MBA PIONEER 2024

QUANTITATIVE APTITUDE

DPP: 2

P and C - 2

Q1 Out of 4 women and 6 men, a committee of 4 has to be selected to represent both genders. In how many ways can the committee be selected?

(A) 254 (B) 194
(C) 210 (D) 234

Q2 An experiment consists of tossing a coin 10 times successively and noting the result after each toss. How many distinct outcomes of the experiment are possible such that exactly 3 of the 10 tosses result in a head ?

(A) 990 (B) 1000
(C) 495 (D) 120

Q3 In how many ways can 3 cards be selected from a pack of playing cards such that all three cards are not of the same colour?

(A) 19500 (B) 18800
(C) 17500 (D) 16900

Q4 As a form of greeting, every member in a group hugs every other member of the group who is of the same gender and shakes hands with every member of the group who is of the opposite gender. If the group has 6 women and 8 men, the number of hugs is x and the number of handshakes is y, find x- y.

(A) -15 (B) 15
(C) -5 (D) 5

Q5 A coach along with his 10 trainees arrive at a racing track for their morning drills. But the racing track allows only 4 athletes to race at a time. The coach then conducts successive races, each race between 4 athletes, such that no two race has the same group of 4 athletes. By the time a race is done across every possible group of 4, how many times would an individual athlete have to race?

(A) 21 (B) 42
(C) 63 (D) 84

Q6 As a part of MBA curriculum, a students has to choose 4 specialisations out of MR, CB, SM, CS, DM, MC, MS and BM. However CB can be opted only if SM is opted. In how many different ways can a student select his specialisations?

(A) 50 (B) 45
(C) 60 (D) None of these

Q7 In a group of 9 friends, 4 of them can sing as well as play musical instruments, 3 of them can ONLY play musical instruments and 2 of them can ONLY sing. A team of 4 needs to be decided for a competition such that at least 3 can sing and at least 3 can play a musical instrument. In how many different ways can the team be formed?

(A) 21 (B) 56
(C) 57 (D) 69

Q8 A test is made up of three sections with each section having 5 questions. A student has to answer a total of 10 questions such that he cannot answer more than 4 questions from any one section. In how many different ways can the students answer the 10 questions? Two ways of answering are different when all the questions answered in the two ways are not the same.

(A) 750 (B) 1500

(C) 2250 (D) 4500

Q9 An objective test has 10 questions. If any question is answered correctly, 4 mark is awarded. And if answered wrongly, 1 mark is deducted as a penalty. Each of n students scored 20 marks. However no two of the n students had identical set of correctly & incorrectly answered questions. Find the maximum value of n.

(A) 462 (B) 472

(C) 522 (D) 582

Q10 In a convex polygon of 12 vertices, two opposite vertices are labeled as P and Q. How many diagonals of the polygon intersect the diagonal PQ?

(A) 25 (B) 27

(C) 26 (D) None of these

Q11 ABC is an equilateral triangle. 2 points are marked on side AB, 3 points on side BC, and 4 points on side AC. Using these 9 points as vertices, how many different triangles can be formed?

(A) 24 (B) 84

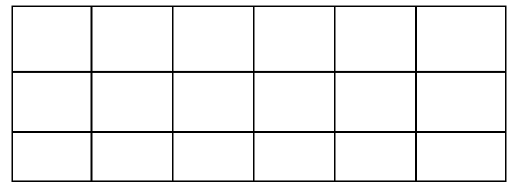
(C) 72 (D) 79

Q12 A convex polygon has 135 diagonals. If another polygon has 3 vertices less than the previous polygon, how many diagonals would this other polygon have?

(A) 100 (B) 90

(C) 104 (D) 77

Q13 Find the numbers of rectangles with unequal length & breadth in the given figure. Consider the consecutive parallel lines to be equidistant from each other.



(A) 126 (B) 45

(C) 77 (D) 94

Q14 How many triangles can be formed using the vertices of a decagon such that exactly one side of the triangle is common with the sides of the polygon?

