GRE

Quant Reasoning Assessment

P & C and Probability

Answer Explanations

1. The correct choice is (D) and the correct answer is $\frac{4!*3!}{2!}$.

ABACUS is a 6 letter word with 3 of the letters being vowels.

If the 3 vowels have to appear together, then there will 3 other consonants and a set of 3 vowels together.

These 4 elements can be rearranged in 4! Ways.

The 3 vowels can rearrange amongst themselves in $\frac{3!}{2!}$ ways as "a" appears twice.

Hence, the total number of rearrangements in which the vowels appear together are $\frac{4!*3!}{2!}$

2. The correct choice is (A) and the correct answer is 59

The first letter is E and the last one is R.

Therefore, one has to find two more letters from the remaining 11 letters.

Of the 11 letters, there are 2 Ns, 2Es and 2As and one each of the remaining 5 letters.

The second and third positions can either have two different letters or have both the letters to be the same.

Case 1: When the two letters are different. One has to choose two different letters from the 8 available different choices. This can be done in 8 * 7 = 56 ways.

Case 2: When the two letters are same. There are 3 options - the three can be either Ns or Es or As. Therefore, 3 ways.

Total number of possibilities = 56 + 3 = 59

3. The correct choice is (A) and the correct answer is 1/4

The total number of ways in which the word Math can be re-arranged = 4! = 4*3*2*1 = 24 ways.

Now, if the positions in which the consonants appear do not change, the first, third and the fourth positions are reserved for consonants and the vowel A remains at the second position.

The consonants M, T and H can be re-arranged in the first, third and fourth positions in 3! = 6 ways without the positions in which the positions in which the consonants appear changing.

Therefore, the required probability = $\frac{3!}{4!} = \frac{6}{24} = \frac{1}{4}$

4. The correct choice is (B) and the correct answer is 21

If only one of the boxes has a green ball, it can be any of the 6 boxes. So, this can be achieved in 6 ways.

If two of the boxes have green balls and then there are 5 consecutive sets of 2 boxes. 12, 23, 34, 45, 56.

Similarly, if 3 of the boxes have green balls, there will be 4 options.

If 4 boxes have green balls, there will be 3 options.

If 5 boxes have green balls, then there will be 2 options.

If all 6 boxes have green balls, then there will be just 1 options.

Total number of options = 6 + 5 + 4 + 3 + 2 + 1 = 21.

5. The correct choice is (D) and the correct answer is $\frac{175}{256}$.

The man will hit the target even if he hits it once or twice or thrice or all four times in the four shots that he takes.

So, the only case where the man will not hit the target is when he fails to hit the target even in one of the four shots that he takes.

The probability that he will not hit the target in one shot = $1 - \frac{1}{4} = \frac{3}{4}$

Therefore, the probability that he will not hit the target in all the four shots = $\frac{3}{4} * \frac{3}{4} * \frac{3}{4} * \frac{3}{4} = \frac{81}{256}$

Hence, the probability that he will hit the target at least in one of the four shots = $1 - \frac{81}{256}$
$= \frac{175}{256}$.

6. 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

7. The correct choice is (B) and the correct answer is 2^9.

When a coin is tossed once, there are two outcomes. It can turn up a head or a tail.

When 10 coins are tossed simultaneously, the total number of outcomes = 2^{10}

Out of these, if the third coin has to turn up a head, then the number of possibilities for the third coin is only 1 as the outcome is fixed as head.
Therefore, the remaining 9 coins can turn up either a head or a tail = 2^9

8. The correct choice is (A) and the correct answer is 7!.

There are seven positions to be filled.

The first position can be filled using any of the 7 letters contained in PROBLEM.
The second position can be filled by the remaining 6 letters as the letters should not repeat.
The third position can be filled by the remaining 5 letters only and so on.

Therefore, the total number of ways of rearranging the 7 letter word = 7*6*5*4*3*2*1 = 7! Ways

9. 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.

10. Correct Answer - 1260. Choice (1)

A team of 6 members has to be selected from the 10 players. This can be done in 10C6 or 210 ways.
Now, the captain can be selected from these 6 players in 6 ways.
Therefore, total ways the selection can be made is 210*6 = 1260.

