MATHIFY TO QUALIFY

PRIVATE UNIVERSITY ADMISSION MATH PRACTICE BOOK

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Mathify to Qualify

Private University Admission Math Practice Book

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Qualify

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Preface

বর্তমান প্রতিযোগিতামূলক বিশ্বে উচ্চশিক্ষা অর্জন এবং একটি মর্যাদাপূর্ণ কর্মক্ষেত্রে প্রতিষ্ঠিত হওয়ার জন্য ভর্তি পরীক্ষা ও বিভিন্ন নিয়োগ পরীক্ষায় সফলতা অর্জন অপরিহার্য। বিশেষ করে বাংলাদেশের শীর্ষস্থানীয় বেসরকারি বিশ্ববিদ্যালয়সমূহ যেমন—IBA, NSU, BRACU, EWU, BUP এবং অন্যান্য প্রতিষ্ঠানে ভর্তিচ্ছু শিক্ষার্থীদের জন্য ভর্তি পরীক্ষা একটি বড় চ্যালেঞ্জ হয়ে দাঁড়িয়েছে। একইভাবে, BCS, ব্যাংক এবং অন্যান্য সরকারি-বেসরকারি চাকরির ক্ষেত্রেও গণিত ও ইংরেজি দক্ষতা নির্ণায়ক ভূমিকা পালন করে থাকে।

এই প্রেক্ষাপটে Mathify to Qualify বইটি মূলত শিক্ষার্থীদের জন্য গণিতের একটি সর্বাঙ্গীণ প্রস্তুতির সহায়ক গ্রন্থ। এতে বিগত বছরগুলো তে বিভিন্ন প্রাইভেট বিশ্ববিদ্যালয়ে আসা প্রশ্নের আদলে প্রচুর গণিত প্রশ্ন দেয়া আছে। এবং সেই সাথে সুস্পষ্ট ব্যাখ্যা সহ সমাধান দেয়া আছে। কারণ বাস্তব অভিজ্ঞতা প্রমাণ করে যে, ভর্তি পরীক্ষায় সাফল্য অর্জনের জন্য প্রচুর অনুশীলন প্রয়োজন, যা কেবল মাত্র সম্ভব একটি সমৃদ্ধ প্রশ্ন ভাণ্ডারের মাধ্যমে।

বইটির বিশেষ বৈশিষ্ট্যসমূহের মধ্যে উল্লেখযোগ্য হলো—

- প্রতিটি অধ্যায়ের অধীনে **অসংখ্য অনুশীলনমূলক প্রশ্ন** সংযোজন।
- প্রতিটি প্রশ্নের **সুস্পষ্ট ও ধাপে ধাপে সমাধান**, যাতে শিক্ষার্থীরা কেবল উত্তর নয়, বরং সমাধানের কৌশল আয়ত্ত করতে পারে।
- শিক্ষার্থীদের স্ব-অধ্যয়ন ও আত্মবিশ্বাস বৃদ্ধির জন্য ব্যবহারিক দৃষ্টান্ত এবং সুনির্দিষ্ট ব্যাখ্যা।

আমরা বিশ্বাস করি, এই গ্রন্থ শিক্ষার্থীদের জন্য কেবল একটি প্রশ্নব্যাংক নয়; বরং এটি হবে **একটি পূর্ণাঙ্গ প্রস্তুতির নির্ভরযোগ্য সহচর।**

সর্বোচ্চ সতর্কতা অবলম্বন করা সত্ত্বেও কোনো ত্রুটি অনিচ্ছাকৃতভাবে থেকে যেতে পারে। শিক্ষার্থীদের মূল্যবান পরামর্শ আমাদের ভবিষ্যৎ সংস্করণকে আরও সমৃদ্ধ ও পরিপূর্ণ করে তুলতে সহায়ক হবে।

পরিশেষে, আমরা প্রত্যাশা করি যে, এই বইটি আপনার একাডেমিক ও প্রতিযোগিতামূলক সাফল্যের পথে একটি দৃঢ় ভিত্তি হিসেবে কাজ করবে।


