GMAT

Quant Reasoning Assessment

Sets, PnC, Counting and Probability

Answer Explanations

1. Ans (B)

Probability that one will have at least three draws before one picks a heart
= 1 – (Probability of getting heart in the first draw OR getting in the second draw)
= 1 – (1/4 + 3/4 * 1/4)
= 1 – (7/16)
= 9/16

2. Ans (B)

Expected value of a roll of one dice is 1/6(1+2+3+4+5+6)=3.5
Expected value of three dices is 3*3.5=10.5
Mary scored 10 so the probability to have more then 10, or more then average is the same as to have less than average = 1/2
P=1/2

3. Ans (D)

2C1 select 1 goalkeeper from 2 boys;
8C2 select 2 defence from 8 boys (as 2 boys can only play goalkeeper 10-2=8);
6C2 select 2 midfield from 6 boys (as 2 boys can only play goalkeeper and 2 we've already selected for defence 10-2-2=6);
4C1 select 1 forward from 4 boys (again as 2 boys can play only goalkeeper, 4 we've already selected for defence and midfield 10-2-4=4)
Total # of selection = 2C1*8C2*6C2*4C1 = 3360

4. Ans (D)

Arrangement of 6 mobsters will be 6! = 720. In half of the cases Frankie will be behind Joey and in half of the cases Joey will be behind Frankie.
So, needed arrangement is 720/2 = 360.

5. Ans (A)

We have 11 English and 9 French books, no French books should be adjacent.
Imagine 11 English books in a row and empty slots like below:*E*E*E*E*E*E*E*E*E*E*E*E*
Now if 9 French books would be placed in 12 empty slots, all French books will be separated by English books.
So we can "choose" 9 empty slots from 12 available for French books, which is 12C9=220.

6. Ans (A)

4 letters word can be formed in 6*5*4*3 = 360 ways

7. Ans (B)

Apart from P nad S their are 10 other letters.
Choosing 4 letters out of 10 to place between P and S = 10C4 = 210;
Permutation of the letters P ans S (PXXXXS or SXXXXP) = 2!=2;
Permutation of the 4 letters between P and S = 4! =24;
Permutations of the 7 units {P(S)XXXXS(P)}{X}{X}{X}{X}{X}{X} = 7! = 5040;
We should divide multiplication of the above 4 numbers by 2! as there is repeated T
Hence,210*2*24*5040 / 2! = 25401600

8. Ans (D)

Total number of outcomes = 6^4
Two dice showing the same face can be chosen in 4C2 = 6 ways
Also, these 2 dice can take 6 values
And other two dice can take 5 and 4 values.
Probability = 6*6*5*4 / 6^4 = 5/9

9. Ans (B)

There are three branches, three units of books: {physics}{math}{chemistry} - aranging branches 3!;
Arranging the books within the branches: physics - 4! ; math - 2! ; chemistry - 3!;
Total: 3!*4!*2!*3! = 1728

10. Ans (E)

It is certain that at least 6 people are born in the same month.
Probability of certain event is 1

11. Ans (A)

Statement (1) alone is sufficient to answer the question asked.
Statement (2) alone is not sufficient to answer the question asked.

12. Ans (C)

Statement (1) alone is not sufficient to answer the question asked.
Statement (2) alone is not sufficient to answer the question asked.
(1) + (2) combine is sufficient to answer the question

13. Ans (B)

Each marble can be placed in any one of the four bowl. So each marble have 4 choices.
Thus, total number of ways = 4*4*4*4*4 =1024

14. Ans (D)

Let the four letters be L1, L2, L3, and L4 and four envelopes be E1, E2, E3, and E4.
Let say the correct letter be L1 going into envelope E1. So, the other three letters are going into incorrect envelopes, which can be done in 2 ways.

15. Ans (E)

First cart can be assigned any 2 horses out of 10, second can be assigned any 2 horses out of remaining 8, and so on.
10C2 * 8C2 * 6C2 * 4C2
= 113400

16. Ans (D)

Statement 1) If there were n people in the party, then
n (n-1) / 2 = 45
Thus, n = 10
Statement 2) Let say there were n people in the party. So half of the people is n/2 = x
Now, x people can be arranged in a row in x! ways.
Thus, x! = 120
x =5

Thus, n = 10 people in the party.
Hence, both statements alone is satisfied to answer the question asked.