Alternatively, we can select the 5 member team out of the 10 in 10C5 ways = 252 ways.
The captain can be selected from amongst the remaining 5 players in 5 ways.
Therefore, total ways the selection of 5 players and a captain can be made = 252*5 = 1260.

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

12. Correct Answer - (2)

4 consonants out of 12 can be selected in $^{12}C_4$ ways.

3 vowels can be selected in $^4C_3$ ways.

Therefore, total number of groups each containing 4 consonants and 3 vowels = $^{12}C_4$ * $^4C_3$

Each group contains 7 letters, which can be arranging in 7! ways.

Therefore required number of words = $^{12}4$ * $^4C_3$ * 7!

13. Correct Answer - (3)

When 4 dice are rolled simultaneously, there will be a total of 6^4 = 1296 outcomes.

The number of outcomes in which none of the 4 dice show 3 will be 5^4 = 625 outcomes.

Therefore, the number of outcomes in which at least one die will show 3 = 1296 – 625 = 671

14. Correct Answer - (3)
The 5 letter word can be rearranged in 5! Ways = 120 without any of the letters repeating.

The first 24 of these words will start with A.

Then the 25th word will start will CA _ _ _. The remaining 3 letters can be rearranged in 3! Ways = 6. i.e. 6 words exist that start with CA.

The next word starts with CH and then A, i.e., CHA _ _. The first of the words will be CHAMS. The next word will be CHASM.

Therefore, the rank of CHASM will be 24 + 6 + 2 = 32.

15. 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

16. Correct Answer - (3)

The word EDUCATION is a 9 letter word, with none of the letters repeating.

The vowels occupy 3, 5, 7^{th} and 8^{th} position in the word and the remaining 5 positions are occupied by consonants

As the relative position of the vowels and consonants in any arrangement should remain the same as in the word EDUCATION, the vowels can occupy only the aforementioned 4 places and the consonants can occupy 1^{st}, 2^{nd}, 4^{th}, 6^{th} and 9^{th} positions.

The 4 vowels can be arranged in the 3^{rd}, 5^{th}, 7^{th} and 8^{th} position in 4! Ways.

Similarly, the 5 consonants can be arranged in 1^{st}, 2^{nd}, 4^{th}, 6^{th} and 9^{th} position in 5! Ways.

Hence, the total number of ways = 4! * 5!.

17. Correct Answer - (1)

Each of the 10 letters can be posted in any of the 5 boxes.

So, the first letter has 5 options, so does the second letter and so on and so forth for all of the 10 letters.

i.e. 5*5*5*….*5 (upto 10 times)

= 5 ^ 10.

18. Correct Answer - (3)

There are 8 students and the maximum capacity of the cars together is 9.

We may divide the 8 students as follows

Case I: 5 students in the first car and 3 in the second

Or Case II: 4 students in the first car and 4 in the second

Hence, in Case I: 8 students are divided into groups of 5 and 3 in $^8C_3$ ways.

Similarly, in Case II: 8 students are divided into two groups of 4 and 4 in $^8C_4$ ways.

Therefore, the total number of ways in which 8 students can travel is $^8C_3 + {}^8C_4 = 56 + 70 = 126$.

19. 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

20. 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!

PROBABILITY –ANSWERS

1.Answer: Option **D**

Explanation:

Here, S = {1, 2, 3, 4, ..., 19, 20}.

Let E = event of getting a multiple of 3 or 5 = {3, 6 , 9, 12, 15, 18, 5, 10, 20}.

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{9}{20}$.

2. **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

$= {}^7C_2$ `

$= \frac{(7 \times 6)}{(2 \times 1)}$

= 21.

Let E = Event of drawing 2 balls, none of which is blue.

∴ $n(E)$= Number of ways of drawing 2 balls out of (2 + 3) balls.

$= {}^5C_2$

$= \frac{(5 \times 4)}{(2 \times 1)}$

= 10.

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

3. **Answer:** Option **A**

Explanation:

Total number of balls = (8 + 7 + 6) = 21.