(A) 120 (B) 80

(C) 60 (D) 50

Q15 If 4 lines are drawn in a plane, find the maximum number of non-overlapping regions the plane could be divided into

(A) 8 (B) 10

(C) 11 (D) 12

Q16 In how many ways can 5 scholarships, each of 20% discount on the tuition fee, be distributed among 10 students, if a student can receive any number of scholarships and all scholarships have to be distributed?

(A) 510 (B) 105

(C) ${}^{10}C_5$ (D) ${}^{14}C_5$

Q17 Find the number of different solutions to the inequality:

$5 < a + b + c < 12$,

where a, b and c are natural numbers.

(A) 155 (B) 161

(C) 308 (D) 455

Q18 How many whole number solutions of a + b + c = 7 are such that at least one of a, b and c is even?

(A) 12 (B) 24
(C) 30 (D) 36

Q19 The local post-office has 5 different Rs. 2 stamps. And I can spend a maximum of Rs. 10 purchasing these stamps. In how many different ways can I purchase stamps if there are plenty of stamps of each of the 5 varieties? Assume I have to purchase at least 1 stamp.
(A) 125 (B) 126
(C) 251 (D) 252

Q20 Out of 6 identical red marbles, 5 identical blue marbles and 4 identical green marbles, in how many distinct ways can I select 5 marbles?
(A) 21 (B) 20
(C) 14 (D) 6

Q21 In how many ways can 2n identical objects be distributed among n people such that each person receives at least 1 object?
(A) ${}^{3n-1}C_{n-1}$ (B) ${}^{2n-1}C_{n-1}$
(C) ${}^{2n}C_{n-1}$ (D) ${}^{3n}C_{n-1}$

Q22 Find the number of integer solution to |a| + |b| + |c| = 10, where none of a, b or c is 0.
(A) 36 (B) 72
(C) 144 (D) 288

Q23 4 dice are rolled. Find the number of distinct outcomes possible such that the sum of the four numbers turned on the dice is 11.
(A) 9 (B) 68
(C) 104 (D) 216

Q24 A florist while making a bouquet for Rs. 200 adds any number of roses from 5 to 8 and any number of daisies from 10 to 15. If the number of roses and/or number of daisies is different in two bouquets, then the bouquets are said to be distinct. How many distinct bouquets can be made by the florist?
(A) 24 (B) 80
(C) 512 (D) 1024

Q25 I have 10 notes of Rs. 20 and 4 coins - one each of Re. 1, Re. 2, Re. 5. Rs. 10. How many different sums can I form, if I have to use at least 3 but not more than 8 notes and any number of coins?
(A) 22 (B) 96
(C) 512 (D) 1024

Q26 Kept in front of me are 2 identical gulab-jamuns, 3 identical rosagullas and 4 identical jalebis. In how many different ways can I eat the sweets, if not eating any of these is not a possibility.
(A) 511 (B) 255
(C) 59 (D) 23

Q27 How many different sets, with at least one element, can be formed such that each element of the set is a two-digit multiple of 10.
(A) 45 (B) 55
(C) 1023 (D) 511

Q28 In a twist to the election process, a voter has to cast his vote by selecting all those candidates that he does NOT want to be elected to the post. Furthermore, he can select any number of candidates, from selecting at least 1 to selecting all, as his choice for not being elected. If there are 5 candidates in the fray, in how many ways can the voter cast his vote?

Q29 7 equidistant points are taken on the circumference of a circle and named A, B, C, D, E, F, and G. How many convex polygons can be drawn using these points as vertices of the polygon?

Q30 A collection has 4 white pearls and 9 non-white pearls, each of these 9 being of a different color. In how many different ways can I purchase at least 1pearl from this collection?

