MATHS

BOOKS - KC SINHA MATHS (HINGLISH)

COMBINATIONS - FOR BOARDS

Solved Examples

1. Evaluate: $\ ^{\wedge}10C_5$

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2. Evaluate: $^{100}C_{97}$

3. Prove that $\sum\limits_{r=1}^{5} {^5C_r} = 31$

4. Evaluate : $^{25}C_{22} - {^{24}C_{21}}$

5. If $\hat{} \ 15C_{3r} = {}^{15}C_{r+3}$ find r

6. If $\hat{} \ 18C_r = {}^{18}C_{r+2}$ find rC_5

7. Determine n if (i) $\hat{} \ 2nC_2 : {}^n C_2 = 12:1$ (ii) $\hat{} \ 2nC_3 : {}^n C_3 = 11:1$

8. If $.^n C_8 =^n C_6$, determine n and hence $.^n C_2$

9. find n if $.^n C_6 :^{n-3} C_3 = 33 : 4$

10. Prove that: $.^n C_r \times^r C_s =^n C_s \times^{n-s} C_{r-s}$

11. If $.^{n-1}C_r : ^{n}C_r : ^{n+1}C_r = 6:9:13$ find n and r.

12. Find the value of the expression:

$$\hat{}\ 47C_4 + \sum_{j=1}^{5} 52 - jC_3 .$$

13. Property:Product of r consecutive number is divisible by r!

14. Find the number of triangles which can be formed having vertices at angular points of a convex polygon of m sides.

15. Show that a convex polygon of m sides has $\dfrac{m(m-3)}{2}$ diagonals

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16. Find the number of sides of a polygon having 44 diagonals.

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17. A man has 8 children to take them to a zoo. He takes three of them at a time to the zoo as often as he can without taking the same 3 children together more than once. How many times will he have to go to the zoo? How many times a particular child will to to the zoo?

18. On a new year day every student of a class sends a card to every other student. The post

man delivers 600 cards. How many students are there in the class?

19. We wish to select 6 persons from 8, but if the person A is chosen, then B must be chosen. In how many ways can the selections be made? 15 (b) 22 (c) 7 (d) None of these

20. A boy has 3 library tickets and books of his interest in the library. Of these 8, he does not wasnt to borrow Chemistry part II, unless Chemistry Part I is also borrowed. In how many ways can be choose th three books to be borrowed?

21. Out of 6 gentlemen and 4 ladies a committee of 5 is to be formed. In how many

ways can this be done so as to include at least one lady in each commiittee?

22. A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consists of: (i) exactly 3 girls ? (ii) atleast 3 girls ? (iii) atmost 3 girls ?

23. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has (i) no girl ? (ii) at least one boy and one girl ? (iii) at least 3 girls ?

24. From a class of 25 students, 10 are to be chosen for an excursion party. There are 3 students who decide that either all of them will join or none of them will join. In how many ways can the excursion party be chosen?

25. In a village, there are 87 families of which 52 families have at most 2 children. In a rural development programme, 20 families are to be helped chosen for assistance, of which at least 18 families must have at most 2 children. In how many ways can the choice be made?

26. Determine the number of 5 card combinations out of a deck of 52 cards if at least one of the 5 cards has to be as king?

27. A sports team of 11 students is to be constituted, choosing at least 5 from class XI and at least 5 from class XII. If there are 25 students in each of these classes, in how many ways can the teams be constituted?

28. There are ten points in a plane. Of these ten points, four points are in a straight line and with the exceptionof these four points, on three points are in the same straight line. Find i. the number of triangles formed, ii the number of straight lines formed iii the number of quadrilaterals formed, by joining these ten points.

29. There are 4 oranges, 5 apples and 6 mangoes in a fruit basket. In how many ways can a person make a selection of fruits from among the fruits in the basket?

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30. Given 5 different green dyes, four different blue dyes and three different red dyes, how many combinations of dyes can be chosen taking at least one green and one blue dye ?