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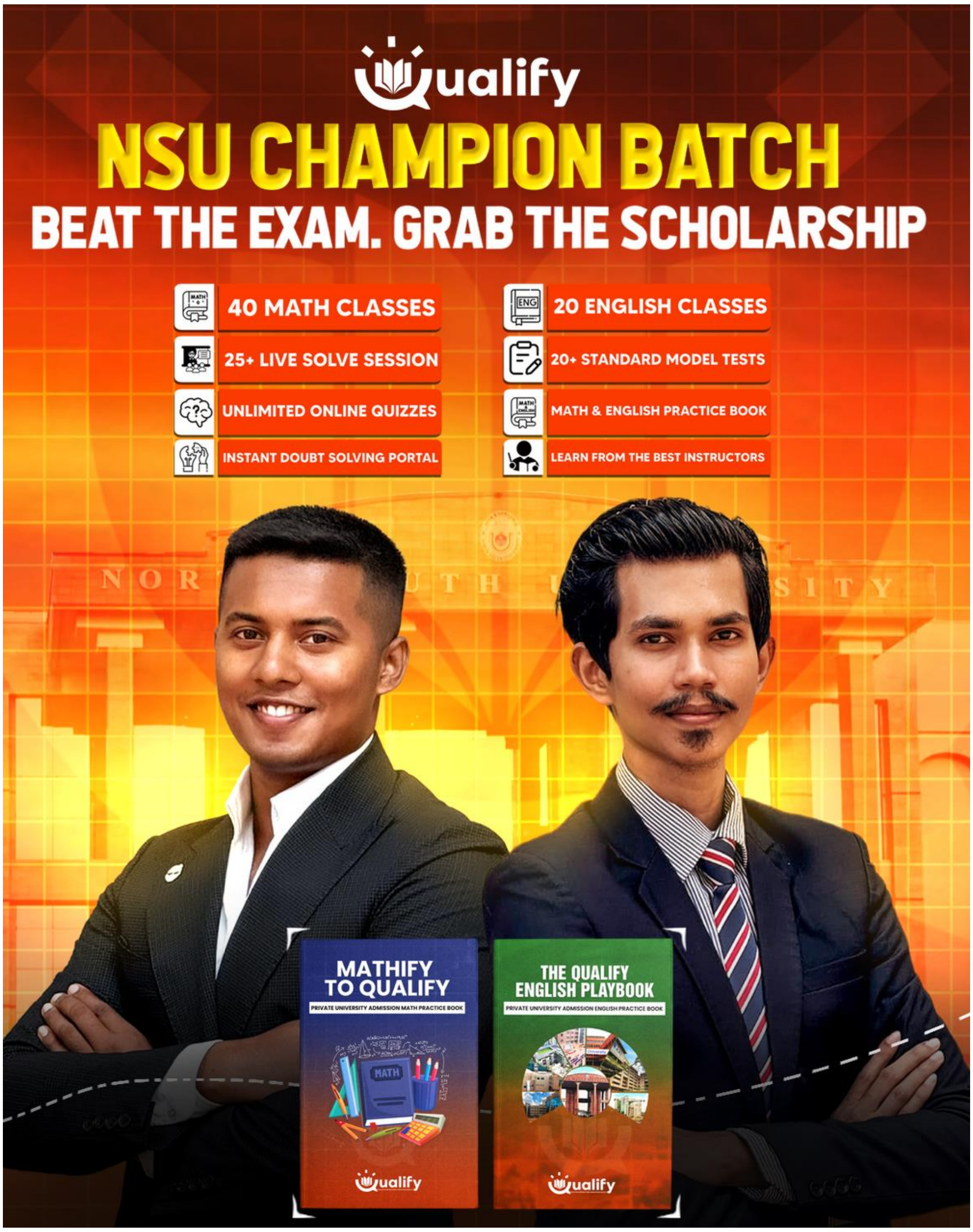
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Table of Content

Combinatorics

1. If there are 20 boys, how many different basketball teams could be formed?
(A) 15,503 (B) 14,503 (C) 14,504 (D) 15,504

2. A man has in his pocket a silver dollar, a half-dollar, a quarter, a dime, a nickel, a penny. If he reaches into his pocket and pulls out three coins, how many different sums may be have?
(A)20 (B)22 (C)32 (D)40

