Probability – Easy

1. Correct option is : C
Solution:
Total number of ways of selecting 3 students from 25 students = ${}^{25}C_3$
Number of ways of selecting 1 girl and 2 boys = selecting 2 boys from 15 boys and 1 girl from 10 girls
⇒ Number of ways in which this can be done = ${}^{15}C_2 \times {}^{10}C_1$
⇒ Required probability = $({}^{15}C_2 \times {}^{10}C_1)/({}^{25}C_3)$
$= \frac{21}{46}$

2. Correct option is : D
Solution:
Given, A be the event that Harish is selected and
B is the event that Kalyan is selected.
P(A)= 2/5
P(B)=3/7
Let C be the event that both are selected.
P(C)=P(A)×P(B) as A and B are independent events:
P(C) = 2/5*3/7
P(C) =6/35
The probability that both of them are selected is 6/35

3. Correct option is : C
Solution:
The probability of getting queen card = 4/52
The probability of getting club card = 13/52
The club card contains already a queen card, therefore required probability is,
4/52 + 13/52 – 1/52 = 16/52 = 4/13

4. Correct option is : B
Solution:
Total possible ways = ${}^{16}C_2$
$= \frac{16 \times 15}{2 \times 1}$
= 120

5. Correct option is : B

Solution:
Clearly n(s) = 6*6 = 36
Let E be the event that the sum of the numbers on the 2 faces is divisible by either 3 or 5. Then
E = {(1,2), (1,4), (1,5), (2,1), (2,3), (2,4), (3,2), (3,3), (3,6), (4,1), (4,2), (4,5), (4,6), (5,1), (5,4), (5,5), (6,3), (6,4), (6,6)}
n(E) = 19
Hence P(E) = n(E) / n(s)
= 19/ 36

6. Correct option is : D
Solution:
Since the year of birth is Unknown, the birthday being on Monday can have a zero probability.
Also since between 26th and 30th, there are three days
i.e. 27th, 28th and 29
We have following possibilities on these three dates,
Monday, Tuesday, Wednesday
Tuesday, Wednesday, Thursday
Wednesday, Thursday, Friday
Thursday, Friday, Saturday,
Friday, Saturday, Sunday
Saturday, Sunday, Monday
Sunday, Monday, Tuesday
Out of these 7 events, we have 3 chances of his birthday falling on Monday
Probability = favourable events/ total events
Probability = 3/7
Therefore, the probability of birthday falling on Monday can be 3/7.

7. Correct option is : B
Solution:
We know that,
Probability=Favorable Cases/Total Cases
The probability that the number is a multiple of 4 is 10/40
Since favorable cases here {4,8,12,16,20,24,28,32,36,40}
=10 cases
Total cases= 40 cases
Similarly the probability that the number is a multiple of 14 is 2/40.
Since favorable cases here {14,28} =2 cases
Total cases= 40cases

Multiple of 4 or 14 have common multiple from 1 to 40 is 28.
Hence, these events are mutually exclusive events.
Therefore chance that the selected number is a multiple of4 or 14 is:
=(10+2-1)/40 =11/40

8. Correct option is : D
Solution:
Number of ways of arranging seven letters = 7!
Let us consider the two vowels as a group
Now the remaining five letters and the group of two vowels = 6
These six letters can be arranged in 6!2! ways(2! is the number of ways the two vowels can be arranged among themselves)
The number of ways of arranging seven letters such that no two vowels come together
= Number of ways of arranging seven letters – Number of ways of arranging the letters with the two vowels being together
= 7! – (6!2!)
= 3600

9. Correct option is : A
Solution:
Circular permutation = n! (n – 1)!
∴ Number of ways = 6! (6 – 1)! = 6! × 5!

10. Correct option is : A
Solution:
The probability of getting king card = 4/52
The first card is replaced so that, it doesn't affect the second drawn card.
Hence, probability of getting 2nd king card = 4/52
∴ Required Probability = 4/52 × 4/52 = 1/169

11. Correct option is :B
Solution:
Probability of 1 yellow dice = ${}^{5}C_1/{}^{10}C_1$
Probability of 1 red dice = ${}^{3}C_1/{}^{10}C_1$
Total outcomes = ${}^{5}C_1/{}^{10}C_1 + {}^{3}C_1/{}^{10}C_1$
$= \frac{5}{10} + \frac{3}{10} = \frac{8}{10}$
$= \frac{4}{5}$

12. Correct option is : D
Solution:
There are 15 prime numbers in the first 50 integers i.e. 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43 and 47.
There are 12 integers are multiples of 4 i.e 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44 an 48
∴ required probability= 15/50 + 12/50 = 27/50

13. Correct option is : C
Solution:
There are 13 heart and 3 king
Probability of getting heart or a king:
= (13+3)/52
=16/52
=4/13
So probability of getting neither hearts nor a king:
=1- 4/13
=9/13

14. Correct option is : A
Solution:
P(none is repair) = ${}^{9}C_{3}$ / ${}^{15}C_{3}$
= (9*8*7 / 3*2*1) / (15*14*13 / 3*2*1)
= (504/6) / (2730 / 6)
= 504/6 * 6/2730
= 504/2730
= 12/65
P(at least one is repair) = 1 – 12/65
= 53/65

15. Correct option is : D
Solution:
P(A) = ${}^{20}C_2$ / ${}^{30}C_2$, P(B) = ${}^{22}C_2$ / ${}^{30}C_2$
P(A∩B) = ${}^{15}C_2$ / ${}^{30}C_2$
P(A∪B) = P(A) + P(B) – P(A∩B)
=> $({}^{20}C_2/{}^{30}C_2)+({}^{22}C_2/{}^{30}C_2)-({}^{15}C_2/{}^{30}C_2)$
=316/435

16. Correct option is : B
Solution:

Total probability = ${}^{6}C_2 = 15$
Probability that one is Banana and another one is orange = ${}^{3}C_1 * {}^{3}C_1 = 9$
probability = 9/15 = 3/5

17. Correct option is : E
Solution:
Total Balls = 15
Probability = ${}^{4}C_2 * {}^{3}C_1 / {}^{15}C_3 = 18/455$

18. Correct option is : C
Solution:
_ _ 5
first two places can be filled in 5 and 4 ways respectively so, total number of 3 digit number = 5*4*1 = 20

19. Correct option is : A
Solution:
4 Indians can be seated together in 4! Ways, similarly for Africans and Japanese in 5! and 7! respectively. So total ways = 4! 5! 7! 3!

20. Correct option is : C
Solution:
Every chess match can have three result i.e. win, loss and draw
so now of ways = 3*3*3*3 = 81 ways

21. Correct option is : B
Solution:
Let the names of children be x, y and z. The probabilities of the three children to finish the race are 1/3, 1/5 and 1/4 respectively. It may be noted that one reaching the finishing point is independent of other reaching. If P(x), P(y) and P(z) denotes the probabilities.
The probability of at least one of them reaching the finishing point = 1 – P (none of them finishing the race)
$= 1 - (\frac{2}{3})(\frac{4}{5})(\frac{3}{4}) = \frac{3}{5}$

22. Correct option is : D
Solution:

Total characters = 9, vowels = 2, consonants = 7

Except the end places, vowels can be arranged at 7 places

No of ways = $^{7}C_{2}$ – 6 (minus 6 for the chances when both vowels are together) = 15

No of ways of arranging the 7 consonants = $\frac{7!}{3! \times 2!}$

Letters are K – 3, A – 2, C – 2, R, and J

No of arrangement with restriction = $\frac{15 \times !}{3! \times 2!}$

Total no of arrangements = $\frac{9!}{3! \times 2! \times 2!}$

Probability = $\frac{(15 \times 7!/\ 3! \times 2!)}{(9!/3! \times 2! \times 2!)} = \frac{5}{12}$

23. Correct option is : B
Solution:
Let s be the sample space.
Then n(S) = no. of ways of drawing 3 apples out of 12
= > $^{12}C_{3}$ = 12*11*10 / 3*2*1
= > 220
Let E = event of getting both apples of the same color.
Then n(E) = no. of ways of drawing 3 apples out of 7 or 3 apples out of 5
=$^{7}C_{3}$ +$^{5}C_{3}$
=7*6*5 / 3*2*1 + (5*4*3 / 3*2*1)
=35 + 10
=45
P(E) = n(E) / n(S)
= 45 / 220
= 9/44

24. Correct option is : D
Solution:
Let s be the sample space
Then n (S) = $^{52}C_{2}$
=52*51/2*1

=2652/2
=1326
Let E = event of getting 2 jack cards out of 4
n(E) = $^4C_2$ = 4*3 / 2*1
=12/2
=6
P(E) = n(E)/n(S)
= 6/1326
=1/221

25. Correct option is : C
Solution:
Total no. of pens = 4+ 2+5
=11
Let s be the sample space.
Then n(S) = no. of ways of drawing 2 pens out of 11
=$^{11}C_2$ = 11*10 / 2*1
=55
Let E = event of drawing 2 pens, none of which is blue
n(E) = no. of ways of drawing 2 pens out of 6 pens
=$^6C_2$
=6*5 / 2*1
=15
P(E) = n(E) / n(S)
=15 / 55
= 3/11

26. Correct option is : C
Solution:
Total no of questions= 15
Probability = $^5C_3/^{15}C_3$ = 2/91

27. Correct option is : B
Solution:
Total caps = 14
Probability = $^5C_2 * ^4C_1 * ^2C_1 / ^{14}C_4$ = 80/1001

28. Correct option is : E
Solution:
We have 6 men and 5 women.

We want to make a committee consisting of 3 men and 3 women.