Let E= event that the ball drawn is neither red nor green
= event that the ball drawn is blue.

∴ $n(E)$ = 7.

∴ $P(E) = \frac{n(E)}{n(S)} = \frac{7}{21} = \frac{1}{3}$.

4. **Answer:** Option **C**

Explanation:

In two throws of a die, $n(S)$ = (6 x 6) = 36.

Let E = event of getting a sum ={(3, 6), (4, 5), (5, 4), (6, 3)}.

∴ P(E) =n(E)= 4 =1.

$n(S)$ 36 9

5. **Answer:** Option **D**

Explanation:

Here S = {TTT, TTH, THT, HTT, THH, HTH, HHT, HHH}

Let E = event of getting at most two heads.

Then E = {TTT, TTH, THT, HTT, THH, HTH, HHT}.

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{7}{8}.$

6. **Answer:** Option **B**

Explanation:

In a simultaneous throw of two dice, we have $n(S) = (6 \times 6) = 36$.

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

$\therefore n(E) = 27.$

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{27}{36} = \frac{3}{4}.$

7. **Answer:** Option **A**

Explanation:

Let S be the sample space and E be the event of selecting 1 girl and 2 boys.

Then, $n(S)$= Number ways of selecting 3 students out of 25

$= {}^{25}C_3$ `

$= \frac{(25 \times 24 \times 23)}{(3 \times 2 \times 1)}$

= 2300.

$n(E) = ({}^{10}C_1 \times {}^{15}C_2)$

$= \left[10 \times \frac{(15 \times 14)}{(2 \times 1)} \right]$

= 1050.

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{1050}{2300} = \frac{21}{46}.$

8. **Answer:** Option **C**

Explanation:

P (getting a prize) $= \frac{10}{(10 + 25)} = \frac{10}{35} = \frac{2}{7}$.

9. **Answer:** Option **D**

Explanation:

Let S be the sample space.

Then, $n(S) = {}^{52}C_2 = \frac{(52 \times 51)}{(2 \times 1)} = 1326$.

Let E = event of getting 2 kings out of 4.

$\therefore n(E) = {}^{4}C_2 = \frac{(4 \times 3)}{(2 \times 1)} = 6$.

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{6}{1326} = \frac{1}{221}$.

10. **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) }

$\therefore n(E) = 15$.

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

11. **Answer:** Option **C**

Explanation:

Here, $n(S) = 52$.

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

Then, $n(E) = 2$.

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

12. **Answer:** Option **C**

Explanation:

Let S be the sample space.

Then, $n(S)$= number of ways of drawing 3 balls out of 15

$= {}^{15}C_3$

$= \frac{(15 \times 14 \times 13)}{(3 \times 2 \times 1)}$

$= 455.$

Let E = event of getting all the 3 red balls.

$\therefore n(E) = {}^{5}C_3 = {}^{5}C_2 = \frac{(5 \times 4)}{(2 \times 1)} = 10.$

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{10}{455} = \frac{2}{91}.$

13. **Answer:** Option **D**

Explanation:

Let S be the sample space.

Then, $n(S) = {}^{52}C_2 = \frac{(52 \times 51)}{(2 \times 1)} = 1326.$

Let E = event of getting 1 spade and 1 heart.

$\therefore n(E)$= number of ways of choosing 1 spade out of 13 and 1 heart out of 13

$= ({}^{13}C_1 \times {}^{13}C_1)$

$= (13 \times 13)$

$= 169.$

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{169}{1326} = \frac{13}{102}.$

14. **Answer:** Option **B**

Explanation:

Clearly, there are 52 cards, out of which there are 12 face cards.

∴ P (getting a face card) = $\frac{12}{52} = \frac{3}{13}$.

15. **Answer:** Option **B**

Explanation:

Let number of balls = (6 + 8) = 14.

Number of white balls = 8.

P (drawing a white ball) = $\frac{8}{14} = \frac{4}{7}$.

16.(D)ANSWER:- D-:35

17.(D) 1848

This is because:
for the girls Sunita is definitely captain. Thus it is Sunita and the 14 other girls as captain and vice captain.