3. Find the value of $^3C_3$
(A)5 (B) 1 (C) 2 (D) 6

4. Find the value of $\frac{5!}{3!}$
(A) 4 (B) 20 (C) 30 (D) 40

5. Find the value of $\frac{6!-4!}{4!}$
(A) 30 (B) 29 (C) 39 (D) 40

6. How many permutations of seven different letters may be made?
(A) 9! (B) 7! (C) 8! (D) 5!

7. How many arrangements of 6 objects, taken two at a time, can be made?
(A) 30 (B) 40 (C) 50 (D) 60

8. In how many ways can eight people be arranged in a row?
(A) 40,320 (B) 40,321 (C) 40,3221 (D) 40,444

9. If 20 boys go out for football team, how many different teams may be formed, one at a time?
(A) 125970 (B) 184756 (C) 92378 (D) 167960

10. In how many ways can a coach choose first a football team and then a basketball team if 18 boys go out for either team?
(A) 668, 304 ways (B) 668, 405 ways (C) 668, 904 ways (D) 668, 309 ways

11. A man has 12 different coloured shirts and 20 different ties. How many shirts and its combinations can be select to take on a trip, if he takes 3 shirts and 5 ties?
(A) 3,410,88 (B) 3,410,889 (C) 3,410,880 (D) 3,410,879

12. How many four digit numbers can be formed from the digits 2,3,4,5,6 and 7 without repetitions?
(A) 120 (B) 240 (C) 360 (D) 720

13. How many four digit numbers can be formed from the digits 2,3,4,5,6 and 7 with repetitions?
(A) 216 (B) 625 (C) 1,296 (D) 360

14. Using the digits 4,5,6,7,8,9 how many five-digit numbers can be formed?
(A) Without repetition? (B) With repetition?
(C) How many four-digit odd number can be formed without repetition?

15. A committee consists of 8 men and 4 women. In how many ways can sub-committee of 3 men and1 1 woman be chosen?
(A) 192 (B) 224 (C) 112 (D) 128 (E) none of these

16. How many ways can the letters of the word 'MANAGER' be rearranged, so that the letters G, E, R will always come together?
(A) 360 (B) 120 (C) 240 (D) 480

17. Each of the six players participating in a chess competition will play one match with each other player. Tell us how many matches will be played in the entire competition-
(A) 30 (B) 36 (C) 15 (D) 12

18. Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?
(A) 20300 (B) 2400 (C) 24100 (D) 25200

19. The value of P(n, n-1) is
(A) n (B) n! (C) 2n (D) 2n!

20. The number of ways in which 8 students can be seated in a line is
(A) 5040 (B) 50400 (C) 40230 (D) 40320

21. The number of ways 4 boys and 3 girls can be seated in a row so that they are alternate is
(A) 12 (B) 104 (C) 144 (D) 256

22. The number of ways 10 digit numbers can be written using the digits 1 and 2 is
(A) 2^{10} (B) $^{10}C_2$ (C) 10! (D) $10C_1 + {}^9C_2$

23. In how many ways can 3 people be seated in a row containing 6 seats?
(A) 110 (B) 120 (C) 130 (D) 140

24. How many 4-letter codes can be formed using the first 9 letters of the English alphabet if no letter is repeated?
(A) 3024 (B) 3036 (C) 3021 (D) 3034

25. There are 35 teachers in a school. In how many different ways one principal and one vice principal can be chosen?
(A) 1160 (B) 1170 (C) 1180 (D) 1190

26. Four boys and three girls are to be seated for a dinner such that no two girls sit together and no two boys sit together. Find the number of ways in which this can be arranged.
(A) 36 (B) 72 (C) 144 (D) 180

27. How many 4-letter words, with or without meaning, can be formed out of the letters of the word, 'LOGARITHMS' if repetition of letters is not allowed?
(A) 40 (B) 400 (C) 5040 (D) 2520

28. 12 people at a party shake hands once with everyone else in the room. How many handshakes took place?
(A) 132 (B)66 (C) 12!/2 (D) 12

29. A man has 9 friends, 4 boys and 5 girls. In how many ways can he invite them, if there have to be exactly 3 girls in the invitees?
(A) 320 (B) 160 (C) 80 (D) 200

