



MATHS

BOOKS - CENGAGE

PERMUTATIONS AND COMBINATIONS

Worked Examples

1. Naveen, Prakash, Shaleen, and Rekha equally qualified are to be appointed against four jobs in a factory. Determine the number of ways in

which the jobs can be filled:

The first and second jobs



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2. Naveen, Prakash, Shaleen, and Rekha equally qualified are to be appointed against four jobs in a factory. Determine the number of ways in which the jobs can be filled:

The first three jobs



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3. Naveen, Prakash, Shaleen, and Rekha equally qualified are to be appointed against four jobs in a factory. Determine the number of ways in which the jobs can be filled:

All the four jobs



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4. How many of the natural numbers from 1 to 1000 have none of their digits repeated?



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5. Find the value of n such that

$${}^n P_5 = 42 \times {}^n P_3 \quad n > 4$$



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6. Evaluate

$${}^{10} C_4$$



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7. Evaluate

$${}^{12}C_7$$



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8. Evaluate

$6C_6$



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9. Evaluate

$9C_0$



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10. A school has five good badminton players. A team of four players has to be sent to an interschool tournament. In how many ways can the team be selected?



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11. How many lines can be drawn through six points on a circle?



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12. Determine the number of five card combinations out of a deck of 52 cards.



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13. Verify that ${}^8C_4 + {}^8C_3 = {}^9C_4$.





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Example

1. In how many ways can A take one apple, one orange and one mango from a basket containing four apples, three oranges, and five mangoes?



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Test Yourself Level 1

1. Evaluate the following:

$${}^{10}P_3$$



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2. Evaluate the following:

$${}^{20}P_4$$



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3. Evaluate the following:

$${}^{75}P_2$$



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4. Evaluate the following:

$9P_5$



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5. Renu wants to arrange three economics, two history, and four language books on a shelf. If the books of the same subjects are different, determine the following:

The number of possible arrangements



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6. Renu wants to arrange three economics, two history, and four language books on a shelf. If the books of the same subjects are

different, determine the following:

The number of arrangements if all books of a subject are to be together.



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7. Determine the number of five-letter words formed from the letters of the word 'EQUATION'.



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8. In how many ways can 10 persons line up at a ticket counter of a cinema hall?



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9. Evaluate the following:

$8C_5$



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10. Evaluate the following:

$${}^{15}C_4$$



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11. Find n if

$${}^n P_6 = 3 \times {}^n P_5$$



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12. Find n if

$${}^n P_4 = 20 \times {}^n P_2$$



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13. Find n if

$$2 \times {}^n P_3 = {}^{n+1} P_3$$



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Test Yourself Level 2

1. Twelve students compete in a race. In how many ways can the first three places be taken?



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2. In how many ways can seven books be arranged in a shelf? In how many ways can we arrange three particular books always together?



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3. Evaluate the following:

$${}^{19}C_{17} + {}^{19}C_{18}$$



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4. Evaluate the following:

$${}^{25}C_{22} - {}^{24}C_{21}$$



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5. Evaluate the following:

$${}^{31}C_{26} - {}^{30}C_{26}$$



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6. In a student reunion meeting in a school, 16 students attended. Each shakes hands with each other exactly once. Determine the total number of hand shakes.



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7. In how many ways can a team of five students be selected from eight students?



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8. There are 10 points on a plane, no three being collinear. By connecting these points in all possible ways, how many line segments can be formed?



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9. There are seven candidates vying for two vacancies in a company, all being equally

eligible. In how many ways can the vacancies be filled?



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10. In how many ways can a cricket team of 11 players be formed from 14 players?



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Test Yourself Level 3

1. In how many ways can the letters of the following words be arranged taking all at a time?

LOGARITHM



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2. In how many ways can the letters of the following words be arranged taking all at a time?

SUNDAY





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3. In how many ways can the letters of the following words be arranged taking all at a time?

MATHS



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4. How many more numbers can be formed by rearranging the digits of the number 54,679?



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5. In how many ways can a committee of three be appointed from 15 members?



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6. Find n if ${}^n C_5 = 5 \times {}^n P_3$ and ${}^n C_{n-2} = 3$.



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7. Find r if ${}^{15} C_{r+1} = {}^{15} C_{3r-5}$.



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Test Yourself Multiple Choice Questions

1. There are five routes for going from station A to station B and four routes for going from station B to station C. Find the number of different ways in which a person can go from A to C via B.

A. 9

B. 20

C. 16

D. none of these

Answer: A



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2. There are 25 students in a class among which 15 are boys and 10 are girls. The class teacher selects either a boy or a girl as monitor of the class. In how many ways the class teacher can make this selection?

A. 25

B. 150

C. 35

D. none of these

Answer: A



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3. Find the value of n if

$$(n + 2)[= 60 \times (n - 1)]$$

A. $n = 6$

B. $n = 3$

C. $n = 9$

D. $n = 4$

Answer: B



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4. If a , b and c are three consecutive positive integers such that

$a < b < c$ and $\frac{1}{a!} + \frac{1}{b!} = \frac{v}{c!}$ then the value of \sqrt{v} is

A. a

B. b

C. c

D. $a + b + c$

Answer: B



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5. If $n!$, $3 \times n!$ and $(n + 1)!$ are in GP then $n!$, $5 \times n!$ and $(n + 1)!$ are in

A. AP

B. GP

C. HP

D. none of these

Answer: A



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6. If ${}^{56}P_{r+6} : {}^{54}P_{r+3} = 30800 : 1$ then find ' P_2 '

A. 1460

B. 1840

C. 1640

D. none of these

Answer: C



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7. If ${}^{n+5}P_{n+1} = \frac{11(n-1)}{2} {}^{n+3}P_n$ then find the value of n .