Answer Key

Q1	(B)
Q2	(D)
Q3	(D)
Q4	(C)
Q5	(D)
Q6	(A)
Q7	(C)
Q8	(C)
Q9	(A)
Q10	(A)
Q11	(D)
Q12	(B)
Q13	(D)
Q14	(C)
Q15	(C)
Q16	(D)
Q17	(A)
Q18	(C)
Q19	(C)
Q20	(B)
Q21	(B)
Q22	(D)
Q23	(C)
Q24	(A)
Q25	(B)
Q26	(C)
Q27	(D)
Q28	31
Q29	99
Q30	2559

Hints & Solutions

Q1 Text Solution:

'Both the genders need to be present' = 'atleast 1 man is present'& 'atleast 1 woman' is present"

at least one man is present = Total- '0 man is present'

And similarly, at least one woman is present' = Total - '0 woman is present

Thus, the required answer = Total ways of forming committees - committees where 0 men are present - committees where 0 women are present

$= {}^{10}C4 - {}^{4}C_4 - {}^{6}C_4$

= 210 - 1 - 15 = 194

Q2 Text Solution:

Two outcomes will be different when at least one of the heads is on a different throw (in a sequence of throws).

E.g. H H H T T T T T T T is different from H H T H T T T T T T.

Thus, the number of different outcomes is the same as the number of different ways of choosing 3 positions.

out of 10 positions i.e. ${}^{10}C_3$ ways

i.e. $\frac{10*9*8}{6}$ ie. 120.

Alternately. you could also view the situation as arranging 3 H and 7 T i.e. arranging 10 objects of which 3 are identical and the other 7 are identical amongst themselves.

i.e. $\frac{10!}{3!*7!}$ i.e. $\frac{10*9*8}{6}$ i.e. 120.

Q3 Text Solution:

Total number of ways of selecting 3 cards from 52 cards ${}^{52}C_3$ =22,100

Number of ways of selecting 3 cards from a pack of cards such that all 3 are red = ${}^{26}C3$ = 2600

Number of ways of selecting 3 cards from a pack of 3 cards such that all 3 are black = ${}^{26}C_3$ = 2600

Required answer = 22100 - 2600 - 2600 = 16,900

Q4 Text Solution:

Any two women will mean a unique hug. Thus, among 6 women, number of hugs = ${}^{6}C_2$ = 15

Similarly, among 8 men, number of hugs = ${}^{8}C_2$ = 28

Total hugs = 15 + 28 = 43

Handshakes between women and men = 6 × 8 = 48

Answer= 43 - 48 = -5

Q5 Text Solution:

Consider any athlete. S/he will be running a race with every possible group of 3 athletes from the other 9 trainees. Thus, an athlete will run ${}^{9}C_3$ races i.e. 84 races.

Alternate explanation: 'every possible group of 4 athletes' = ${}^{10}C_4$ different groups i.e. 210 groups.

Total instances of athletes running = 210 × 4

Total instances of one athlete running $= \frac{210*4}{10} = 84$

Q6 Text Solution:

Case i: CB is opted => SM is opted

Thus, one has to just choose 2 from the remaining 6 subjects, which can be

Done in ${}^{6}C_2$ i.e. 15 ways.

Case ii: CB is not opted

SM may or may not be opted

A student has to choose any 4 out of 7 subjects (excluding CB). This can be done

In ${}^{7}C_4$ ways

i.e. ${}^{7}C_4$ ways i.e. 35 ways.

Total answer = 15 + 35 = 50 ways.

Q7 Text Solution:

Case i: All 4 who can sing and play musical instrument are selected.

The conditions are satisfied. And the 4 can be chosen in just 1 way since there are just 4 who can sing and play musical instruments.

Case ii: 3 who can sing and play musical instruments are selected.

The conditions are satisfied. And the 3 can be selected in ${}^4C_3$ ways i.e. 4 ways.

The remaining 1 member for the team can be any from the other 3 + 2 = 5 friends i.e. 5 ways.

Total for the case: 4 × 5 = 20

Case iii: 2 who can sing and play musical instrument is selected

The above 2 can be selected in ${}^4C_2$ ways i.e. 6 ways

To satisfy the condition, 1 out of the 3 people who can sing has to be selected. And 1 out of the 2 people who can play musical instrument has to be selected.

Total for the case = ${}^4C_2 \times {}^3C_1 \times {}^2C_1$

= 6 × 3 × 2 = 36

Case iv: 1 who can sing and play musical instrument is selected with this case, it is not possible to form the team since at least 2 will need to be selected from those who ONLY sing and at least 2 will need to be selected from those who ONLY play musical instrument, making the number of members in the team to be more than 4.