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31. Find the number of divisors of 21600.

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32. In an examination a minimum is to be secured in ech of 5 subjects for a pass. In how many ways can a student fail?

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33. In how many ways 12 different things can be divided equally among 3 persons? Also find in how many ways can these 12 things be divided in three sets each having 4 things.

34. In how many ways 50 different things can be divided in 5 sets three of them having 12 things each and tow of them having 7 things each.

35. Six X ' s have to be placed in thesquares of the figure below, such that each rowcontains atleast one X. In how many different wayscan this be done?

36. Five balls of different colours are to be placed in three boxes of different sizes. Each box can hold all five. In how many different

ways can we place the balls so that no box

remains empty?

37. How many words of 4 different letters can

be formed out 7 capital letters 3 vowels and 5

consonants if each word starts with a capital

letter and contains at least one vowel.

38. The English alphabet has 5 vowels and 21 consonants. How many words with 2 different vowels and 2 different consonants can be formed from the alphabet?

39. Find the number of permutations of n different things taken r at a time such that two specific things occur together?

40. How many different words of 4 letters can be formed with the letters of the word EXAMINATION?

41. Find the total number of ways of selecting five letters from the word INDEPENDENT.

42. An 8 ored boat to be manned from a crew of 11, out of which 3 can only steer but cannot row.8 can row but cannot steer.In how many ways the staff can be arranged if 2 of the men can only row on bow side.

Exercise

1. Find n if $^{2n}C_2 = 12, 1$

2. If $.^n C_{30} =^n C_4$, find n

3. If $.^n C_{12} =^n C_8$, find. $^n C_{17}$ and $^{22}C_n$

4. If $.^{18} C_r =^{18} C_{r+2}$, find $.^r C_6$

5. If $^{n}C_{n-4} = 15$, find $^{r}C_{6}$

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6. If $.^{15}C_{r} : {}^{15}C_{r-1} = 11 : 5$, find r

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7. Evaluate $.^{10}C_{4} + {}^{10}C_{5}$

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8. Evaluate $^{13}C_6 + {}^{13}C_5$

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9. Evaluate $.^{19}C_{18} + {}^{19}C_{17}$

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10. Evaluate $.^{31}C_{26} - {}^{30}C_{26}$

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11. Evaluate $.^{61}C_{57} - {}^{60}C_{56}$

12. If $.^{n}C_9 = {}^{n}C_8$ find $.^{n}C_{17}$
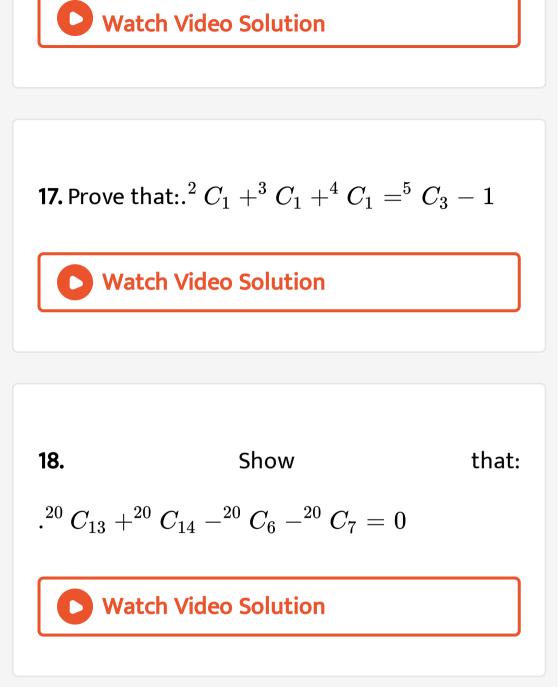
13. If $.^{n}C_8 = {}^{n}C_2$, find $.^{n}C_2$