For the boys, it will be the first boy and the 12 other boys, the second and the 12 other boys and so on. thus, it is 11x12 for the boys

Multiply 11x12 by the 14 and you get 1848.

18(B) ANSWER- B-816

Given the two sets ... first two set1 and next two from second set2 ..

So the combinations are ..

a)1 from set1 and 3 from set2 ==== (2c1)* 3c3 = 2

b)2 from set1 and 2 from set2 ====(2c2)*(3c2) = 3

So after selecting the sets .. we have to select with in the set ..

a) Selecting options in the following way === > 3*4*4*4 = 3*4*4*4 * 2 (Selecting the set)
b)Selecting options in the following way ===> 3*3*4*4 = 3*3*4*4 * 3 (Selecting the set)

So By adding the above products .. we get answer as 816

19.(B)

First digit can be any of nine (not "0"), second can also be any of nine, third any of eight, fourth any of seven and fifth any of six, that is 9 x 9 x 8 x 7 x 6 = 27216 such numbers.

20.(D) ANSWER-: 14!*13

first we have to place 14 boys leaving one talkative boy.
so 14! for placing the 14 boys.
now we have 15 places vacant to place the 2nd talkative boy .but as 1st talkative boy is already placed places adjacent to him are not to be used so 13 places left.

answer is 14!*13.

21 .(C) 60
Tagore House has 5 choices of color for the first block. That leaves only 4 choices for the second block, because it has to be different, and that leaves only 3 choices for the third block, so there are
5 * 4 * 3 = 60 possible flags.

22.(E)- 8 letters in equation, 5 vowels :
5*7*6*5*4*3*2*1= 25200

23. 2000 is the answer. D
(explanation)
There are four choices for the first digit since it cannot be zero . (We do not consider something like 01234 to be a 5-digit number.)
Any of the five choices will do for the second, third and fourth digits.
The last digit must be 0,2,4, or 5 to make it divisible by 2 or 5 or both.

Therefore, there are 4 x 5 x 5 x 5 x 4 = 2000 possibilities in all.

24. D-If the main road running North to South has two-way traffic (and if each side road allows traffic from the East to the West) then there are six possibilities: **2 x 3 = 6.**

If the main road is one-way from the North to the South , then depending on the position of the side roads and the direction of their traffic, the answer could be anything from 0 to 6.

25. (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

26. Each person out of 4 has 6 floors (options) to get out of (since no one gets out on the ground floor), hence total ways is 6*6*6*6=6^4. Now, there is no need to actually calculate this value: 6^4 will have 6 as the units digit and there is only one option (B) which offers such a number.

Answer: B.

27 .(D)ANSWER -1000

2 letters followed by 2 digits .. so it contains four places

_ _ _ _

10 * 10 * 10 * 10

First place can be selected from ten letters , second place is selected from 10 letters ..

units place is a digit which be selected digits ... tens place is digit which can be selected from 10 digits ..

So the answer is **10000**

28. (B) n=4
P(2n+1, n-1): P(2n-1,n) = 3:5
or, (2n+1)!/(n+2)!: (2n-1)!/(n-1)!=3/5 (using the permutations formula npr=n!/(n-r)!

or(2n+1)!/(n+2)! * (n-1)!/(2n-1)!=3/5

2n(2n+1)/n(n+1)(n+2)=3/5

solve this..you will get n=4. reject he other value i.e n=-1/3

29.(E) It is an octagon with 8 sides.

Let n be the number of sides = number of vertices.

Then each vertex can be connected to n-3 other vertices, giving n(n -3) connections. However, this counts each vertex pair connection twice, so there are:

$n(n - 3) / 2$ diagonals.

Thus if there are 20 diagonals:

$n(n - 3) / 2 = 20$
$n^2 - 3n = 40$
$n^2 - 3n - 40 = 0$
$(n + 5)(n - 8) = 0$

so n = -5 or 8. As a polygon cannot have a negative number of sides, n = 8.