Total answer = 1 + 20 + 36 = 57.

Q8 Text Solution:

10 questions can be distributed between the three sections, such that no one section accounts for more than 4 questions as: (4, 4, 2) or (4, 3, 3). These are the only two ways.

If the attempts are (4, 4, 2), the section from which 2 is attempted can be selected and the questions can also be selected.

Total possible way = ${}^3C_1 \times {}^5C_4 \times {}^5C_4 \times {}^5C_2$

= 3 × 5 × 5 × 10 = 750.

If the attempts are (4, 3, 3), the section from which 4 is attempted can be selected and the questions can also be selected.

Total possible way = ${}^3C_1 \times {}^5C_4 \times {}^5C_3 \times {}^5C_3$

= 3 × 5 × 10 × 10 =1500

Answered = 750 + 1500 = 2250

Q9 Text Solution:

20 marks can be scored in following different manners....

Case i: Answer 5 questions correctly

The 5 correctly answered questions can be selected from the 10 questions in ${}^{10}C_5$ ways i.e. 252 ways.

Case il : Answer 6 questions correctly and 4 questions incorrectly

The 6 correctly answered questions can be selected from the 10 questions in ${}^{10}C_6$ ways. And the 4 questions answered incorrectly will be just 1 way, the remaining 4. Thus, total for the case ${}^{10}C_6$ i.e. 210 ways.

Required: answer = 252 + 210 = 462.

Q10 Text Solution:

Diagonal PQ divides the polygon into two halves. each half having 5 vertices. Whenever one vertex is selected from one half and other vertex is selected from other half, then the diagonal so formed will intersect PQ. Thus, required answer = 5 × 5 = 25

Q11 Text Solution:

Total possible ways of choosing 3 points out of 9 given points = ${}^9C_3$ = 84

We would have to subtract all cases where the 3 chosen points are collinear.

3 chosen points can be the 3 points on BC. This can be just 1 way.

3 chosen points can be the points on AC. This can be just ${}^4C_3$ = 4 ways.

Required answer = 84 - 1 - 4 = 79.

Q12 Text Solution:

The number of diagonals of an polygon with n vertices (or sides) = $\frac{n*(n-3)}{2}$

Thus, n (n -3) = 270

Don't solve this algebraically, just do hit and trial

18 × 15 = 270

n = 18

The other polygon would have 15 vertices. And no. of diagonals will be $\frac{(\mathbf{15}\times\mathbf{12})}{2} = \mathbf{90}$

Q13 Text Solution:

To find the number of rectangles in the image, we just need to select 2 vertical lines and 2 horizontal lines. Each distinct selection will result in a distinct rectangle.

Thus, total number of rectangles in the figure = ${}^7C_2 \times {}^4C_2$ = 21 × 6 = 126

We need to subtract all the squares that are counted in the above 126.

Number of squares of size 1×1 = 3 × 6 = 18

Number of squares of size 2 × 2 = 2 × 5 = 10

Number of squares of size 3 × 3 = 1 × 4 = 4

We cannot have squares of larger sizes.

Required answer = 126 - 18 - 10 - 4 = 94

Q14 Text Solution:

The side common to the polygon can be any one of the 10 sides of the polygon.

Considering any one side, the third vertex of the triangle can be selected from any of the 10 - 4 = 6 vertices. (2 vertices will be end-points of the side common to the polygon and neither can the two adjacent vertices be selected)

Thus, required answer = 10 × 6 = 60.

Q15 Text Solution:

1 line in a plane, divides the plane into 2 regions.

2 lines in a plane, divides the plane into maximum 4 regions.

3 lines in a plane, divides the plane into maximum 7 regions. You have to actually draw the lines such that no three lines pass through the same point and no two lines are parallel

4 lines in a plane, divides the plane into maximum 11 regions.

Seeing the pattern, we arrive at a standard relation.

the maximum number of non-overlapping regions that n lines can divided a plane into is (1 + ∑n).

Q16 Text Solution:

Since the scholarships are identical it does not matter which scholarship is given to whom, what matters is just how many does each get. The question allows a student to get more than one scholarship.