$\therefore$ No. of ways of selecting 3 men out of 6 men = ${}^6C_3$

$\therefore$ No. of ways of selecting 3 women out of 5 women = ${}^5C_3$

So the no. of ways of forming a committee consisting of 3 men and 3 women $= {}^6C_3 \times {}^5C_3$

=> $\frac{6\times5\times4}{3\times2\times1} \times \frac{5\times4\times3}{3\times2\times1} = 200$

29. Correct option is : B

Solution:

"FORMULATE" is a nine letter word.

Since there are no repeating letters, the answer would simply be solved by 9! = 362880

This is solved directly by multiplying $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9$

Therefore, there are 362880 ways of arranging it.

30. Correct option is : C

Solution:

There are 10 even numbers in the group 1-21.

$\therefore$ The probability that the first ball is even numbered $= \frac{10}{21}$

Since the ball is not replaced there are now 20 balls left, of which 9 are even numbered.

$\therefore$ The probability that the second ball is even numbered $= \frac{9}{20}$

$\therefore$ Required probability $= \frac{10}{21} \times \frac{9}{20} = \frac{9}{42} = \frac{3}{14}$

31. Correct option is : B

Solution:

Let E_1, E_2 be the event of picking a green bulb and white bulb respectively.

Total no. of bulbs in a bag = 3 + 4 + 5 = 12

$E_1 = \frac{3}{12} = \frac{1}{4}$

$E_2 = \frac{5}{12} = \frac{5}{12}$

$P(E_1 \text{ or } E_2) = P(E_1) + P(E_2)$

$= \frac{1}{4} + \frac{5}{12} = \frac{2}{3}$

32. Correct option is : C
Solution:
When 4 fair coins are tossed simultaneously, the total number of outcomes is 2^4 = 16
At least 3 heads implies that one can get either 3 heads or 4 heads.
One can get 3 heads in ${}^4C_3$ = 4 ways and can get 4 heads in ${}^4C_4$ = 1 ways.
∴ Total number of favorable outcomes = 4 + 1 = 5
Required probability = $\frac{5}{16}$

33. Correct option is : B
Solution:
Number of possible combination of 3 persons in which 2 have to be women = (2 Women out of 5 x 1 Man out of 6) or (3 Women out of 5)
$= ({}^5C_2 \times {}^6C_1 + {}^5C_3)$
Total possible outcomes = ${}^{11}C_3$

$$= \frac{\frac{5!}{2! \times 3!} \times \frac{6!}{5! \times 1!} + \frac{5!}{3! \times 2!}}{\frac{11!}{3! \times 8!}} = \frac{70}{11 \times 15} = \frac{14}{33}$$

34. Correct option is : D
Solution:
We have a 6 letter word CRISIS
Out of which I and S repeat for 2 times.
Hence, number of different ways to arrange the letters of 'CRISIS'
$= \frac{6!}{2!2!}$
= 720 / (2×2)
= 180

35. Correct option is : A
Solution:
Two vowels can be selected from 4 in ${}^4C_2$ ways. Three consonants can be selected from 10 in ${}^{10}C_3$ ways.

$\therefore$ 2 vowels and 3 consonants can be selected in $({}^4C_2 \times {}^{10}C_3)$ ways

$= \frac{4\times3}{2\times1} \times \frac{10\times9\times8}{3\times2\times1} = 720$

36. Correct option is : C
Solution:
The given word is COUSIN. If vowels are arranged in dictionary order, then I will come before O and O will come before U.
There are 6 letters in this word which need to be arranged.
Let's first arrange the vowels. They can be placed in any 3 of the 6 places.
Number of ways of choosing these places = ${}^6C_3$
There's only one way of arranging the vowels in the selected places, and that is the alphabetical order.
Now, the remaining three letters, i.e. C, S and N are to be placed in remaining 3 places. This can be done in 3! Ways.
$\therefore$ Total number of possible arrangements = ${}^6C_3 \times 3! = 6 \times 5 \times 4 = 120$

37. Correct option is : A
Solution:
Number of possible outcomes = n(S) = 900
Numbers from 107 to 1006 divisible by 11 and 37 both = {407, 814} = 2
Numbers on cards not divisible by both 11 and 37 = 900 – 2 = 898
$\therefore$ Probability = $\frac{\text{n(FavourableEvents)}}{\text{n(Possibleoutcomes)}} = \frac{898}{900} = 0.998$

38. Correct option is : B
Solution:
According to the given information,
Card numbers which are multiples of 5 are 5, 10, 15, 20, 25, 30, 35, 40, 45
Card numbers which are multiples of 10 or 15 are 10, 15, 20, 30, 40, 45
The latter ones are to be ruled out from the former ones.
⇒ So, the only card numbers we are left with are 5, 25, 35.
$\therefore$ Probability of picking up a card, the number on which is a multiple of 5 but not that of 10 and 15 = 3/49

39. Correct option is : A
Solution:
The sum of their marbles is odd, as 43 + 92 = 135.

The sum of their marbles will remain same, irrespective of exchange of marbles. They both cannot have even number of marbles, as sum of 2 even numbers cannot be odd.

∴ The probability will be 0 as it is an impossible case.

40. Correct option is : D

Solution:

If there are exactly two coins in one of the bags, any bag can be chosen and then any two coins can be chosen to put into this bag.

Number of ways in which this can be done = $4 \times {}^{4}C_{2} = 24$

Third coin can be put in any of remaining three ways and fourth coin can be put in any of remaining two bags.

∴ Total number of ways in which this can be done = $24 \times 3 \times 2 = 144$

41. Correct option is : A

Solution:

If the dice is thrown for exactly four times, that means the numbers obtained in first three throws was even and that in fourth throw is odd (because there was no further throw).

⇒ Sum of numbers in four throws will be odd, and hence cannot be 16.

∴ Answer will be 0.

42. Correct option is : A

Solution:

Let the total number of person be N

∵ Total number of hand-shakes is 55

∵ For a hand shake we require two people, total number of handshake is ${}^{N}C_{2}$

∴ ${}^{N}C_{2} = 55$

∴ N = 11 persons

43. Correct option is : D

Solution:

The selected team should have at least two boys and at least two girls and the number of boys and girls should not be equal. So, there can be following cases:

i) Two boys and four girls

This can be done in ${}^{20}C_{2} \times {}^{25}C_{4}$ ways, i.e. $190 \times 12650 = 2403500$ ways.

ii) Four boys and two girls

This can be done in ${}^{20}C_{4} \times {}^{25}C_{2}$ ways, i.e. $4845 \times 300 = 1453500$ ways.

∴ Total number of ways in which team can be selected = 2403500 + 1453500 = 3857000

44. Correct option is : B
Solution:
Number of ways of selecting 2 people out of 4 from Engineering = $^4C_2$
Number of ways of selecting 2 people out of 5 from Management = $^5C_2$
Number of ways of selecting 2 people out of 3 from Medical = $^3C_2$
Required number of ways to form the committee where 2 persons are included from each department
= $^4C_2 \times {}^5C_2 \times {}^3C_2 = 6 \times 10 \times 3 = 180$
Hence, the number of ways to form the committee is 180.

45. Correct option is: B
Solution:
All black face cards have been removed i.e. 3 clubs and 3 spades have been removed.
Number of remaining cards = 52 - 6 = 46
Number of red cards = 26
Probability that first card is red = $\frac{26}{46} = \frac{13}{23}$
The first card drawn was red.
∴ Probability of second card being red $= \frac{25}{45} = \frac{5}{9}$
∴ Probability of being both the cards red = $\frac{13}{23} \times \frac{5}{9} = \frac{65}{207}$

46. Correct option is : B
Solution:
The number of ways for taking out 5 apples out of 12 = $^{12}C_5 = 792$
The number of ways of selecting only ripen apples = $^8C5 = 56$
(As 4 are not ripe and there are total 12, means only 8 are ripe)
Hence, the probability that chosen apples are ripe = 56/792 = 28/396 = 7/99

47. Correct option is: B
Solution:
When S is the sample space,
Probability of occurrence of the event, P(E) = $\frac{\text{Numberoffavorableoutcome,n(E)}}{\text{Numberofpossibleoutcome,n(S)}}$
In a simultaneous throw of two dice, total number of possible combinations = n(S) = 6 × 6 = 36
Let E be the event when the sum of both numbers is a prime number

E = {(1, 1), (2, 1), (1, 2), (1, 4), (4, 1), (2, 3), (3, 2), (1, 6), (6, 1), (3, 4), (4, 3), (5, 2), (2, 5), (5, 6), (6, 5)}
n(E) = 15
∴ Probability P(E) = n(E)/n(S) = 15/36 = 5/12

48. Correct option is : B
Solution:
Probability that the first ball will be of white color
$= \dfrac{8}{26} = \dfrac{4}{13}$
Probability that the second ball will be of black color
$= \dfrac{13}{25}$

$\therefore$ Reqd. probability $= \dfrac{4}{13} \times \dfrac{13}{25} = \dfrac{4}{25}$

49. Correct option is : A
Solution:
When a die is thrown 2 times, and sum of numbers is 5, the following cases would form the sample space:
S = {(1,4), (2,3), (3,2), (4,1)}
n(S) = 4
Now the event in which 3 appears at least once in the throws:
E = {(2,3), (3,2)}
n(E) = 2
Required probability = Number of favorable outcomes/Number of Exhaustive outcomes
∴ Required probability = n(E)/n(S) = 2/4 = 1/2