30. There are three ways to go to Bashundhara from Banasree. There are 4 ways to go to Mirpur from Bashundhara. How many different routes are there to go to Mirpur to Banasree?
(A) 3^4 (B) 4 (C) 7 (D) 12 (E) None

31. How many ways can the letter if the word QUALIFY be arranged?
(A) 2520 (B) 5040 (C) 10080 (D) 2426 (E) None

32. How many ways the letter of the word APPLE be arranged?
(A) 120 (B) 30 (C) 60 (D) 70 (E) None

33. A dice has been rolled 3 times. How many results are there possible in total?
(A) 216 (B) 36 (C) 18 (D) 6 (E) None

34. A coin has been tossed 8 times. What’s the total number of possible result?
(A) 2^7 (B) 2^0 (C) 2^8 (D) 2^4 (E) None

35. How many ways can the letters of the word ABBCCCD be arranged?
(A) 8! (B) $\frac{8!}{2!3!}$ (C) 12! (D) 1268024 (E) None

36. How many ways can the letters of the word ARRANGE be arranged?
(A) 600 (B) 450 (C) 1260 (D) 1300 (E) None

37. How many ways 5 people can sit in a round table?
(A) 12 (B) 30 (C) 24 (D) 16 (E) None

38. How many ways can you select invite 3 out of 5 relatives?
(A) 25 (B) 10 (C) 16 (D) 24 (E) None

39. How many ways a captain, a sub-captain and a scout can be selected out of 7 people?
(A) 35 (B) 20 (C) 10 (D) 24 (E) None

40. How many ways can the letters of the word ENGINEERING be arranged?
(A) 287530 (B) 1444900 (C) 277200 (D) 189769 (E) None

41. How many ways can the letters of the word COMBINATORICS be arranged?
(A) 13! (B) $\frac{13!}{4}$ (C) $\frac{13!}{8}$ (D) $\frac{13!}{2}$ (E) None

42. How many ways can the letters of the word COLLEGE be arranged?
(A) 630 (B) 1260 (C) 1890 (D) 1920 (E) None

43. How many even numbers of 3 digits can be created by using only 2, 6, and 9?
(A) 36 (B) 18 (C) 20 (D) 45 (E) None

44. If C(n, 5) = C(n, 7) then n = ?
(A) 5 (B) 7 (C) 12 (D) 35 (E) None

45. How many ways the latter of the word CALCULAS be arranged so that the beginning and ending letters are the same?
(A) 270 (B) 540 (C) 320 (D) 460 (E) None

46. How many ways can be the letters of the word ENGINEERING be arranged so that the 3 E's are always together but do not start with the E's?
(A) 128422 (B) 92841 (C) 13440 (D) 490 (E) None

47. How many ways can be a cricket team of 11 members be made out of 2 teams of 6 members so that 5 members from the team of 6 members are always selected?
(A) 21 (B) 42 (C) 63 (D) 882 (E) None

48. how many ways can 8 mails be delivered so that 5 of them go to a house and other 3 go to another house?
(A) 45 (B) 10 (C) 56 (D) 60 (E) None

49. How many ways can the letters of the word MILLENIUM be arranged so that the word starts and ends with M?
(A) 100080 (B) 184610 (C) 103990 (D) 1260 (E) None

50. how many ways can the letters of the word DHAKA be arranged so that the word that vowels are together?
(A) 512 (B) 24 (C) 638 (D) 700 (E) None

51. How many ways can the letters of the word TRIANGLE arranged so that the vowels are not together?
(A) 72000 (B) 284900 (C) 36000 (D) 1260 (E) None

52. How many 4 letters word are there so that 2 of them are vowels?
(A) 25000 (B) 69700 (C) 50400 (D) 578590 (E) None

53. How many pairs of numbers are there from 1 to 40 so that their sum is even?
(A) 380 (B) 190 (C) 190^2 (D) 380^2 (E) None

54. How many ways can the letters of the word PREMUTATION be arranged?
(A) 11! (B) $\frac{14!}{2}$ (C) 241815900 (D) $\frac{11!}{2}$ (E) None