Let, each of the 10 student get, a, b, c, d, e, f, g,h.i and j scholarship. We will have the condition that

a + b + c + d + e + f + g + h + i + j = 5.

The required answer is the number of whole number solutions to the above equation, which is

${}^{(5+10-1)}C_{(10-1)}$ i.e. ${}^{14}C_5$.

Q17 Text Solution:

The number of natural number solution to a + b + c < 12

= the number of natural number solution to a + b + c + d = 12, (where even d is natural number, ensuring that (a + b + c) is strictly less than 12 and not equal to 12)

= ${}^{(12-1)}C_{(4-1)}$ ie. ${}^{11}C_3$ = 165.

The number of natural number solution to a + b + c 5
= the number of solution to a + b + c + d = 5, where a, b, c are natural but d is whole
= the number of whole number solution to a + b + c + d = 2
= ${}^{(2+4-1)}C_{(4-1)}$ i.e. ${}^{5}C_{3}$ = 10
Required answer = 165 - 10 = 155.

Q18 Text Solution:

'at least 1 is even ' = total cases - 'no one is even'
All possible whole number solutions to a + b + c = 7 is ${}^{(7+3-1)}C_{(3-1)}$ i.e. ${}^{9}C_{2}$ = 36.
Number of whole number solutions to a+ b+ c = 7, such that all of a, b, c are odd numbers
= number of whole number solution to (2p + 1) + (2q + 1) + (2r + 1) = 7,
i.e. number of whole number solution to p + q + r = 2
= ${}^{(2+3-1)}C_{(3-1)}$ i.e. ${}^{4}C_{2}$ = 6
Required answer = 36 - 6 = 30.

Q19 Text Solution:

Let the 5 varieties of stamps be A, B, C, D and E. And let me purchase, a stamps of A, b stamps of B, c stamps of C, d stamps of D and e stamps of E ariety.
Since I can spend a maximum of 10 Rs, I can purchase a maximum of 5 stamps
Thus, a + b + c + d + e $\leq$ 5
And since each variety has any number of stamps, each of a, b, c, d, e can be any whole number.
Whole number solutions to a + b + c + d + e $\leq$ 5
= whole number solution to a + b + c + d + e + f = 5
= ${}^{(5+6-1)}C_{(6-1)}$ i.e. ${}^{10}C_5 = 252$
One of the solution is a = b = c = d = e = 0 (and f = 5).
This one solution is not acceptable because the question requires us to purchase atleast 1 stamp.
Thus, required answer = 251

Q20 Text Solution:

The marbles of a color are identical. So it does not matter which marbles are selected, what matters is how many of each color are selected. Hence, let number of red marbles selected be x, blue marbles selected by y, and green marbles selected be z.
We will have the condition: x + y + z = 5
And whole number solutions to the above equation = ${}^{(5+3-1)}C_{(3-1)}$ i.e. ${}^{7}C_{2}$ = 21
However one of the solution is x = y = 0 and z = 5.
This is not acceptable since the maximum value that z can assume is 4. Other than this one solution, all other solutions will have z to be less than 5, which is acceptable.
Thus, required answer =21 - 1 = 20

Q21 Text Solution:

We require natural number solution to a + b + c + ...+ n = 2n
The LHS has n variables.
And the number of natural solutions to the equation = ${}^{2n-1}C_{n-1}$

Q22 Text Solution:

The number of natural number solutions to a + b + c = 10 is ${}^{(10-1)}C_{(3-1)}$ i.e.${}^{9}C_{2}$ = 36
Consider any solution, say a = 1, b = 1, c = 8
Since the given equation is |a| + |b| + |c|, we can have a = 1, b = 1 and c = 8
i.e. 8 different solutions for a, b, c to be integers for each solution of a, b, c being natural numbers.
Thus, required number of solutions = 36 × 8 = 288

Q23 Text Solution:

Let the number on first dice be a, that on second dice be b, that on third dice be c, and that on fourth dice be d.

We need, a + b + c + d = 11

The problem with this question is that there are upper limits to each of a, b, c and d

i.e. a, b,c,d 6, since they are numbers turned on a dice

The total number of natural number solutions to a + b + c + d = 11 is ${}^{11-1}C_{4-1}$ i.e.${}^{10}C_3$ = 120.