50. Correct option is : D
Solution:
There are 10 prime numbers between 51 to 100: 53, 59, 61, 67, 71, 73, 79, 83, 89, 97
∴ Probability that the number on the coin is a prime number = (10/50) = (1/5)
Probability that the number on the coin is not a prime number = 1 - probability that the number on the coin is a prime number
⇒ Probability that the number on the coin is not a prime number = 1 – 1/5 = 4/5

Probability – Moderate

1. Correct option is : B
Solution:
Daniel and Sherin will contradict each other when one speaks truth and other speaks lies.
Probability of Daniel speak truth and Sherin lies
=2/5*3/7
=6/35
Probability of Sherin speak truth and Daniel lies
=4/7*3/5
=12/35
The two probabilities are mutually exclusive.
Hence, probabilities that Daniel and Sherin contradict each other:
=6/35 +12/35
=18/35
=18/35*100
=51.4%

2. Correct option is : C
Solution:
The total number of students = 18
When 1 name was selected from 18 names, the probability that he was of section B

$= \frac{6}{18} = \frac{1}{3}$

But from the question, there are 6 students from the section B and the age of all 6 are different therefore, the probability of selecting one i.e. youngest student from 6 students will be 1/6

3. Correct option is : D
Solution:
Number of ways in which the person can pick three balls out of 18 balls
$= {}^{18}C_3 = 816$
Number of ways of picking 3 balls of same colour = ${}^{6}C_3 + {}^{4}C_3 + {}^{8}C_3 = (20 + 4 + 56) = 80$
Probability of picking three balls of same color

$= \frac{80}{816} = \frac{5}{51}$

Required probability = 1 – probability of picking three balls of same colour

$= 1 - \frac{5}{51} = \frac{46}{51}$

4. Correct option is : B
Solution:
The required probability = ${}^{3}C_1/{}^{10}C_1 \times {}^{10}C_1/{}^{15}C_1$
= 3/10 × 10/15 = 1/5

5. Correct option is : B
Solution:
Total boxes = 16
Total pieces = 16
Similar pieces = 8 pawns, 2 bishops, 2 rooks, 2 knights
Total ways of arranging these 16 pieces in 16 boxes
$= \frac{16!}{(8!\ 2!\ 2!\ 2!)} = \frac{16!}{(8 \times 8!)}$
Ways of correct arrangement = 1
Probability of correct arrangement $= \frac{1}{(16! / (8 \times 8!)}$

$= \frac{(8 \times 8!)}{16!} = \frac{8!}{(2 \times 15!)}$

6. Correct option is : C
Solution:
Pages = 1 cover page, 12 theory pages, 6 pictures page
Except cover page
Ways of arranging 12 + 6 pages = 18!
Ways of arranging so that the theory pages are in order and drawing pages come together= ${}^{13}C_1 \times 6!$
(As there are 13 gaps between 12 pages where 6 pages can be kept)
Probability $= \frac{{}^{13}C_1 \times 6!}{18!} = \frac{13 \times 40}{17!}$

7. Correct option is : B
Solution:
Total number of ways to select team blue without any restriction = ${}^{9}C_5$ Similarly team Red can be selected in ${}^{9}C_5$ ways

Total number of ways to select both the teams = ${}^9C_5 \times {}^9C_5$
P (at least one of them plays) = 1 – P (none of them plays)
Total number of ways of selecting team without selecting ankit and vaibhav
$= {}^8C_5 \times {}^8C_5$
P (at least one of them plays)

$$= 1 - \frac{({}^8C_5 \times 8C_5)}{({}^9C_5 \times {}^9C_5)} = \frac{65}{81}$$

8. Correct option is : D
Solution:
Blue marble – x
${}^xC_1/{}^{27}C_1 = 1/3$
x/27=1/3 —> x=27/3=9
No of green marbles = Total – Blue marble =27-9=18

9. Correct option is : A
Solution:
Total balls in A bag = 14, Total balls in A bag = 12
A bag = $1/2({}^8C_1/{}^{14}C_1) = 2/7$
B bag = $1/2({}^6C_1/{}^{12}C_1) = 1/4$ —> total Probability = 2/7 + 1/4 =15/28

10. Correct option is : B
Solution:
The probability of an even number appearing on the first draw is 1/2(since there are 25 even numbers in counting of 1 to 50).
The probability of an odd number appearing on the second draw is 1/2(since there are 25 odd numbers in counting of 1 to 50).
The probability of a number divisible by 3 appearing on the third draw is 16/50 (since there are 16 numbers that are divisible by 3 while counting from 1 to 50.)
Since all these events have no relation with each other and no dependence either, and the slips are replaced, we can directly multiply the individual probabilities to get the resultant probability.
So, the probability of all the events taking place is

$$\frac{1}{2} \times \frac{1}{2} \times \frac{16}{50} = \frac{2}{25}$$

11. Correct option is : A

Solution:
There are 2 decks of 52 cards each.
When we select first card from first deck, it can be any of 52 cards.
Number of ways in which this can be done = ${}^{52}C_1 = 52$
When we select second card from first deck, it can be any of 39 cards that are not of same type as we got in first pick.
Number of ways in which this can be done = ${}^{39}C_1 = 39$
When we select third card from second deck, it can be any of 26 cards that are not of same type as we got in first and second picks.
Number of ways in which this can be done = ${}^{26}C_1 = 26$
When we select fourth card from second deck, it can be any of 13 cards that are not of same type as we got in first second and third picks.
Number of ways in which this can be done = ${}^{13}C_1 = 13$
∴ Total number of ways in which this can be done = $52 \times 39 \times 26 \times 13 = 685464$

12. Correct option is : C
Solution:
Let's assume that P_A is the probability that event A occurs and P_B is the probability that event B occurs.
∴ probability that A does not occur = $1 – P_A$
∴ probability that B does not occur = $1 – P_B$
∵ the two events are independent,
The probability that both occur = $P_A \times P_B = 1/12$
Similarly, the probability that neither A not B occurs = $(1 – P_A) \times (1 – P_B) = ½$
$\Rightarrow 1 – P_B – P_A + P_A.P_B = ½$
$\Rightarrow 1 – (P_A + P_B) = \frac{1}{2} - \frac{1}{12} = \frac{5}{12}$
$\Rightarrow P_A + P_B = 7/12$ ------(i)
We know that, $(P_A – P_B)^2 = (P_A + P_B)^2 – 4P_A.P_B$
$\Rightarrow (P_A – P_B)^2 = (\frac{7}{12})^2 – (4\times \frac{1}{12}) = \frac{49}{144} - \frac{4}{12} = \frac{1}{144}$
$\Rightarrow P_A – P_B = 1/12$ or $(-1/12)$ -------(ii)
Solving equation (i) and (ii) simultaneously, gives:
$P_A = 1/3$ and $P_B = ¼$ OR $P_A = ¼$ and $P_B = 1/3$
∴ $P_A = 1/3$ and $P_B = ¼$ (or) $P_A = ¼$ and $P_B = 1/3$ is the solution.

13. Correct option is : B
Solution:
There are total 4 coins in 1st purse, out of which 1 coin is a rupee.
Probability of taking out a rupee coin from 1st purse = 1/4

Similarly,
Probability of taking out a rupee coin from 2nd purse = 2/6
Probability of taking out a rupee coin from 3rd purse = 3/5
But, the purse itself is selected at random,
Probability of selecting any 1 purse = 1/3
Required probability = P(selecting a purse) × P(taking a rupee coin from that purse)
= (1/3) × (1/4) + (1/3) × (2/6) + (1/3) × (3/5)
= (1/3) × [(1/4) + (2/6) + (3/5)]
= 71/180

14. Correct option is : A
Solution:
Since there are 4 red, 3 green, 2 blue and 5 black balls in the bag, there are a total of 14 balls in the bag.
4 balls are drawn at random; therefore exhaustive number of cases = ${}^{14}C_4$
Total cases are = ${}^{14}C_4$ = (14 × 13 × 12 × 11)/(1 × 2 × 3 × 4) = 1001
Now we need to find the case where two are red and two are blue = ${}^{4}C_2 \times {}^{2}C_2$
= 6 × 1 = 6
Therefore the required probability = 6/1001

15. Correct option is : C
Solution:
Given,
Total no. of probability = 9+x
Required probability = 5/(9+x)=1/3
=>9+x=15
=>x=6
=>6+9=15

16. Correct option is : B
Solution:
Probability of getting one green ball in bucket A = x/(2x+5)=1/3
X=5
Required no of ball in bucket B = 3+6=9

17. Correct option is : C
Solution:
Probability of getting one black colour ball in bucket P = x/(9+x)=2/5

$=>3x=18$
$=>x=6$
Required probability in bucket Q = $1-{}^{11}C_2/{}^{20}C_2=1-11/38=27/38$

18. Correct option is : C
Solution:
The probability of choosing one pot = 1/2
The probability of choosing white ball in first pot = $1/2 \times [\,{}^{5}C_1 / {}^{8}C_1] = 5/16$
The probability of choosing white ball
$= 1/2 \times [{}^{5}C_1 / {}^{8}C_1] + 1/2 \times [{}^{4}C_1 / {}^{10}C_1]$
$= 1/2 \times [5/8] + 1/2 \times [4/10]$
$= 5/16 + 1/5 = 41/80$
∴ The probability that it is from the first pot = (5/16) / (41/80)
$= 5/16 \times 80/41 = 25/41$

