × 5 × 4 × 3 × 2 × 1)
= 1/7

9. Answer: (E)

Quantity A:
Probability of getting green ball is 1/4
We know that, Probability = Favourable outcomes/Total outcomes
Probability = x/(12 + x)
1/4 = x/(12 + x)
3x = 12
x = 4
Quantity B = 4
Hence Quantity A = Quantity B

10. Answer: (A)

Total number of persons = 3 girls + 4 boys = 7
The girls always sit together. Considering three girls as one person, we have 5 persons who can be arranged in 5! Ways. But corresponding to each way of these arrangements, the girls can be arranged together in 3! Ways.
Hence,
Required number of ways = 5! × 3!
= 120 × 6 = 720

11. Answer: (D)

Probability of drawing one green ball
$= \frac{x}{12+x} = \frac{2}{5} \Rightarrow x = 8$
∴ Required Probability
$= \frac{{}^{2}C^{2}}{{}^{15}C^{2}} = \frac{5 \times 4}{15 \times 14} = \frac{2}{21}$

12. Answer: (C)

Let the number of green balls be x.
Then, number of yellow balls (12 – x)
ATQ,
$\frac{{}^{x}C_1}{{}^{20}C_1} = \frac{7}{20} \Rightarrow x = 7$
Number of yellow balls = 12 – 7 = 5
Required probability = $\frac{{}^{5}C_1}{{}^{20}C_1} \times \frac{{}^{4}C_1}{{}^{19}C_1} = \frac{1}{19}$

13. Answer: (D)

Let the number of red and brown balls be 7x and 4x respectively.
Then, number of blue balls = $(7x - 6)$
ATQ,
$7x + 4x + (7x - 6) = 30$
$\Rightarrow x = 2$
Number of red balls $7 \times 2 = 14$
Remaining balls = $30 - 4 \times 2 = 22$
Required probability = $\frac{^{14}C_3}{^{22}C_3} = \frac{13}{55}$

14. Answer: (A)
Favorable case = (20, 2M) or (30, 3M) or 40
∴ Probability
$\frac{^6C_2 \times {}^5C_2}{^{11}C_4} + \frac{^6C_3 \times {}^5C_1}{^{11}C_4} + \frac{^6C_4}{^{11}C_4}$
$\frac{15 \times 10}{330} + \frac{20 \times 5}{330} + \frac{15}{330}$
$= \frac{265}{330} = \frac{53}{66}$

15. Answer: (B)
Reqd. probability = $\frac{^2C_1 + {}^1C_1}{^{12}C_1} = \frac{3}{12} = \frac{1}{4}$

16. Answer: (C)
Reqd. probability
$= \frac{1}{^{12}C_2}\left(^4C_1 \times {}^8C_1 + {}^4C_2\right) = \frac{38}{12 \times 11} \times \frac{219}{33}$

17. Answer: (D)
Reqd. probability = $\frac{(^4C_2 \times {}^5C_1)}{^{12}C_3} = \frac{3}{22}$

18. Answer: (B)
Total no. of balls = 5 + 3 + 4 = 12
Sample space = n (S) = $^{12}C_2 = \frac{12 \times 11}{2} = 66$
n (E) = $^5C_2 + {}^3C_2 + {}^4C_2 = \frac{5 \times 4}{2} + \frac{3 \times 2}{2} + \frac{4 \times 3}{2}$
= 10 + 3 + 6 = 19
∴ Reqd. probability P (E) = $\frac{n(E)}{n(S)} = \frac{19}{66}$

19. Answer: (C)
Required probability = $\frac{3}{15} \times \frac{10}{22} = \frac{1}{11}$

20. Answer: (B)
Probability that both balls are either Red or **White** = $\frac{\boldsymbol{^4C_2 + {}^6C_2}}{\boldsymbol{^{20}C_2}} = \frac{\boldsymbol{6 + 15}}{\boldsymbol{190}} = \frac{\boldsymbol{21}}{\boldsymbol{190}}$
Probability that both balls are of different colours (RWO, RWB, WOB and ROB)
$= \frac{(4 \times 6 \times 2) + (4 \times 6 \times 8) + (6 \times 2 \times 8) + (4 \times 2 \times 8)}{^{20}C_3}$
$= \frac{20}{57}$
Quantity I < Quantity II