30.(D) T he possibilities are

3 blue, 1 red
3 red, 1 blue
2 blue, 2 red

Number of (3 blue, 1 red) = (4C3)(5C1) = 4*5 = 20
Number of (3 red, 1 blue) = (5C3)(4C1) = 10*4 = 40
Number of (2 red, 2 blue) = (5C2)(4C2) = 10*6 = 60

Therefore, 4 balls, at most 3 of which are the same color, can be chosen in 20+40+60 = 120 ways.
[mCn = m!/(n!(m-n)!) for m ≥ n]

Or

This is a combination problem because you have to assess a subgroup without a particular order. I find it easiest to first deduce what the total number of arrangements are and then subtract from there.

Firstly, There are a total of 9 balls getting assigned to a group of 4. So, to get our total, we use 9C4, which equals 9!/(4!*5!)=126. This means there are a total of 126 arrangements regardless of order. However, this number also includes the combination of 4 like-colored balls we're told to avoid.
To calculate the number of arrangements for 4 like-colored balls we set up a separate subgroup for each color. For red balls the possible arrangement are 5C4, which is 5!/(4!*1!)=5. For blue balls the possible arrangements are 4C4, which is 4!/(4!*0!)=1

(remember that 0!=1). So the total number of like-colored arrangements is 5+1=6.
Now we just subtract the exceptions from the total to get the answer...126-6=120

31. Answer

T here are 15 ways that 6 objects can be taken 4 at a time (without respect to order). Each group of 4 points can be connected into a closed loop 3 different ways, so a total of 45 four-sided polygons can be made by connecting points. Only 15 of those will be polygons whose non-adjacent sides don't crossorrect Answer is **: D**

32.(D) ans 48

33. B-Total possible 3 digit numbers that don't begin/end in zero or end with 8= 4*5*3 = 60

Explanation:
First possible digit {1, 3, 5, 8} --> 4 #'s
Second possible digit {0, 1, 3, 5, 8} --> 5 #'s
Third possible digit {1, 3, 5} --> 3 #'s
Total possible 3 digit #'s = 4*5*3

34. B-There are 12 letters, including two D's, four E's, and three N's.

There are: $\frac{12!}{2!4!3!} = 1,663,200$ permutations.

35.(D) RA: 66

36. (B) the correct mathematical answer is 18,

Any of the 5 numbers can be the first number, and any of the remaining 4 can be the second number, for a total of 20 differences. Because 10-5 = 15-10, there won't be that many different differences. Let **d(x,y)** represent the possible differences between x and y.
d(2,3) = ±1
d(2,5) = ±3
d(2,10) = ±8
d(2,15) = ±13
d(3,5) = ±2
d(3,10) = ±7
d(3,15) = ±12
d(5,10) = ±5
d(5,15) = ±10
d(10,15) = ±5

The different differences seem to be ±1, ±2, ±3, ±5, ±7, ±8, ±10, ±12, ±13, for a total of **18 different differences.**

37.(E) 4536
First we must understand the number of ways we can choose the first four questions. This is clearly 3*3*6*6 = 324 (since we need one from each chapter, and we have 3, 3, 6, & 6 possible choices)

next, consider adding the fifth question. Our answer depends on what chapter the 5th question comes from. so 324*2 + 324*2 + 324*5 + 324*5 (if the last question comes from chapter 1, 2, 3, or 4, respectively. You could also recognize that there are 14 questions remaining, and just do 324*14)
This yields 4536 possible tests

38:- D-ANSWER (RA: 1500

My guess was: 4*5*5*5*4 = 2000; 4(0 doesn't work at the beginning)*5*5*5*4(0, 2,4,5 are divisible by 2 or 5 ...)

39. D-he answer is 3^5 = 243. Their logic is that each of the three fingers has a choice of 5 rings.

3^5 is pretty straightforward. You know you have to raise 3 to the 5th power (and not the other way around) because you only have three fingers so all the arrangements will be in groups of three. Three to the fifth of course is 3*3*3*3*3, so you know you did it the right way around. You can't actually have five rings on at a time in this problem, so you definitely don't want to do 5^3=5*5*5.

40. (B) ANSWER-:252