19. Correct option is: D
Solution:
Total number of ways in which both of them can select a number each:
=8*8
=64
Total number of ways in which both of them can select a same number so that they both can win:
=8ways
[They both can select {(1,1),(2,2),(3,3),(4,4),(5,5),(6,6),(7,7),(8,8)}]
Probability that they win the prize:
=Favourable Cases / Total Cases
=8/64
=1/8
Probability that they do not win a prize:
=1-1/8
=7/8

20. Correct option is : D
Solution:
Out of the 5 girls, 3 girls are to be invited
It can be done in ways = 10 ways
Now, nothing is given about the number of boys to be invited
Keshav can invite one boy, two boys, three boys, all the four boys or no boy
Hence, the total number of ways of selection of boys = 16
So, the total number of ways of invitation = 10 * 16 = 160

21. Correct option is : B
Solution:
Given,
${}^{6}C_2/{}^{(X+18)}C_2=5/92$
$X^2+35x-246=0$
Simplify the above equation we get x=6
Required difference = 10-8=2 balls

22. Correct option is : E
Solution:
Required probability = (2/3*3/5*1/4) + (1/3*3/5*1/4) + (2/5*2/3*1/4) + (3/4*2/3*3/5)
=(6/60) + (3/60) + (4/60) + (18/60)
= 31/60

23. Correct option is : C
Solution:
Total no. Of possible outcomes= 2^5 =32
Number of tails and heads can be (5, 0), (4, 1), (3, 2) respectively for getting more heads than tails.
N (E) = ${}^{5}C_5+{}^{5}C_4+{}^{5}C_3$ = 1+5+10 = 16
P (E) =n (E) /n(S) =16/32
P (E) =1/2

24. Correct option is : A
Solution:
P(odd) = P(even) = 1/2
Sum of three numbers to be even cases
Even+ even+ even = 1/2*1/2*1/2
Even+ odd+ odd = 1/2*1/2*1/2
Odd+ odd + even = 1/2*1/2*1/2
Odd+ even + odd = 1/2*1/2*1/2
Probability = 1/8+1/8+1/8+1/8 = ½

25. Correct option is : B
Solution:
Total probability = ${}^{20}C_4$ = (20*19*18*17) / (2*3*4)
=4845
Either Pink or Black = ${}^{4}C_2+{}^{5}C_2$ = 6+10 =16
Two balls are taken out randomly = ${}^{18}C_2$ =18*17/2

=153
Total probability = (16/4845) +(153/4845)
= 169/4845

26. Correct option is : B
Solution:
X/(7+X+5) =2/5
X =8
Bag B = 5 R, 4 Y , 6 G
Probability = 5/15*4/14 = 2/21

27. Correct option is : B
Solution:
P (B/A) = (p (A and B) /p (A))
P (second/first) = P (first and second) / P (first)
= 0.3 /0.48 = 0.625 = 62.5%

28. Correct option is : B
Solution:
Total digit = 7. Total 1 = 1, Total 0 =1, total 2 = 3 and total 4 =2
Total 7 digit numbers = $\frac{7!}{3!2!1!}$ = 420
But, there numbers include also the number having 0 at their 0 at the extreme left
Thus, total numbers having 0 at extreme left = $\frac{6!}{3!2!1!}$
Total 7 digits numbers = 420 – 60 = 360

29. Correct option is : A
Solution:
n(S)= number of ways of sitting 12 persons at round table:
=(12-1)!=11!
Since two persons will be always together, then number of persons:
=10+1=11
So, 11 persons will be seated in (11-1)!=10! ways at round table and 2 particular persons will be seated in 2! ways.
n(A)= The number of ways in which two persons always sit together =10!×2
So probability = 10!*2!/11!= 2/11

30. Correct option is : C
Solution:
First we have to find the no. of brown tiles,

$2/7 = X / (12+8+X)$
$2 * (20+X) = 7X$
$40+2X = 7X$
$5X = 40$
$X = 8$
Probability of choosing white color tiles,
$= 8 / (8+8+12)$
$= 2/7$.
Not Choosing $= 1-(2/7) = 5/7$

31. Correct option is : D
Solution:
There are 7 letters in the word ‘Bengali; of these 3 are
vowels and 4 consonants.
I. Considering vowels a, e, i as one letter, we can arrange letters in 5! ways in each of which vowels are together.
These 3 vowels can be arranged among themselves in 3! ways
Total number of words $= 5! \times 3! = 120 \times 6 = 720$
Vowels never together $= 7! – 720 = 4320$
II. There are 4 odd places and 3 even places. 3 vowels can occupy 4 odd places in 4P3 ways and 4 constants can be arranged in 4P4 ways
Number of words = 4P3 * 4P4 = 24 * 24 = 576

32. Correct option is : B
Solution:
The candidate has to select six questions in all of which at least two should be from Part I and two should be from Part II. He can select questions in any of the following ways

	(i)	(ii)	(iii)
Part I	2	3	4
Part II	4	3	2

If the candidate follows choice (i), the number of ways in which he can do so is = 5C2 * 5C4
= 10 * 5 = 50
If the candidate follows choice (ii), the number of ways in which he can do so is = 5C3 * 5C3
= 10 * 10 = 100
Similarly, if the candidate follows choice (iii), then the number of ways in which he can do so is = 5C4 * 5C2 = 50
Therefore, the candidate can select the question in 50 + 100 + 50 = 200 ways

33. Correct option is : E
Solution:
We are to choose 11 players including 1 wicket keeper and 4 bowlers or 1 wicket keeper and 5 bowlers.
Number of ways of selecting 1 wicket keeper, 4 bowlers and 6 other players = 2C1 * 5C4 * 9C6
= 2 * 5* 84 = 840
Number of ways of selecting 1 wicket keeper, 5 bowlers and 5 other players = 2C1 * 5C5 * 9C5
= 2 * 1 * 126 = 252
Total number of ways of selecting the team = 840 + 252
= 1092

34. Correct option is : D
Solution:
Probability of choosing a boy = 24/40
Probability of choosing a A grade student = 10/40
So, probability of choosing an ‘A grade’ boy = 4/40
Probability of choosing a boy or ‘A grade’ student =
24/10 +10/40 -4/40
= (24+10-4) /40 =30/40
= 3 /4

35. Correct option is : B
Solution:
Six letter words with at least two vowels can have 2, 3, 4 or 5 vowels as no letters can be repeated.
There are 21 consonants and 5 vowels.
All possible cases:
2 vowels and 4 consonants
3 vowels and 3 consonants
4 vowels and 2 consonants
5 vowels and 1 consonant
∴ Number of ways in which this can be done
$= {}^5C_2 \times {}^{21}C_4 + {}^5C_3 \times {}^{21}C_3 + {}^5C_4 \times {}^{21}C_2 + {}^5C_5 \times {}^{21}C_1$
= 10 × 5985 + 10 × 1330 + 5 × 210 + 1 × 21 = 74221
In each of these cases, chosen 6 letters can arrange themselves in 6! Ways.
∴ Total number of ways in which this can be done = 6! ×74221
= 720 × 74221 = 53439120

36. Correct option is : D
Solution:
S = { HH, HT, T1, T2, T 3, T 4, T 5, T6 }
Let A be the event that the die shows a number greater than 4 and B be the event that the first throw of the coin results in a tail then,
A = { T5, T6 }
B = { T1, T2, T 3, T 4, T 5, T6 }
Then P=P(A and B)/P(B)=(2/8)/(6/8)=1/3.

37. Correct option is : C
Solution:
P(A) = 1/3 P(A') = 2/3
P(B) = 3/5 P(B') = 2/5
P(C) = 2/5 P(C') = 3/5
Exactly two of them hit
= P(A & B hits & C misses) + P(A & C hits & B misses) + P(B & C hits & A misses)
= (1/3*3/5*3/5) + (1/3*2/5*2/5) + (3/5*2/5*2/3)
=9/75 + 12/75 + 4/75 ==>25/75=1/3.

38. Correct option is: B
Solution:
Probability of grasshopper not eating grass

$$= 1 - \frac{1}{5} = \frac{4}{5}$$

Reqd probability $= \frac{1}{9} \times \frac{1}{8} \times \frac{1}{7} \times \frac{1}{6} \times \frac{4}{5} = \frac{1}{3780}$

39. Correct option is : C
Solution:
Let us say that Paul selected Ghana.
Then probability of Ghana winning = 2/3 × 2/3
= 4/9
Let us say the Paul selected Bolivia
Then probability of Bolivia winning = (1 - 2/3) × (1 - 2/3)
= 1/3 × 1/3

= 1/9
Hence total probability of Paul getting correct guesses = (4/9) + (1/9)
= 5/9

40. Correct option is : A
Solution:
Probability of red car coming through test area = 1/2
Probability of blue car coming through test area = 1/2
∴ Probability of same color car coming 5 consecutive times = $(1/2)^5$ = 1/32
But there are two types of cars equally likely.
So probability of same color car coming 5 consecutive times = 2 × (1/32) = 1/16

41. Correct option is : C
Solution:
As in PRANKED total number of letters are 7 and the lowest letter as per dictionary is A so words starting with A are = 6! (number of letters left in PRANKED other than A)
= 6 × 5 × 4 × 3 × 2 × 1 = **720 words** so 55^{th} word will definitely start with A.
After A next letter is D so words starting with AD are = 5!(number of letters left in PRANKED other than AD) = 5 × 4 × 3 × 2 × 1 = 120 so 55^{th} word will definitely start with AD.
After AD next letter is E so words starting with ADE are = 4!(number of letters left in PRANKED other than ADE) = 4 × 3 × 2 × 1 = 24 so 55^{th} word is not included in it
And after combination of ADE next combination is ADK so words forming with ADK = 4!(number of letters left in PRANKED other than ADK) = 4 × 3 × 2 × 1 = 24 so 24 + 24 = 48 so 55^{th} word is not included in it.
After combination of ADK next combination is ADN so words forming with ADN = 4!(number of letters left in PRANKED other than ADN) = 4 × 3 × 2 × 1 = 24 so 24 + 24 +24 = 72 so 55^{th} word is included in it.
So ADNE will be the next combination and with it 3! = 3 × 2 × 1 = 6 words can form so 48 + 6 = 54
So after ADNE next combination is ADNK and with it 3! = 3 × 2 × 1 = 6 words can form so **ADNKEPR is the 55^{th} word**.