14. If $.^n C_{10} =^n C_{12}$, determine n and hence $.^n C_5$

15. Prove that: $1 +^3 C_1 +^4 C_2 =^5 C_3$

16. Prove that: $2 \times^7 C_4 =^8 C_4$

17. Prove that:. $^2C_1 + {}^3C_1 + {}^4C_1 = {}^5C_3 - 1$

18. Show that:

. $^{20}C_{13} + {}^{20}C_{14} - {}^{20}C_6 - {}^{20}C_7 = 0$

19. Prove that:

$$.^{n-1}C_3 + {}^{n-1}C_4 > {}^n C_3, \quad \text{if } n > 7$$

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20. If

$$nC_{r-1} = 36, nC_r = 84 \text{ and } nC_{r+1} = 126,$$

then (a) $n = 8, r = 4$ (b) $n = 9, r = 3$ (c) $n = 7, r = 5$ (d) non of these

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21. In how many ways can a committee be selected from 15 persons if the committee is to have (i). 3 members, (ii). 13 members

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22. How many different teams of 7 players can be chosen from 10 players?

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23. Sudha wants to choose any 9 stamps from a set of 11 different stamps. How many different selections can she make?

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24. How many lines can be drawn through 21 points on a circle?

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25. Seven points lie on a circle. How many chords can be drawn by joining these points.

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26. How many selection of 4 books can be made from 8 different books?

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27. In how many ways can a student choose a programme of 5 courses if 9 courses are available and 2 courses are compulsory for every student?

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28. How many quadrilaterals can be formed joining the vertices of a convex polygon of n sides?

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29. A man has 7 friends and he wants to invite 3 of them at a party. Find how many parties to each of 3 different friends he can give and how many times any particular friend will attend the parties?

30. Prove that the number of combinations of n things taken r at a time in which p particular things always occur is $.^{n-p}C_{r-p}$

31. A delegation of 6 members is to be sent abroad out of 12 members. In how many ways can the selection be made so that , a particular member is included?

32. A delegation of 6 members is to be sent abroad out of 12 members. In how many ways

can the selection be made so that , A

particular member is excluded?

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33. There are 6 students A,B,C,D,E,F. In how

many ways can they be seated in a line so that

C and D do not sit together?

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34. There are 6 students A,B,C,D,E,F. In how many ways can a committee of 4 be formed so as to always include C?

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35. There are 6 students A,B,C,D,E,F. In hoiw many ways can a committee of 4 be formed so as to always include C but exclude E?

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36. There are n stations on a railway line. The number of kinds of tickets printed (no return tickets) is 105. Find the number of stations

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37. Twelve persons meet in a room and each shakes hand with all others. Find the number oif hand shakes.

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38. Determine the number of 5 card combinations out of a deck of 52 cards if there is exactly one ace in each combination.

39. Determine the number of 5-card combinations out of a deck of 52 cards if each selection of 5 cards has exactly one king.

40. There are 15 points in a plane, no three of which are collinear. Find the number oif triangles formed by joining them.

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41. There are 10 points in a plane of which 4 are collinear. No three of the remaining 6 points are collinear. How many different straightlines can be drawn by joining them?

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42. There are 15 points in a plane, no three of which are in the same straight line with the exception of 6, which are all in the same straight line. Find the number of i. straight lines formed, ii. number of triangles formed by joining these points.

43. There are 10 points in a plane out of which 5 are collinear. Find the number of

quadrilaterals formed having vertices at these points.

44. in any traingle ABC , 3 , 4 and 5 are the interior points on side AB , BC, and CA respectively . then total number traingle , consider these points as vertices, are

45. In how many ways can a team of 11 be chosen from 14 football players if two f them can be only goal-keepers?

46. IN how many ways can one select a cricket team of eleven from 17 players in whch only 5 players can bowl if each cricket team of 11 must include exactly 4 bowlers.

47. To fill 12 vacancies there are 25 candidates of which 5 are from scheduled caste. If three of the vacancies are reserved for scheduled caste candidates while the rest are open to all; the number of ways in which the selection can be made is a. $\hat{} \ 5C_3 \times^{22} C_9$ b. $\hat{} \ 22C_9 -^5 C_3$ c. $\hat{} \ 22C_3 +^5 C_3$ d. none of these

48. A committee consisting of 2 men and 2 women is to be chosen from 5 men and 6 women. IN how many ways can this be done?