17. Ans (D)

The man will hit the target if he hits it once or twice or thrice or all four times in the four shots that he takes.
Probability that he will not hit the target in any of the four shots = 3/4 * 3/4 * 3/4* 3/4 = 81/256
The probability that he will hit the target at least in one of the four shots = 1 - {probability of not hitting the target even once}
= 1 – 81/256
= 175/256

18. Ans (C)

P (picking atleast one vowel) = 1 – P (picking no vowel)
= 1 – (3/5 * 5/6)
= 1 – 1/2
= ½

19. Ans (A)

Let's # of students at Social High be 8 (I picked 8 as in this case 3/8 of total and 5/8 of total will be an integer).
3/8 of all students at Social High are in all three clubs --> 3/8*8=3 people are in exactly 3 clubs;
1/2 of all students are in Albanian club --> 1/2*8=4 people are in Albanian club;
5/8 of all students are in Bardic club --> 5/8*8=5 people are in Bardic club;
3/4 of all students are in Checkmate club --> 3/4*8=6 people are in Checkmate club;
Also as every student is in at least one club then # of students in neither of clubs is 0;
Total=A+B+C-{# of students in exactly 2 clubs}-2*{# of students in exactly 3 clubs}+{# of students in neither of clubs};
8=4+5+6-{# of students in exactly 2 clubs}-2*3+0 --> {# of students in exactly 2 clubs}=1, so fraction is 1/8.

20. Ans (E)
# of selections of 2 women out of w employees = wC2
Total # of selections of 2 representatives out of 10 employees = 10C2
So, question is wC2 / 10C2 > 1/2
w (w-1) > 45
w > 7
Statement (1) w > 5 , not sufficient
Statement (2) (10-w)C2 / 10C2 < 1/10
w > 6 , not sufficient.
After combining two statements still it is not sufficient to answer the question.

21. Ans (E)
Let the # of sedans be s and the # of convertibles be c.
Given: $s+c=20$.
Question is $\frac{s}{20}*\frac{s-1}{19}>\frac{3}{4}$?
Is $s>17$ (18, 19, 20)?
Statement (1) $s \geq \frac{3}{4}*20$

$s \geq 15$. Not sufficient.

Statement (2) $\frac{c}{20} * \frac{c-1}{19} < \frac{1}{20}$

$c(c-1) < 19$

$c < 5$ (4, 3, 2, 1, 0)

$s > 15$. Not sufficient.

(1)+(2) Not sufficient.

22. Ans (C)

Statement (1) Not sufficient

Statement (2) R = 8 + Y, Not sufficient

(1) + (2) Combine

R + Y = 20 and R = 8 + Y

R = 14, Sufficient

23. Ans (C)

One lady and respective gentleman can be selected in 40C1 * 1 = 40 ways

Total outcome = 40C1 * 50C1 = 40*50

Probability = 40 / 40*50 = 1/50

24. Ans (A)

Statement (1) Let say there are n red balls.

P (Both being red) = nC2 / 12C2

5/33 = n(n-1)/12

n = 5

So P(All 4 are red) = 5C4 / 12C4 , Sufficient.

Statement (2) There are 7 blue balls but don't know how many red balls out of remaining 5 balls, Not sufficient.

25. Ans (D)

Password can have 8, 9 or 10 digits (more than 10 is not possible as per question digits must be distinct).

Total # of passwords possible for 8 digits is 10*9*8*7*6*5*4*3 = 10!/2;

Total # of passwords possible for 9 digits is 10*9*8*7*6*5*4*3*2 = 10!;

Total # of passwords possible for 10 digits is 10*9*8*7*6*5*4*3*2*1 = 10!.

Time needed to guarantee access to database is $(\frac{10!}{2} + 10! + 10!) * \frac{1}{5} = \frac{10!}{2}$ minutes.

26. The correct choice is (D) and the correct answer is 3^5.

The first letter can be posted in any of the 3 post boxes. Therefore, it has 3 choices.