55. How many ways can the letters of the word BANGLADESH be arranged?
(A) 11! (B) $\frac{12!}{2}$ (C) $\frac{10!}{2}$ (D) $\frac{10!}{3!}$ (E) None

56. How many ways can the letters of the word 'BOOK' be arranged?
(A) 12 (B) 7200 (C) 1800 (D) 2000 (E) None

57. How many diagonals does an octagon have?
(A) 20 (B) 30 (C) 28 (D) 52 (E) None

58. There are 4 and 6 points respectively on two parallel lines. How many triangles can be created out of them?
(A) 48 (B) 96 (C) 180 (D) $3^4. 3^6$ (E) None

59. There are 15 books in a shelf. Among them 7 are of Algebra, 6 of Geometry and 2 are of Combinatorics. How
Many ways can you select the book so that you have one of the categories?
(A) $3^7. 3^6. 3^2$ (B) 84 (C) 15 (D) 21 (E) None

60. How many 4 letter words (meaningful or not) do not contain 2 vowels?
(A) $^{26}C_2$ (B) $26^4 - {}^5c_2.{}^{26}C_4$ (C) $26^4 - {}^5C_2.{}^{26}C_2. 4!$ (D) 26^4 (E) None

Answer:

1.D	2.A	3.B	4.B	5.B	6.B	7.A	8.A	9.D	10.A
11.C	12.C	13.C	14.	15.B	16.A	17.C	18.D	19.B	20.D
21.C	22.A	23.B	24.A	25.D	26.C	27.C	28.B	29.B	30.D
31.B	32.C	33.A	34.C	35.B	36.C	37.C	38.B	39.A	40.C
41.C	42.B	43.B	44.C	45.B	46.C	47.C	48.C	49.D	50.B
51.C	52.C	53.A	54.D	55.C	56.A	57.C	58.B	59.B	60.C

Combinatorics – Solution

1. There are 5 boys needed in each team.
$^nC_r = \frac{n!}{r!(n-r)!}$ Here, n=20, r=5
Now, we put value,
$^{30}C_5 = \frac{20!}{5!(20-5)!} = \frac{20!}{5!\times15!}$
$= \frac{20\times19\times18\times17\times16\times15!}{5!\times15!} = \frac{20\times19\times18\times17\times16}{120}$=15,504

2. ∴ The no. of possible combination is $^6C_3 = \frac{6!}{3!(6-3)!} = 20$

3. $^6C_3 = \frac{3!}{3!(3-3)!} = \frac{3!}{3!\,0!} = 1$ [∴ 0!= 1]

4. $\frac{5!}{3!} = \frac{5.4.3.2.1}{3.2.1} = 20$ (by simplification)

5. ∴ $\frac{6!-4!}{4!} = \frac{4!(6\times5-1)}{4!} = 29$

6. The easiest solution is to use the previous statement and write
$^7C_7 = \frac{7!}{(7-7)!} = \frac{7!}{0!} = \frac{7!}{1} = 7!$

7. The number of permutations of six objects, taken two at a time, can be time, is written as follows:
$^6C_2 = \frac{6!}{(6-2)!} = \frac{6!}{4!} = \frac{6\times5\times4!}{4!} = 6\times 5 = 30$
Here, n=6 , r=2 means, $^nC_r = {^6C_2}$

8. $^8C_8 = \frac{8!}{(8-8)!} = \frac{8!}{0!} = \frac{8\times7\times6\times5\times4\times3\times2\times1}{1}$ =40,320

9. $^{20}C_{11} = \frac{20!}{11!(20-11)!} = 167960$ ways

10. $^{18}C_{11} = \frac{18!}{11!(18-11)!} = 31,824$ ways
The coach now must choose a basketball team from the reaming seven boys. 5 boys in one basketball team.
That is,
$^7C_5 = \frac{7!}{5!(7-5)!} = \frac{7!}{5!2!} = 21$
Then, together, the two teams can be chosen in (31,824) × (21) = 668,304 ways

11. **Hint:** $^{12}C_3 \cdot {^{20}C_5} = 3,410,880$

12. The (A) part of the question is a straight forward permutation problem and we reason that we want the number of permutations of six items taken four at a time.
Therefore, $^6C_4 = \frac{6!}{(6-4)!} = \frac{6\times5\times4\times3\times2\times1}{2\times1} = 360$