42. Correct option is : A
Solution:
Say A, B and C are the three committees.
n(A ∩ B ∩ C) = 2, n(A ∩ B) = 3, n(A ∩ C) = 3 and n(B ∩ C) = 3

⇒ Number of people in committee A and B but not in C = 3 – 2 = 1
⇒ Number of people in committee A and C but not in B = 3 – 2 = 1
So minimum number of people in committee A = 1 + 1 + 2 = 4

43. Correct option is : C
Solution:
We have total number of friends = 9
Total number of spouses = 9
Hence total number of people in picture = 9 + 9 + 2 (the hosts)
= 20
Hence they can be arranged in 20! Ways
When Mr and Mrs Smith are together, assume both as a group. Now total people = 19
Number of arrangement, when Mr and Mrs Smith are together = 19! × 2!
So, Number of ways arrangement when Mr and Mrs Smith are not together in the photograph
= 20! – 19! × 2!
= 20 × 19! – 19! × 2
= 18 × 19!

44. Correct option is: B
Solution:
Let xyz is the three digit number.
∴ according to given condition y = (x+z)/2
⇒ (x + z) = 2y …… (Eq.1)
And (x+y+z) = 9 ……. (Eq.2)
Substituting Eq.1 in Eq.2 ⇒ 3y = 9 ⇒ y = 3
⇒ From Eq.1 (x + z) = 6
Number of possibilities for (x + z) = 6 are 6 viz.(6,0), (5,1), (4,2), (3,3), (2,4), (1,5)
∴ There are 6 possibilities for such number.

45. Correct option is : B
Solution:
Probability of getting a red ball can be maximised by taking only one red ball in one box and transferring all other red balls into other boxes.
Now probability of choosing each box is (1/2).
Probability of choosing red box = (1/2) × 1 + (1/2) × (9/19)
= (1/2) × (28/19) = 14/19

46. Correct option is : C
Solution:
Probability that patiyala is not white = 4/5
Probability that top is not white = 5/6
Required probability = Probability that patiyala is not white * Probability that top is not white
=4/5*5/6
=4/6
=2/3

47. Correct option is : A
Solution:
The probability of choosing one white ball from the bag 1
$= \frac{4}{7}$
The probability of choosing one white ball from the bag 2
$= \frac{6}{11}$

The probability of choosing one out of two bags = $\frac{1}{2}$

The reqd. probability = $\frac{1}{2}(\frac{4}{7} + \frac{6}{11}) = \frac{44 + 42}{2 \times 77} = \frac{43}{77}$

48. Correct option is : C
Solution:
Case 1 : 1 apple, 1 Mango, 3 bananas
The number of ways = ${}^6C_1 \times {}^4C_1 \times {}^3C_3 = 6 \times 4 \times 1 = 24$ ways
Case2 : 1 apple, 1 banana, 3 mangoes
The number of ways = ${}^6C_1 \times {}^3C_1 \times {}^4C_3 = 6 \times 3 \times 4 = 72$ ways
Case3 : 1 banana, 1 mango, 3 apples
The number of ways = ${}^3C_1 \times {}^4C_1 \times {}^6C_3 = 3 \times 4 \times 4 \times 5 = 240$ ways
The total number of ways = 72 + 240 + 24 = 336 ways
In the rest other selection, the same type of fruits will become in even number.

49. Correct option is : C
Solution:
Let the number of red balls be x,
Probability = ${}^5C_2 / {}^{(x+5)}C_2 = 5/33$

$(5 * 4) / [(x + 5)(x + 4)] = 5/33$
$132 = (x + 5)(x + 4)$
$X^2 + 9x + 20 = 132$
$X^2 + 9x – 112 = 0$
$(x + 16)(x – 7) = 0$
x = -16, 7 (Negative value will be eliminated)
So, x = 7
The number of red balls = 7 balls

50. Correct option is : B
Solution:
Since the gents should not be outnumbered,
The number of ladies can at the most be equal to the number of gents so,
The possibilities are:
6 gents, 0 ladies $^6C_6 {}^7C_0 = 1(1) = 1$
5 gents, 1 ladies $^6C_5 {}^7C_1 = 6(7) = 42$
4 gents, 2 ladies $^6C_4 {}^7C_2 = 15(21) = 315$
3 gents, 3 ladies $^6C_3 {}^7C_3 = 20(35) = 700$
Total number of ways = 1,058

Probability – Hard

1. Correct option is : A
Solution:
Let, the number of pink balls be p
Probability of choosing a pink ball = $\frac{p}{35}$

=> $\frac{3}{7} = \frac{p}{35}$
=> p = 15
So, remaining number of balls = (35 – 15) = 20
Number of orange balls = $\frac{2}{2+3} \times 20 = 2 \times 4 = 8$

Therefore, reqd. probability = $\frac{^8C_1 \times {}^{15}C_1}{^{35}C_2}$

$$= \frac{8 \times 15}{35 \times 34/2} = \frac{24}{119}$$

2.Correct option is : B

Solution:

Let the tiffin boxes be T1 and T2. T1 contains x pink and x-4 yellow toffees; T2 contains x-3 pink and x-1 yellow toffees. The possibility is that either of T1 or T2 is selected with a probability of 1/2 in each case. Having selected a tiffin, two different toffees are selected. The probability is 67/132.

$$\frac{[x(x-4)/{}^{2x-4}C_2]}{2} + \frac{[(x-1)(x-3)/{}^{2x-4}C_2]}{2} = \frac{67}{132}$$

$$\frac{\{(2x^2 - 8x + 3)/{}^{2x-4}C_2\}}{2} = \frac{67}{132}$$

$$\frac{(2x^2 - 8x + 3)}{{}^{2x-4}C_2} = \frac{134}{132}$$

$$\frac{(2x^2 - 8x + 3)}{{}^{2x-4}C_2} = \frac{67}{66} \text{..........(i)}$$

Total number of toffees in first tiffin = x + x – 4 = 2x – 4

Now putting the value of total number of toffees i.e.; 2x – 4 in (1)using options

From option (a)

2x – 4 = 8

x = 6

put value of x in (1)

$$\text{L.H.S} = \frac{\{2(36) - 8(6) + 3\}}{{}^{8}C_2} = \frac{27}{28}$$

L.H.S ≠ R.H.S

From option (b)

2x – 4 = 12

x = 8

put value of x in (1)

$$\text{L.H.S} = \frac{67}{66}$$

L.H.S = R.H.S

3. Correct option is : A
Solution:
According to the question,
P(X')/P(X)=7/4
P(X')=7/11
P(X)=4/11
P(Y')/P(Y)=5/3
P(Y')=5/8,P(Y)=3/8
Now, out of X,Y and Z, one and only one can happen.
P(X)+P(Y)+P(Z)=1
4/11+3/8+P(Z)=1
P(Z)=1-4/11-3/8
=88-32-33/88
=23/88
P(Z')=1-P(Z)
=1-23/88
=65/88
So odd against z
P(z')/p(z)=65/23

4. Correct option is : B
Solution:
Odd digits =1, 3,5,7,9
Even Digits =0, 2,4,6,8
Since,
Odd number= odd position; Even number = Even
Position
Favorite ways = 5P2 and 5P1 = 5*4*5 =100
Total three digit numbers that can be formed = 9*10*10
=900
Total Probability =100/900 =1/ 9.