Similarly, the second, the third, the fourth and the fifth letter can each be posted in any of the 3 post boxes.

Therefore, the total number of ways the 5 letters can be posted in 3 boxes is 3*3*3*3*3

= 3^5

27. If there were two questions on the quiz, we could prepare two quizzes with the questions in different order -- 2•1 = 2.

If there were three questions, we could get 3•2•1 = 6 different orders.

If there were four questions, we could get 4•3•2•1 = 24 different orders -- not quite enough for the class of 27 students.

If there were five questions, we could get 5•4•3•2•1 = 120 different orders. The teacher will need at least 5 questions on the quiz.

28. Correct Answer - (3)
If he picks any of the three socks invariably any two of them should match. Hence the probability is 1.

29. Correct Answer - (1)

The last of the four letter words should be a consonant. Therefore, there are 21 options.
The first three letters can be either consonants or vowels. So, each of them have 26 options. Note that the question asks you to find out the number of distinct initials and not initials where the letters are distinct.
Hence answer = $26*26*26*21 = 26^3 * 21$

30. Correct Answer - (1)
There are 2^n ways of choosing 'n' objects. For e.g. if n = 3, then the three objects can be chosen in the following 2^3 ways - ${}^3C_0$ ways of choosing none of the three, ${}^3C_1$ ways of choosing one out of the three, ${}^3C_2$ ways of choosing two out of the three and ${}^3C_3$ ways of choosing all three.
In the given problem, there are 5 Rock songs. We can choose them in 2^5 ways. However, as the problem states that the case where you do not choose a Rock song does not exist (at least one rock song has to be selected), it can be done in $2^5 - 1 = 32 - 1 = 31$ ways.
Similarly, the 6 Carnatic songs, choosing at least one, can be selected in $2^6 - 1 = 64 - 1 = 63$ ways.
And the 3 Indi pop can be selected in $2^3 = 8$ ways. Here the option of not selecting even one Indi Pop is allowed.
Therefore, the total number of combinations = 31 * 63 * 8 = 15624

31. Correct Answer - (4)
$1*1! = (2 -1)*1! = 2*1! - 1*1! = 2! - 1!$
$2*2! = (3 - 1)*2! = 3*2! - 2! = 3! - 2!$
$3*3! = (4 - 1)*3! = 4*3! - 3! = 4! - 3!$
$n*n! = (n+1 - 1)*n! = (n+1)(n!) - n! = (n+1)! - n!$
Summing up all these terms, we get $(n+1)! - 1!$

32. Answer: Option **A**
Explanation:
Total number of balls = (2 + 3 + 2) = 7.
Let S be the sample space.
Then, $n(S)$= Number of ways of drawing 2 balls out of 7

$$= {}^7C_2 \text{ `}$$
$$= \frac{(7 \times 6)}{(2 \times 1)}$$
$$= 21.$$

Let E = Event of drawing 2 balls, none of which is blue.
$\therefore n(E)$= Number of ways of drawing 2 balls out of (2 + 3) balls.

$$= {}^5C_2$$
$$= \frac{(5 \times 4)}{(2 \times 1)}$$
$$= 10.$$

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{10}{21}.$

33. Answer: Option **B**

Explanation:

Clearly, $n(S) = (6 \times 6) = 36$.

Let E = Event that the sum is a prime number.

Then E= { (1, 1), (1, 2), (1, 4), (1, 6), (2, 1), (2, 3), (2, 5), (3, 2), (3, 4), (4, 1), (4, 3), (5, 2), (5, 6), (6, 1), (6, 5) }

$\therefore n(E) = 15.$

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{15}{36} = \frac{5}{12}.$

34. Answer: Option **C**

Explanation:

Here, $n(S) = 52$.

Let E = event of getting a queen of club or a king of heart.

Then, $n(E) = 2$.

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{2}{52} = \frac{1}{26}.$

35. (B)Answer – 120

A heptagon has 7 vertices. The number of ways to choose 7 of the 10 vertices of the decagon is the number of unique heptagons we can construct. The number is 10-choose-7: 10C7 = 120