13. The question would become quite complicated if we tried to use the formulas, therefore, we reason as follows:
We desire a four-digit number and we have six choices for the first digit. That is, we may use any of the digits 2,3,4,5,6 or 7 in the thousands column which gives us six choices for the digit to be placed in the thousands column. If we select the digit 4 for the thousands column we still have a choice of any of the digits 2,3,4,5,6 or 7 for the hundreds column. This is because as we did for the thousands column, this gives us six choices for the hundreds column.
Continuing this reasoning, we could write the number of choices for each place value column as shown in table.

Thousands column	Hundreds column	Tens column	Units column
Six choices	Six choices	Six choices	Six choices

In the table, observe that the total number of choices for the four digit number, by the principle of choice, is $6\times 6 \times 6 \times 6 = 1{,}296$

14. **HINTS:** (A) ${}^6C_4 = 720$
(B) $n^r = 6^5 = 7{,}776$
(C) ${}^3C_1 \times {}^5C_3 = 180$

15. The number of ways to choose 3 men from 8 is: ${}^8C_3 = \frac{8!}{3!(8-3)!} = \frac{8!}{3!5!} = 56$
The number of ways to choose 1 woman from 4 is: ${}^4C_1 = \frac{4!}{1!(4-1)!} = \frac{8!}{1!3!} = 4$
Multiply the number of ways to choose men and women: $56 \times 4 = 224$

16. The letters G,E and R can be arranged together in 3! = 6.
So we have 6 way to arrange G,E and R.
Considering GER as one alphabet or one block,
Now, we have 4(M, A, N and A) +1 (GER = 5 letters.
To be randomly arranged of which the 2 A's are indistinguishable.
So they can be randomly arranged as:
$\frac{5!}{2!} = 60$
There is 60 ways to arrange 5 letters.
So the total number of ways letters of the word MANAGER can be arranged such that the letter G, E and R come t together is:
$60 \times 6 = 360$

17. Each of the six players participating in a chess competition will play one match with each other player.
Concept Used:
${}^nC_c = n!\,/r!\,(n-r)!$
Calculations:
Symbolically, this can be represented as C(n, r) where:
n represents the total number of players.
r represents the number of players in a single match.
In this case, n is 6 (the total number of players) and r is 2 (players in a single match).
So, in the notation of combinations, the number of matches would be represented as C(6,2).
C(6,2)=6!/[2!(6-2)!] = 30/2 = 15
∴ **There will be 15 matches played in the entire competition**

18. Given:
Number of consonants = 7
Number of vowels = 4
Number of consonants to be in each word = 3
Number of vowels to be in each word = 2
Concept used:
The number of ways to select items is given by the combinations formula: $C(n, r) = \frac{n!}{r!(n-r)!}$
The number of ways to arrange items is given by the permutations formula: P(n) = n!
Calculation:
3 consonants can be selected from 7 in ${}^7C_3$ ways = 35 ways.
2 vowels can be selected from 4 vowels in ${}^4C_2$ ways = 6 ways.
Since we will have to make words from these 5 (3 consonants and 2 vowels) letters.
So arrangements of these 5 letters = 5! = 120
Total number of ways = $35\times 6 \times 120 = 25200$ ways.
∴ **25200 words of 3 consonants and 2 vowels can be formed.**

19. We know that $P(n,r) = {}^nP_r, = n!/(n-r)!$
Hence, $P(n, n-1) = {}^nP_{n-1} = n!/[n-(n-1)]!$
$P(n, n-1) = n!/(n-n+1)! = n!/1! = n!$
Therefore, the value of P(n, n-1) is n!.
Hence, the correct answer is option (b) n!

20. For the 1st position, there are 8 possible choices. For the 2nd position, there are 7 possible choices. For the 3rd position, there are 7 possible choices, etc. And for the eighth position, there is only one possible choice. Hence, this can be written as 8!
(i.e.) $8! = 8\times7\times6\times5\times4\times3\times2\times1=40,320$
Hence, the number of ways in which 8 students can be seated in a line is 40320.