5. Correct option is : C
Solution:
The available digits are 0, 1, 2 …9
The first digit can be chosen in 9 ways (0 not acceptable); the second digit can be accepted in 9 ways
(digits repetition not allowed)

Thus, the code can be made in 9 × 9 = 81 ways
Now there are only 4 digits 1, 6, 8, 9 which can create confusion
Hence, the total number of codes which create confusion are = 4 × 3 = 12
Out of these 12 codes 69 and 96 will not create confusion
Hence, in total 12 – 2 = 10 codes will create confusion
Hence, the total codes without confusion are 81 – 10 = 71

6. Correct option is : D
Solution:
${}^{W}C_2/{}^{(B+W)}C_2 = 14/33$
W (W-1)/(W+B)*(B+W-1) = 14/33
Now expressing 14/33 in the above format by multiplying 4 in numerator and denominator
W (W-1)/(W+B)*(B+W-1) = 8*7/12*11 (note = balls <15)
W =8
W+B =12 B =4
Probability = ${}^{4}C_2/{}^{12}C_2 = 1/11$

7. Correct option is : A
Solution:
Let original number be 10a+b
So 10a+b>4(10b+a)
10a+b> 40b+4a
6a>39b
If b =1 then 6a>39 or a≥ 7 so possible numbers are 71, 81 & 91.
If b =2 then 6a>78 or a> 13 which is not possible a is a single digit number. Hence possible numbers are only 3

8. Correct option is : B
Solution:
Probability of getting 2 green balls from bag A = ${}^{5}C_2/{}^{10}C = 2/9$
Probability of getting 2 green balls from bag B =
${}^{x}C_2/{}^{(x+11)}C_2 = x(x-1)/\{(x+11)(x+10)\}$
Now ATQ,
x (x-1)/{(x+11) (x+10)} = 2/9 – 52/315
x (x-1)/{(x+11) (x+10)} = 18/315 = 2/35 --- (1)
Now putting all the options one by one in equation (1), we will check
When. x= 4,
4(4-1)/{(4+11)(4+10)} = 12/210 = 2/35 which satisfy the equation.

9. Correct option is : A
Solution:
Given that there are two cases
One is choosing a card from well shuffled cards and other one is throwing a die
In first case there are 6 possible ways (1, 2, 3, 4, 5, 6)
In second case also there are 6 possible ways (1, 2, 3, 4, 5, 6)
When we use both cases simultaneously there are 36 possible cases
Possibility of getting sum 8 = (2,6), (6,2), (3,5), (5,3), (4,4) = 5
Possibility of getting sum 9 = (3,6), (6,3), (4,5), (5,4) = 4
Possibility of getting sum 10 = (4,6), (6,4), (5,5) = 3
When we use two methods simultaneously more often occurring sum = 8

10. Correct option is : D
Solution:
This can be solved by assuming closer to centre of the circle is less than half the radius and closer to periphery is more than half the radius from centre.
Divide the dart into two concentric circles. Radius of smaller is r/2 and bigger is r.
Dart is closer to centre Q lies in smaller circle.
Probability of point Q lying closer to the centre = (Area of Smaller circle)/(Total area of dart board)
$= (\pi \times (r/2)^2)/(\pi r^2)$
$= 1/4 = 0.25$

11. Correct option is : E
Solution:
Probability of getting a white ball in 2 trails
$= \{P\,(\overline{W})\}^2 = \frac{1}{81}$

$\{P\,(\overline{W})\} = \frac{1}{9}$; ∴ Number of white ball = 1
Similarly ,probability of getting yellow ball in two trails

$= \{P\,(Y)\}^2 = \frac{4}{9}$

$\{P\,(Y)\} = \frac{2}{3}$; ∴ Number of yellow ball = 6

Number of Black balls = 9 – (6 + 1) = 2

$P(B) = \frac{2}{9}$; $P(W) = \frac{1}{9}$; $P(Y) = \frac{6}{9}$

There are six different ways of getting 3 different balls of 3 different colour.They are

(B, Y, W) , (Y, B, W) , (Y, W, B) , (W, Y, B), (B, W, Y) , (W, B, Y)

Probability of each six $= \frac{2}{9} \times \frac{1}{9} \times \frac{6}{9} = \frac{4}{243}$

Reqd. probability $= \frac{4}{243} \times 6 = \frac{8}{81}$

12. Correct option is : D

Solution:

Red balls = 2/6 * 30 = 10

Yellow balls = 3/6 * 30 = 15

Blue balls = 1/6 * 30 = 5

Red balls from A = 20/100 * 10 = 2

Yellow balls from A = 40/100 * 15 = 6

Blue balls from A = 20/100 * 5 = 1

Red balls from B = 10 – 2 = 8

Yellow balls from B = 15 – 6 = 9

Blue balls from B = 5 – 1 = 4

2 Yellow balls drawn from A = ${}^{6}C_2 / {}^{9}C_2$ = 5/12

Three red balls drawn from B = ${}^{8}C_3 / {}^{21}C_3$ = 4/95

Difference = 5/12 – 4/95 = 427/1140

13. Correct option is :A

Solution:

Let the number of girls be x

The reqd. probability

$$= \frac{{}^{x}C_2}{{}^{5+x}C_2} = \frac{x \times (x-1)}{(5+x)(4+x)} = 16.67\% = \frac{1}{6}$$

$(x^2 - x) \times 6 = x^2 + 9x + 20$

$5x^2 - 15x - 20 = 0$

By solving. $x = 4$ or -1

Negative value is not possible therefore, $x = 4$

P(at least one boy) = 1 – P(No boys at all/ both are girls)

$$1 - \frac{{}^4C_2}{{}^9C_2} = 1 - \frac{3 \times 4}{9 \times 8} = 1 - \frac{1}{6} = \frac{5}{6}$$

14. Correct option is : A
Solution:
Number of red marbles = 8
Number of green marbles = 10
In Bag B:
Number of red marble = 10
Number of green marbles = 13
Case I:
If red marble is transferred, then bag B will have 11 red marble and 13 green marble,
Probability that red marble is drawn
= P (red marble transfer) × P (drawing red marble)

$$= \frac{8}{18} \times \frac{11}{24} = \frac{11}{54}$$

Case II:
If green marble is transferred, then bag B will have 10 red marble and 14 green marble
Probability that red marble is drawn
= P (green marble transfer) × P (drawing red marble)

$$= \frac{10}{18} \times \frac{10}{24} = \frac{25}{108}$$

So, Probability that marble drawn is red in colour

$= \underline{11} + \underline{25\ } = \underline{22 + 25} = \underline{47\ }$

54 108 108 108

15. Correct option is : D
Solution:
Let probability of getting an odd number= x
Then, probability of getting an even number = 2x
So, x + 2x = 1

$\Rightarrow x = \frac{1}{3}$

Let probability of getting a multiple of 4 = y

Then, probability of getting rest of the even numbers = $\frac{y}{3}$

Therefore, $y + \frac{y}{3} = 2x$

$\Rightarrow \frac{3y + y}{3} = \frac{2}{3}$

$\Rightarrow y = \frac{1}{2}$

Required probability = $\frac{1}{6}$

16. Correct option is : D
Solution:
Any of the three friends can ride the horse for each hour
The number of total cases = 35
Now, after 3 hours, two friends must be repeated

That can be done in ${}^{3}C_{2} \times \frac{5!}{2! \times 2!} = 90$ ways

The required probability = $\frac{90}{3^5} = \frac{10}{27}$

17. Correct option is : D

Solution:
Let, another bag contains 2x red, x blue and 2x green balls initially.
Case I: A green ball is drawn from the bag P
Probability of drawing green ball from the bag Q

$$= \frac{\frac{12}{27} \times (2x + 1)}{5x + 1}$$

Case II: A blue ball is drawn from the bag P
Probability of drawing green ball from the bag Q

$$= \frac{\frac{15}{27} \times (2x)}{5x + 1}$$

So the probability of drawing a green ball from the bag

$$= \frac{\frac{12}{27} \times (2x + 1)}{5x + 1} + \frac{\frac{15}{27} \times (2x)}{5x + 1} = \frac{65}{162}$$

$$\frac{24x + 12 + 30x}{135x + 27} = \frac{65}{162}$$

$$\frac{54x + 12}{135x + 27} = \frac{65}{162}$$

8748x + 1944 = 8775x + 1755
27x = 189
x = 7
So, the total number of balls in the bag Q initially = 5 × 7 = 35

18. Correct option is : E
Solution:
Number of ways to select the team having exactly two female players = ${}^{9}C_{4} \times {}^{x}C_{2}$ = 1890

$$126 \times \frac{x\,(x - 1)}{2} = 1890$$

$x^2 - x = 30$
$x^2 - x - 30 = 0$
$x^2 - 6x + 5x - 30 = 0$
$x(x - 6) + 5(x - 6) = 0$
$(x - 6)(x + 5) = 0$

$x = 6, -5$
Number of players can't be negative, so the value of $x = 6$

19. Correct option is : B
Solution:
Let, number of red colour balls = 'x'
So, total number of balls in bag = 8 + 6 + x = '14 + x'

Therefore, $\frac{{}^{x}C_1 \times {}^{8}C_1}{{}^{(14+x)}C_2} = \frac{22}{75}$

$$\frac{2 \times x \times 8}{(14 + x)(13 + x)} = \frac{22}{75}$$
$600x = 11 \times (182 + 27x + x^2)$

$600x = 2002 + 297x + 11x^2$
$11x^2 - 303x + 2002 = 0$
$11x^2 - 121x - 182x + 2002 = 0$
$11x(x - 11) - 182(x - 11)$
$(x - 11)(11x - 182)$

$x = 11, \frac{182}{11}$

Number of balls cannot be in fraction.
So, $x = 11$

Reqd probability $= \frac{({}^{11}C_2 \times {}^{8}C_1) + ({}^{11}C_2 \times {}^{6}C_1) + {}^{11}C_3}{{}^{25}C_3}$

$= \frac{(55 \times 8) + (55 \times 6) + 165}{2300} = \frac{935}{2300}$
$= \frac{187}{460}$

20. Correct option is : B
Solution:
Total number of ways $= {}^{15}C_4 \times {}^{11}C_4 = 450450$
When Tier-1 comprises bowlers only and Tier-2 comprises batsmen only