Now we need to subtract all cases where any variable is greater than 6. Thankfully, since the RHS is just 11, only 1 variable can be more than 6. And that variable can be any of the 4.

Say it is a.

Further say, a = 6 + x, where x is natural number.

Thus, the equation becomes (6 + x) + b + c + d = 11

I.e. x + b + c + d = 5

this will have ${}^{5-1}C_{4-1}$ i.e. ${}^{4}C_3$ = 4 natural number solution.

Thus, the number of unacceptable solution = 4 × 4 = 16.

And required answer = 120 - 16 = 104.

Q24 Text Solution:

The number of roses can be any natural number from 5 to 8 i.e. 4 different values.

The number of daisies can be any natural number from 10 to 15 i.e. 6 different values.

Thus the number of different combination of number of roses and number of daisies can be 4 × 6 = 24.

Q25 Text Solution:

At Least 3 but not more than 8 notes means I can choose any number of notes from 3 to 8 i.e. 6 different values. And since all the notes are identical, choosing which notes does not matter.

Thus, considering the notes, I can choose the notes in 6 ways.

And I have 4 different coins and I can select any number of coins. This can be done in ${}^4C_0 + {}^4C_1 + {}^4C + {}^4C_3 + {}^4C_4$ ie. 24 i.e. 16 ways.

And since no combination of choosing the notes in 6 different ways and choosing the coins in 16 different ways result in the same sum, all the 6 x 16 i.e. 96 ways of selecting notes and coins result in a different amount.

Q26 Text Solution:

Both the gulab-jamuns are identical. Thus, considering the gulab-jamuns, I can have 0 or 1 or 2 i.e. a total of 3 ways.

All the 3 rosagullas are identical. Thus, considering the rosagullas, I can have 0 or 1 or 2 or 3. i.e. a total of 4 ways.

All the 4 jalebi are identical. Thus, considering the jalebi, I can have 0 or 1 or 2 or 3 or 4 i.e. a total of 5 ways.

All the 3 types of sweet considered together, I can have any number of sweets (including the possibility of none of them) in 3 × 4 × 5 i.e. 60 ways.

Excluding the 1 case of having no sweets (0 gulab - jamuns AND 0 rosagullas AND 0 jalebi, this combination is just 1 single case), there will be 59 ways in which at least one piece of sweet can be eaten.

Q27 Text Solution:

Two-digit multiples of 10 are 10, 20, 30, ...80, 90 i.e. 9 in numbers

We can select at least one element from these 9 elements and make a new set.

And number of ways of selecting at least 1 object out of n distinct objects = $2^n - 1$.

Thus, required answer = $2^9 - 1$ = 512 - 1 = 511.

Q28 Text Solution:

Voter can select 1 candidate in ${}^5C_1$ ways.

Voter can select 2 candidates in ${}^5C_2$ ways.

And so on, till

Voter can select 5 candidates in ${}^5C_5$ ways.

Required answer = ${}^5C_1 + {}^5C_2$ +..". + ${}^5C_5 = 2^5 - 1$= 31

Q29 Text Solution:

To form a polygon, we need to select at least 3 vertices.

3 vertices can be selected from the 7 points in ${}^7C_3$ ways

4 vertices can be selected from the 7 points in ${}^7C_4$ ways

And so on.

Every selection results in a different polygon.

Thus, required answer = ${}^7C_3 + {}^7C_4 + \ldots\ldots\ldots + {}^7C_7$

= $2^7 - {}^7C_0 - {}^7C_1 - {}^7C_2$

=128 - 1 - 7 - 21 = 99

Q30 Text Solution:

From the 4 identical white pearls, any number of pearls (including 0 pearls) can be purchased in 5 ways.

From the 9 distinct non-white pearls, any number of pearls (including 0 pearls) can be be purchased in 2^9 = 512 ways.

And the combinations of the above two purchases will be 5 × 512 = 2560

But exactly 1 combination will be of 0 white and 0 non-white pearl, which is not acceptable as per the as condition in the question.

Thus, answer = 2560 - 1 = 2559.