21. Given that, there are 4 boys and 3 girls.
The only pattern 4 boys and 3 girls are arranged in an alternate way is BGBGBGB.
Therefore, the total number of ways is $4!\times3! = 144$.

22. Given digits are 1 and 2.
Here, each place can be filled in two ways either with 1 or 2 and every place has two chances.
Therefore, the number of ways 10 digit numbers can be written using the digits 1 and 2 is 2^{10}.
Hence, option (A) 2^{10} is the correct answer.

23. There are 6 seats available and 3 people to be seated. The first person can choose any of the 6 seats. After the first person is seated, there are 5 seats remaining. The second person can choose any of the 5 seats. After the second person is seated, there are 4 seats remaining. The third person can choose any of the 4 seats. Therefore, the total number of ways to seat 3 people in a row containing 6 seats is 6 x 5 x 4 = 120.

24. To form a 4-letter code using the first 9 letters of the English alphabet without repetition, we have 9 choices for the first letter, 8 choices for the second letter, 7 choices for the third letter, and 6 choices for the fourth letter. Therefore, the total number of possible codes is 9 x 8 x 7 x 6 = 3024.

25. The number of ways to choose one principal from 35 teachers is 35. After selecting the principal, there are 34 teachers remaining from which to choose the vice principal. Therefore, the number of ways to choose one vice principal is 34. To find the total number of ways to choose both a principal and a vice principal, we multiply the number of ways to choose each position together: 35*34=1190.

26. In this scenario, we need to arrange four boys and three girls for a dinner in such a way that no two girls sit together and no two boys sit together. To find the number of ways this can be arranged, we can consider the arrangement of boys and girls separately. There are 41 (4 factorial) ways to arrange the boys and 3! (3 factorial) ways to arrange the girls. However, since the arrangement of boys and girls is independent, we need to multiply these two numbers together. Therefore, the total number of ways to arrange the boys and girls is 413124*6=144.

27. The given word "LOGARITHMS" has 10 letters. We need to form 4-letter words without repetition. To do this, we can select 4 letters from the 10 available. The number of ways to select 4 letters from 10 is given by the combination formula, which is 10!/(4! (10-4)!). Simplifying this expression gives us 10!/(4!6!). This can be further simplified to (10*9*8*7)/(4*3*2*1)= 5040. Therefore, there are 5040 possible 4-letter words that can be formed.

28. In this scenario, each person shakes hands with every other person in the room once. To calculate the number of handshakes, we can use the formula n(n-1)/2, where n represents the number of people. In this case, there are 12 people, so the calculation would be 12(12-1)/2 = 66 handshakes.

29. The man has 5 girls to choose from for the first girl to be invited, then 4 girls for the second girl, and 3 girls for the third girl. Since the order in which the girls are invited does not matter, we divide by 3! (the number of ways to arrange 3 girls) to avoid overcounting. For the remaining 6 spots, the man can invite any of the 4 boys or the remaining 2 girls. Therefore, the total number of ways to invite the friends is 5* 4 *3/3!*6*5=160.

30. There are two major routes: 1. Mirpur to Bashundhara. 2. Bashundhara to to Bansree. you have to select one path from each of the major routes. So, total available routes = 3 x 4 = 12

31. 7 letters can be arranged in 7! Ways = 5040.

32. Total letters = 5 which includes 2 P.
Total way of arranging = $\frac{5!}{2!}$

33. $6^3 = 216$.

34. Total outcomes = 2^n, where n is the number of tosses. Thus, possible results = 2^8.

35. Total numbers of letter = 8. Repetitions = 2 B and 3 C.
Total ways of arranging = $\frac{8!}{2!3!}$

36. Total letters = 7. Repetitions = 2 A and 2 R.
Total ways of arranging = $\frac{7!}{2!2!}$ = 1260

37. $(5-1)!=24$

38. $^5C_3 = 10$

39. As the ranks are mentioned, order must be considered here. Therefore, total ways = $^7C_3 = 35$

40. 11 letters with 3, 3, 2, 2 repeating letters can be arranged in = $\frac{11!}{3!.3!.2!.2!}$ =277200

41. $\frac{13!}{2!.2!.2!} = \frac{13!}{8}$

42. $\frac{7!}{7!2!.2!} = 1260$

43. The first two digits can be any of 2, 6, 9. There are $3^2 = 9$ ways to select them.
The last digit can be 2 or 6, so that the number is even. Therefore, there are 2 ways to select the last digit.
Total ways = 2 × 9 = 18.