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49. A committee of 3 persons is to be constituted from a group of 2 men and 3 women. In how many ways can this be done? How many of these committees would consist of 1 man and 2 women?

50. There are 6 boys and 3 girls in a class. An entertainment committee of 6 persons is to be selected such that there are 4 boys and 2 girls in the committee. In how many ways can the committee be selected?

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51. How many different committees each consisting of 3 girls and 2 boys can be chosen

from 7 girls and 5 boys?

52. What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these (i) four cards are of the same suit, (ii) four cards belong to four different suits, (iii) are face cards, (iv) two are red cards and two are bla

53. A bookshelf contains 7 different Mathematics textbooks and 5 different Physics textbooks. How many groups of 3 Mathematics and 3 physics textbooks can be selected?

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54. Find the number of ways of selecting 9 balls from 6 red balls, 5 white balls and 5 blue balls if each selection consists of 3 balls of each colour.

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55. In how many ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls?
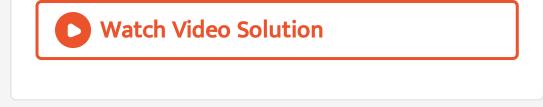
56. A bag contains 5 black and 6 red balls. Determine the number of ways in which 2 black and 3 red balls can be selected.

57. A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consists of: (i) exactly 3 girls ? (ii) atleast 3 girls ? (iii) atmost 3 girls ?

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58. At an election, three wards of a town are convassed by 4,5, and 8 men respectively. If there are 20 volunters. In how many ways can they be alloted to different wards?

59. Out of 7 men and 4 ladies committee of 5 is to be formed. In how many ways can this be done so as to include at least 3 ladies?

60. A candidate is required to answer 6 out of 10 questions, which are divide into two groups, each containing 5 questions. He is not

permitted to attempt more than 4 questions from either group. The number of different ways in which the candidate can choose 6 questions is a. 50 b. 150 c. 200 d. 250

61. A mathematics paper consists of 10 questions divided into two parts I and II each part containing 5 questions. A student is required to attempt 6 questions in al, taking

at least 2 questions from each part. In how many ways can student select the questions?

62. In an examination, a question paper consists of 12 questions divided into two parts i.e., Part I and Part II, containing 5 and 7 questions, respectively. A student is required to attempt 8 questions in all, selecting at least 3 from each part. In

63. There are 10 professors and 20 students out of whom a committee of 2 professors and 3 students is to be formed. Find the number of ways in which this can be done. Further find in how many of these committees: A particular professor is included A particular student is included Particular student is excluded

64. From 6 boys nd 7 girls a committee of 5 is to be formed so as to include at least one girl. Find the number of ways in which this can be done.

65. From 6 gentlemen and 4 ladies a committee of 5 is to be formed. In how many ways can this be done if,(i). there is no

restriction (ii). the committee is to include at least one lady.

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66. From 8 gentlemen and 4 ladies a committee of 5 is to be formed. In how many ways can this be done so as to include at least one lady?

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67. In a group of 15 boys there are 6 hockey players. In how many ways can 12 boys be selected so as to include at least 4 hockey players?

68. From 7 gentlemen and 4 ladies a committee of 5 is to formed. In how many ways can this be done so as to include at least one lady?

69. From 7 gentlemen and 5 ladies, a boat party of 5 is to be formed. In how many ways can it be done so as to include atleast one lady?

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70. A committee of 6 is to be formed out of 4 boys and 6 girls. In how many ways can it be

done so that the girls may not be out numbered?

71. A perosn has 12 friends of whom 8 are reltives. In how many wys can he invite 7 friends such that at least 5 of them may be relatives?