Number of ways = ${}^7C_4 \times {}^8C_4$
When Tier-1 comprises batsmen only and Tier-2 comprises bowlers only
Number of ways = ${}^8C_4 \times {}^7C_4$
When both Tier-1 and Tier-2 comprises of batsmen only
Number of ways = ${}^8C_4 \times {}^4C_4$
Total number of ways = ${}^7C_4 \times {}^8C_4 + {}^8C_4 \times {}^7C_4 + {}^8C_4 \times {}^4C_4 = 4970$

Reqd. probability = $\frac{4970}{450450} = \frac{497}{45045}$

21. Correct option is : C
Solution:
Let the number on the ball picked first = a, second = b, third = c.
The order of a, b and c can be (a>b>c)
Number of ways selecting the first number = 13 (Because we can't select 0 and 1)
Number of ways selecting the second number = 13 (Because we can't select 0)
Number of ways selecting the third number = 13 (Because we can't select first and third number) Required probability = $(13 * 13 * 13)/15^3$
= 2197/3375

22. Correct option is : A
Solution:
Let the number of boys be x and girls be y.
No. of races played between boys = ${}^xC_2 = 10 = x(x – 1) = 20 => x = 5$
Total number of boys participating in running race is 5.
No. of races played between girls = ${}^yC_2 = 45 = y(y – 1) = 90 => y = 10$
Total number of girls participating in running race is 10.
Therefore, no of running races in which one player is boy and one is girl is,
= ${}^5C_1 \times {}^{10}C_1 = 5 * 10 = 50$

23. Correct option is : E
Solution:
308/4845 = (12 / 20) * (y / 19) * (11 / 18) * ((y – 1) / 17))
$Y^2 – y – 56 = 0$
y = – 7, 8 y = 8
So, 8 blue balls, A, B, C can be found.

24. Correct option is : A
Solution:

Case 1: first was a white ball
Now it is put in second urn, so total white balls in second bag = 5 + 1 = 6,
and total balls in second bag = 12 + 1 = 13

So probability of white ball from second bag = $\frac{6}{13}$

Case 2: first was a blue ball
Now it is put in second bag, so total white balls in second bag remain 5,
and total balls in second urn = 12 + 1 = 13

So probability of white ball from second bag = $\frac{5}{13}$

So required probability = $\frac{6}{13} + \frac{5}{13} = \frac{11}{13}$

25. Correct option is : C
Solution:
5 out of 7 days can be selected in ${}^7C_5$ ways. In those 5 days, Kajal has to go to Basketball.
Probability = $(2/3)^5$
On the other 2 days she has to go for football practice.
Probability = $(1/3)^2$
Therefore required probability
= ${}^7C_5 \times (2/3)^5 \times (1/3)^2$
= 224/729.

26. Correct option is: C
Solution:
12 = (3 × 4).The number formed by all these digits will always be divisible by 3, because (6 + 7 + 8 + 0) = 21.
For divisibility by 4, last two digits should be 60 or 80 or 08 or 68 or 76.
If the last two digits are fixed we must make sure that the first digit is non-zero.
Case I: Last two digits are 60 or 80 or 08.
The first two digits can be arranged in 2 × 1 = 2 ways.
Case II: Last two digits are 68 or 76.
The first two digits can be arranged in 1 way, because the first digit cannot be 0.
So, sum = [(78 + 87) × 100 + 2 × 60] + [(67 + 76) × 100 + 2 × 80] + [(67 + 76) × 100 + 2 × 08] + 7068 + 8076 = 60540.

27. Correct option is : D
Solution:

P (neither blue nor green ball) = P(Red ball)
Let x be the number of red balls
Hence, (x/15) * (x - 1/14) = 2/35
x(x - 1) = 12; x = -3, 4;
Number of red balls = 4;
Number of green and blue balls = 15 - 4 = 11

28. Correct option is : B
Solution:
Let us assume all girls as one student because all the girls are sitting together then the total number of students = 5 + 1 = 6 students
Now, we can arrange 6 students in 6! Ways
And, originally the total number of students = 5 + x students (where x = total number of girls)
We can arrange then in (5 + x)! ways
And, we can arrange x girls in x! ways

The reqd. probability = $\frac{1}{42} = \frac{6! \times x!}{(5+x)!}$
$42 \times 720 \times x! = (x + 5)! = (x + 5) \times (x + 4) \times (x + 3) \times (x + 2) \times (x + 1) \times x!$
$42 \times 720 = 7 \times 6 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = (x + 5) \times (x + 4) \times (x + 3) \times (x + 2) \times (x + 1)$
Now check with the option instead of solving the equation
Only x = 5 satisfy the given condition

29. Correct option is : D
Solution:
From option (A)
If number of blue balls is 4
Required probability=${}^{4}C_3 / {}^{9}C_3$ =1/21
This not satisfied.
From option (B)
If number of blue balls is 3
Required probability=${}^{3}C_3 / {}^{8}C_3$ =1/56
This not satisfied.
From option (C)
If number of blue balls is 5
Required probability=${}^{5}C_3 / {}^{10}C_3$ =1/12
This satisfied given condition.
From option (D)

If number of blue balls is 6
Required probability=$^{6}C_3$ /$^{11}C_3$ =4/33
This not satisfied the given condition.

30. Correct option is : B
Solution:
The chances that a random piece of products P, Q, R and S is found to be defective are 20%, 30%, 5% and 10%, respectively.
In terms of probability, this can be stated as probability that a random piece of products P, Q, R and S is found to be defective are 0.20, 0.30, 0.05 and 0.10, respectively.
There can be four cases when exactly three of chosen pieces are defective.
Case i) Only P, Q and R are defective
Probability = 0.2 × 0.3 × 0.05 × (1-0.1) = 0.0027
Case ii) Only P, Q and S are defective
Probability = 0.2 × 0.3 × (1-0.05) × 0.1 = 0.0057
Case iii) Only P, R and S are defective
Probability = 0.2 × (1-0.3) × 0.05 × 0.1 = 0.0007
Case iv) Only Q, R and S are defective
Probability = (1-0.2) × 0.3 × 0.05 × 0.1 = 0.0012
∴ Probability that exactly three of them are found to be defective = 0.0103

31. Correct option is : A
Solution:
Let there be g girls and b boys.
Number of games between two girls = $^{g}C_2$
Number of games between two boys = $^{b}C_2$
∴ g(g - 1)/2 = 45
∴ g = 10
Also, b(b - 1) / 2 = 190
∴ b = 20
∴ Total number of games = $^{(g + b)}C_2$ = $^{30}C_2$ = 435
∴ Number of games in which one player is a boy and other is a girl = 435 – 45 - 190 = 200

32. Correct option is : C
Solution:
Initially we look at the general case of the seats not numbered.

The total number of cases of arranging 8 men and 2 women, so that women are together = 8! × 2!
The number of cases where in the women are not together = 9! – (8! × 2!) = Q.
Now,
When the seats are numbered, it can be considered to be a linear arrangement and the number of ways of arranging the group such that no two women are together is = 10! – (9! × 2!)
But the arrangements where in the women occupy the first and the tenth chairs are not favourable as when the chairs which are assumed to be arranged in a row are arranged in a circle, the two women would be sitting next to each other
The number of ways the women can occupy the first and the tenth position = 8! × 2!
The value of P = 10! – (9! × 2!) – (8! × 2!)
∴ P : Q = 10 : 1

33. Correct option is : C
Solution:
In a four digit number, first digit is 9 and last digit is smallest among 4 digits. Sum of middle two digits is even.
⇒ Between first and last digits, there is a difference of at least 3 digits.
It may come into mind that a difference of 2 digits can suffice, but that would lead to sum of middle two digits being odd (sum of two consecutive digits). But we need the sum to be even.
Combinations for first and last digits can be (9, 0), (9, 1), (9, 2), (9, 3), (9, 4), (9, 5).
Between 0 and 9, there are 4 odd digits and 4 even digits. Two can be chosen such that their sum is even, if both are odd or both are even. This can be done in 4 × 3 + 4 × 3 = 24 ways.
Similarly, for 1 and 9, there can be 3 × 2 + 4 × 3 = 18 ways.
For 2 and 9, there can be 12 ways. For 3 and 9, there can 8 ways. For 4 and 9, there can be 4 ways. For 5 and 9, there can be 2 way.
∴ Total number of 4 digit numbers possible = 24 + 18 + 12 + 8 + 4 + 2 = 68

34. Correct option is : B
Solution:
This problem can be solved using the M-N-P rule.
Rule – If there are three things to do and there are M ways to do the first thing, N ways to do the second thing and P ways to do the third thing then there will be M × N × P ways to do all the three things together.

Thus, to travel from Allahabad to Kolkata via Lucknow
There are M = 5 routes to travel from Allahabad to Lucknow
There are N = 4 routes to travel from Lucknow to Kolkata
Then, $M \times N = 5 \times 4 = 20$ ways to travel from Allahabad to Kolkata via Lucknow.