44. We know, C(n, r) = C(n, n-r). Therefore, according to the question, n – 5 = ⟹ n = 12

45. The beginning and ending letters can be the same in 3 ways (UU, LL, CC). The other letters (8 – 2 = 6) can be arranged in 6! Ways where 2, 2 are repeating.
Total ways = $\frac{3.6!}{2!.2!} = 540$

46. If the 3 E's are together, the ways to arrange the letters = $\frac{9!}{3!.2!2!}$. If the 3 E's are the beginning, then ways to arrange the letters = $\frac{8!}{3!.2!.2!}$
Total ways to arrange = $\frac{9!}{3!2!2!} - \frac{8!}{3!.2!.2!} = 13440$

47. Here are few cases to consider.
Let the team of 6 members be the first team and the other one be the second team.
1. 5 members from the first team, the rest 6 members from the second team = $^6C_5$. $^7C_6 = 42$
2. 6 members from the first team, the rest 5 members from the second team = $^6C_6$. $^7C_5 = 21$
Total ways = 42 + 21 = 63

48. 5 mails can be chosen out of 8 mails in = $^8C_5$.
The other 3 mails go to the other house automatically as only 3 mails left.
So, total ways = $^8C_5$ x 1 = 56

49. Total letters = 9. If starts and ends with M, the rest 7 letters can be arranged in = $\frac{7!}{2!.2!}$ ways = 1260 ways.

50. Total letters = 5, Repeating letters – 2, Letters who are bond to stay together = 2, letters who are not bound to stay together = (5 – 2) = 3
Total ways to arrange = (5 -2 + 1)!. $\frac{2!}{2!} = 2$

51. Total ways to arrange the letters = 8!
Total ways to arrange so that the vowels are together = 6!. 3!
Total ways to arrange so that the vowels are not together = 8! – 6!. 3! = 36000

52. Ways to choose 2 vowels out of 5 vowels = $^5C_2$
Ways to choose 2 consonants out of 21 consonants = $^{21}C_2$
The letters of every word arrange among themselves in = 4! Ways.
Total words = $^5C_2$ x $^{21}C_2$ x 4! = 50400

53. 20 of them are even and 20 of them are odd. Sum will be even when –
    1. Botha are even: ways to choose 2 even numbers out of 20 = $^{20}C_2$ = 190
    2. Both are odd: ways to choose 2 odd numbers out of 20 = $^{20}C_2$ = 190

    Total ways to arrange = 190 + 190 = 380

54. Total letters = 11 and repeating letters = 2. Total ways = $\frac{11!}{2}$

55. Total letters = 10 and repeating letters = 2
Total ways to arrange the letters = $\frac{10!}{2}$

56. Total letters = 4, repeating letters = 2. Total ways = $\frac{4!}{2!} = 12$

57. Octagon is created by connecting 8 of its corner points. 2 out of 8 points can be connected in $^8C_2$ ways. Among these, 8 of its sides are included. Therefore, diagonals = $^8C_2 - 8 = 20$

58. 1. A point from the first and two points from the second can create a triangle in 4. $^6C_2$ ways.
2. Two points from the first and a oints from the second can create a triangle in = $^4C_2$. 6 ways
Total = 4 x $^6C_2$ + $^4C_2$. 6 = 96 ways.

59. Consider the categories as sets. Therefore, total ways = 7. 6. 2 = 84

60. Ways to arrange 4 letters out of 26^4
Ways to choose 2 vowels = $^5C_2$, Remaining letters = 26 – 2 = 24
Ways to choose other 2 letters = $^{24}C_2$
4 letter arrange themselves in – 4! Ways.
Total words containing 2 vowels $^5C_2$. $^{26}C_2$. 4!
Words do not contain 2 vowels = 26^4 – $^5C_2$. $^{26}C_2$. 4!