72. A candidate is required to answer 7 questions out of 12 questions which re divided into two groups, each containing 6 questions. He is not permitted to attempt more than 5 from either group. In how many different ways can he choose the seven questions?

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73. Each of two parallel lines has a number of distinct points marked on them. On one line

there are 2 points P and Q and on the other there are 8 points. i. Find the number of triangles formed having three of the 10 points as vertices. ii. How many of these triangles include P but exclude Q?

74. There are 7 men and 3 ladies contesting for two vacancies, an elector can vote for any number of candidates not exceeding the

number of vacancies. In how many ways can be vote?

75. A party of 6 is to be formed from 10 boys and 7 girls so as to include 3 boys and 3 girls. In how many different ways can the party be formed if two particular girls refuse to join the same party?

76. In an examination, the question paper contains three different sections A,B, nd C containing 4,5, and 6 questions respectively. In how many ways, a candidate can make a selection of 7 questions, selecting at lest tow questions from each sectiion.

77. From 5 apples, 4 oranges and 3 mangoes, how many selections of fruits can be make?

78. Find the total number of selections of at least one red ball from 4 red balls and 3 green balls, if (a) the balls of the same colour are different, (b) the balls of the same colour are identical.

79. Find the number of different sums that can be formed with one rupee, one half rupee and

one quarter rupee coins.

80. There asre 5 questiions in a question paper. In how many ways can a boy solve one or more questions?

81. In an election for 3 seats there are 6 candidates. Voter cannot vote for more than 3

candidates. In how many ways can he vote?

82. In an election the nuber oif candidates is one more than thenumber of members to be electeed. If a voter cn vote in 30 different weaqys, find the number of candidates (A voter has to vote for at least one candidate).

83. In how many ways 12 different books can be distributed equally distributed equally among 4 persons?

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84. In how many ways 12 different books can be distributed equally among 3 persons?

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85. (i) In how many ways can a pack of 52 cards be divided equally among four players? (ii) (ii) In how many ways can you divide these cards in four sets, three of them having 17 cards each and the four the one just one card?

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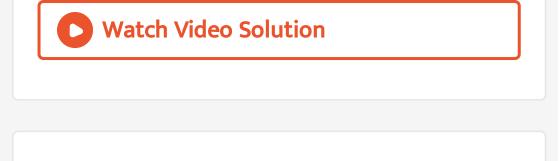**86.** In how many ways can 7 cross marks X be placed in the given figure so that each row has at least one cross mark?

87. Five crosses are to be put into eleven square blocks written in the form of an E as shown in figure so that every row has a cross. In how many different ways can it be done?

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88. How many words can be formed out of 10 consonants and 4 vowels, such that each contains 3 consonants and 2 vowels?

89. How many words, with or without meaning, each of 3 vowels and 2 consonants can be formed from the letters of the word INVOLUTE?

90. How many words, with or without meaning, each of 2 vowels and 3 consonants can be

formed from the letters of the word DAUGHTER ?

91. A table has 7 seats, 4 being n one side facing the window and three being on the opposite side. In how many ways can seven people be seated at the table if 3 people X, Y and Z must sit on the side facing the window?

92. A tea party is arranged for 16 persons along two sides of a long table with 8 chairs on each side. Four persons wish to sit on one particular and two on the other side. In how many ways can they be seated?

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93. Eight chairs are numbered 1 to 8. Two women and three men wish to occupy one chair each. First, the women choose the chairs from amongst the chairs marked 1 to 4, and

then the men select th chairs from amongst the remaining. The number of possible arrangements is a. $\hat{\ } 6C_3 \times^4 C_2$ b. $\hat{\ } 4P_2 \times^4 P_3$ c. $\hat{\ } 4C_2 \times^4 P_3$ d. none of these

94. A team of 8 players is to be chosen from a group of 12 players. Out of the 8 players one is to be elected as captain and another an, vice-captain. In how many ways can this is done?

(A) 27720 (B) 13860 (C) 6930 (D) 495

95. How many three letter words can be made using the letters of the word ORIENTAL?