35. Correct option is : B
Solution:
First of all we will make circular permutations for all the flowers of a particular colour.
We know that, for permutation of n objects in a circle is = (n - 1)!
So, for 10 flowers of same colour, the permutations in 10 places = (10 - 1)! = 9!
Now, for permutation of the remaining ten flowers of same colour in between the previously placed flowers = 10!
Now, since this is a necklace hence the number of permutations are divided by 2.
Hence, the required answer = $(9! \times 10!)/2 = 5(9!)^2$

36. Correct option is : C
Solution:
Each pencil can be put in one of three bags.
$\Rightarrow$ Number of ways in which this can be done = $3 \times 3 \times 3 \times 3 \times 3 \times 3 = 729$
Out of these, there can be some cases when one or more bags are empty, and when all bags have same number of pencils.
Case i) one bag is empty
Empty bag can be selected in $^3C_1$ ways i.e. 3 ways
Now, each pencil can be put in one of two ways.
Number of ways in which this can be done = $3 \times (2 \times 2 \times 2 \times 2 \times 2 \times 2) = 192$
Case ii) two bags are empty
All pencils will be in one of three bags. This can be done in only 3 ways.
Case iii) three bags are empty. This case is not possible
Case iv) all bags have same number of pencils, i.e., 2 pencils.
$\Rightarrow$ We have to select two pencils for each bag.
Number of ways in which this can be done = $^6C_2 \times {}^4C_2 \times {}^2C_2 = 15 \times 6 \times 1 = 90$
$\therefore$ Total number of ways in which this can be done = $729 – 192 – 3 – 90 = 444$

37. Correct option is : A
Solution:
In bag A, Number of Denise Lawrence, Paulo Coelho and Ruskin Bond books is 4, 3 and 5 respectively. Total number of books in bag A = 12
So, probability of drawing two Paulo Coelho's book from bag A = (3C /12C) = 1/22

In bag B,
Number of Denise Lawrence, Paulo Coelho and Ruskin Bond books is 4, x and 5 respectively.
Total number of books in bag B = x + 9
So, probability of drawing three Paulo Coelho's books from bag B
= $({}^{x}C_3 / {}^{x+9}C_3)$
={ x (x-1)(x-2) / (x+9)(x+8)(x+7)} ……………. (1)
According to the question,
The probability of drawing 3 Paulo Coelho's book from bag B
= (1/22) – (9/286)
= (2/143)
Putting x = 4 in (1),
= {4 (4-1)(4-2) / (4+9)(4+8)(4+7)}
= (4*3*2)/(13*12*11)
= 2/143
Therefore, x = 4 is the answer

38. Correct option is : C
Solution:
Let the number of green balls be x. Then, number of yellow balls = (12 – x)
${}^{x}C_1/{}^{20}C_1 = \frac{7}{20}$
=> x = 7
Number of yellow balls = 12 – 7 = 5
Required probability = ${}^{5}C_1/{}^{20}C_1 \times {}^{4}C_1/{}^{19}C_1 = \frac{1}{19}$

39. Correct option is : D
Solution:
Let the number of red and brown ball be 7x and 4x respectively
Then, number of blue balls = (7x – 6)
ATQ,
7x+ 4x+(7x-6) = 30
=> x= 2
Number of red balls = 7 × 2 = 14
Remaining balls = 30 – 4 × 2 = 22
Required probability = ${}^{14}C_3 / {}^{22}C_3 = \frac{13}{55}$

40. Correct option is : B
Solution:

Total ball = 40
Red ball = 18
Let green balls are x
Then, $\frac{18}{40} \times \frac{x}{39} = \frac{3}{26}$
=> x = 10
No. of blue balls = 40 – 28 = 12

41. Correct option is : A
Solution:
Probability of selecting a bag = $\frac{1}{2}$
Required probability = $\frac{1}{2}$ [$({}^{10}C_2/{}^{15}C_2)$ $(+\frac{1}{2}$ $({}^{6}C_2/{}^{15}C_2)$ + $({}^{6}C_1 \times {}^{9}C_1)/{}^{15}C_2)$]
$= \frac{1}{2}\left(\frac{45}{105} + \frac{50}{105}\right) + \frac{1}{2}\left(\frac{15}{105} + \frac{54}{105}\right)$
$= \frac{1}{2} \times \frac{95}{105} + \frac{1}{2} \times \frac{69}{105}$
$= \frac{95+69}{210} = \frac{164}{210} = \frac{82}{105}$

42. Correct option is : A
Solution:
Total number of apple from A = 3x
Total number of orange from A = 2x
Total number of apple from B = 2y
Total number of orange from B = 3y
5x =5y
x = y
Number of rotten orange from A = 2x * 25/100 = x/2
Number of good orange from A = 2x * 75/100 = 3x/2
Number of good apple from A = 3x
Number of apple from box B is rotten = 2x * 50/100 = x
Number of good apple from box B = 2x – x = x
Number of orange from box B = 3x
3x + x + 3x + 3x/2 = 17
6x + 2x + 6x + 3x = 34
17x = 34
x = 2
Two apple drawn from A = ${}^{6}C_2 / {}^{10}C_2$
= 1/3
Total orange from A = 2 * 2 = 4
III. Required probability = ${}^{2}C_1 * {}^{6}C_1 / {}^{10}C_2$

= 4/15

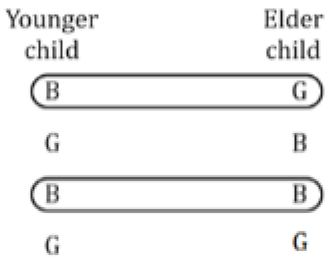
IV. Required probability = ${}^{2}C_1 * {}^{1}C_1 / {}^{20}C_2$

= 1/95

43. Correct option is : A

Solution:

Possible cases may be



Possible cases = 3 (according to question there is at least one boy)

Favorable cases = 2 (marked above)

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

44. Correct option is : B

Solution:

Let the number of blue ball be x

Then, number of white ball = (x+4)

Number of pink balls = 25 – (2x+4) = 21- 2x

ATQ,

${}^{(21-2x)}C_1 / {}^{25}C_1 = \frac{1}{5}$

=> x = 8

Number of blue balls =8

Number of white ball = 12

Number of pink ball = 5

Required probability = $6 \times ({}^{8}C_1/{}^{25}C_1 \times {}^{12}C_1/{}^{12}C_1 \times {}^{5}C_1/{}^{23}C_1) = \frac{24}{115}$

45. Correct option is : D

Solution:

Case I – If only one bag contains blue balls, then it can be one of the 11 bags and number of ways = 11

Case II – if only two bags contains blue balls, then bags which can have blue balls will be, (1, 3) or (2, 4) or (3, 5) or …. (9, 11)

So, number of ways = 9

Case III – If only 3 bags contains blue balls, then bags which can have blue balls

will be, (1, 3, 5) or (2, 4, 6) or (3, 5, 7), …. Or (7, 9, 11)
So, number of ways = 7
Case IV – If only four bags contains blue balls, then bags which can have blue balls be (1, 3, 5, 7) or (2, 4, 6, 8) or ………. (5, 7, 9, 11)
So, number of ways = 5
Case V – If only five bags contain blue balls, then bags which can have blue balls be (1, 3, 5, 7, 9) or (2, 4, 6, 8, 10) or (3, 5, 7, 9, 11)
So, number of ways = 3
Case VI – If only 6 bags contains blue balls, then bag which can have blue balls be (1, 3, 5, 7, 9, 11)
So, number of ways = 1
So, total number of required ways = (11 + 9 + 7 + 5 + 3 + 1) = 36

46. Correct option is : A
Solution:
ATQ,
$\frac{a}{7+a+b} = \frac{5}{16}$
16a = 35 + 5a + 5b
11a – 5b = 35 ………….. (i)
Also
$\frac{b}{7+a+b} = \frac{1}{4}$
4b = 7 + a + b
3b – a = 7 ………………. (ii)
From (i) and (ii) we get
a = 5 and b = 4
Required difference = 5 – 4 = 1

47. Correct option is : C
Solution:
Total balls = x + 10
Probability of choosing 2 blue balls = ${}^{x}C_2$ + ${}^{x+10}C_2$ = 0.125
$\frac{x \times (x-1)}{(10+x)\times(9+x)} = \frac{125}{1000} = \frac{1}{8}$
$8(x^2 - x) = (10 + x)(9 + x)$
$8x^2 - 8x = 90 + 9x + 10x + x^2$
$7x^2 - 27x - 90 = 0$
$(7x+15)(x - 6) = 0$
$x = 6, -\frac{15}{7}$
Blue ball = x = 6

Total number of balls in the box = 5+5+6 = 16

48. Correct option is : E
Solution:
Let the total number of appeared students be x
Then, failed students in both paper
= x – (320 +180+150)
= x -650
ATQ,
$\frac{x-650}{x} = \frac{1}{14}$
=> 14x – 9100 = x
=> 700 =x

49. Correct option is : C
Solution:
7R, 6B
Let x no. of blue balls were taken out from bag B
Required probability = ${}^{x}C_{2}/(7+{}^{x}C_{2})$
$= \frac{1}{15}$
=> $\frac{x(x+1)}{(x+7)(x+6)} = \frac{1}{15}$
=> 15 $(x^2-x) = x^2+13x+42$
=> $14x^2 – 28x – 42 = 0$
=> x =3

50. Correct option is : C
Solution:
Probability of Abishek winning the game = (Probability of Abishek getting Head in first try) + (Probability of Abishek getting tail in first try, Arun getting Tail in first try and Abishek getting Head in second try) + (Probability of Abishek getting tail in first try, Arun getting Tail in first try, Abishek getting tail in second try, Arun getting Tail in second try and Abishek getting Head in third try)
$= \frac{1}{2} + (\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}) + (\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2})$
$= \frac{1}{2} + \frac{1}{8} + \frac{1}{32}$
$= \frac{21}{32}$