A. 6, 7

B. 6, 5

C. 6, 2

D. 10, 9

Answer: A



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8. If ${}^{n+n}P_2 = 90$ and ${}^{m-n}P_2 = 30$ then find the value of m and n .

A. $m = 8, n = 2$

B. $m = 2, n = 8$

C. $m = 4, n = 4$

D. none of these

Answer: A



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9. Find the value of r if ${}^8P_5 \times {}^8P_4 = {}^9P_r$

A. 3

B. 4

C. 5

D. 6

Answer: C



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10. Determine the number of permutations of the letters of the word "SIMPLETON" taken all at a time.

A. 36280

B. 362880

C. 36288

D. none of these

Answer: B



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11. How many different signals can be given using any number of flags from 4 flags of different colors?

A. 56

B. 24

C. 48

D. 64

Answer: D



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12. If ${}^{m+n}P_2 = 56$ and ${}^{m-n}P_3 = 24$ then

$\frac{{}^mP_3}{{}^nP_2}$ equals

A. 20

B. 40

C. 60

D. 80

Answer: C



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13. If ${}^9P_5 + 5 \times {}^9P_4 = {}^nP_r$ then the value of $(n + r)$ is

A. 13

B. 14

C. 15

D. 16

Answer: C



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14. If ${}^{15}C_{3r} = {}^{15}C_{r+3}$ then find the value of rC_2 .

A. 6

B. 9

C. 3

D. none of these

Answer: C



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15. Find the value of

$${}^n C_r + 2 \times {}^n C_{r-1} + {}^n C_{r-2}.$$

A. ${}^{n+1} C_r$

B. ${}^{n+2} C_r$

C. ${}^n C_r$

D. ${}^n C_{r+1}$

Answer: B



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16. Thirty-six games were played in a football tournament with each team plying once against the other. How many teams were there?

A. 8

B. 6

C. 9

D. 10

Answer: C



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17. If ${}^n C_3 + {}^n C_5 > {}^{n+1} C_3$ then

A. $n > 6$

B. $n < 6$

C. $n > 7$

D. $n < 7$

Answer: A



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18. If ${}^nC_r = {}^nC_{r-1}$ and ${}^nP_r = {}^nP_{r+1}$ then the value of n is

A. 2

B. 3

C. 4

D. 5

Answer: B



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19.

If

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

then find r .

A. 2

B. 3

C. 4

D. 5

Answer: B



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Test Yourself Multiple Choice Questions

Olympiad And Ntse Level Exercises

1. How many numbers divisible by 5 and lying between 3000 and 4000 can be formed from the digits 1, 2, 3, 4, 5 and 6 (repetition is not allowed)?

A. $\frac{n + r - 1}{r}$

B. 5P_2

C. 4P_2

D. 6P_3

Answer: C



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2. In how many ways can mn letters be posted in n letter-boxes?

A. $(mn)^n$

B. m^{mn}

C. n^{mn}

D. none of these

Answer: C



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3. How many words can be formed by taking 3 consonants and 2 vowels out of 5 consonants and 4 vowels?

A. ${}^5C_3 \times {}^4C_2$

B. $\frac{{}^5C_3 \times {}^4C_2}{5}$

C. ${}^5C_3 \times {}^4C_3$

D. ${}^5C_3 \times {}^4C_2(5)!$

Answer: D



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4. In how many ways a team of 11 players can be formed out of 25 players, if 6 out of them are always to be included and 5 are always to be excluded?

A. 2020

B. 2002

C. 2008

D. 8002

Answer: B



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5. There are 9 chairs in a room on which 6 persons are to be seated, out of which one is the guest with one specific chair. In how many ways they can sit?

A. 6720

B. 60480

C. 30

D. 346

Answer: A



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6. The number of triangles that can be formed by 5 points in a line and 3 points on a parallel line is

A. 8C_3

B. ${}^8C_3 - {}^5C_3$

C. ${}^8C_3 - {}^5C_3 - 1$

D. none of these

Answer: C



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7. Consider all possible permutations of the letters of the word INDIANOIL.

Now, match the following lists and then

choose the correct option from amongst the given codes.

List I		List II	
(P)	The number of permutations which contain the word INDIA is	(1)	28866
(Q)	The number of permutations which contain the word OIL is	(2)	1374
(R)	The number of permutations which contains neither the word OIL nor the word INDIA is	(3)	1260
(S)	The number of permutations which contains at least one of the words OIL and INDIA is	(4)	120

A. $P \quad Q \quad R \quad S$
 $4 \quad 3 \quad 1 \quad 2$

B. $P \quad Q \quad R \quad S$
 $2 \quad 1 \quad 4 \quad 3$

C. $P \quad Q \quad R \quad S$
 $3 \quad 1 \quad 4 \quad 2$

D. $P \quad Q \quad R \quad S$
 $2 \quad 3 \quad 4 \quad 2$

Answer: A



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8. Read the following statements.

Statement 1: Number of ways in which Indian team (11 players) can bat, if Yuvraj wants to bat before Dhoni and Pathan wants to bat after Dhoni is $11!/3!$.

Statement 2: Yuvraj, Dhoni and Pathan can be arranged in batting order in $3!$ ways.

A. Both Statement 1 and Statement 2 are true.

B. Statement 1 is true and Statement 2 is false.

C. Statement 1 is false and Statement 2 is true.

D. Both Statement 1 and Statement 2 are false.

Answer: A



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9. Match the following columns.

Column I		Column II	
(P)	Number of straight lines joining any two of 10 points of which four points are collinear is	(i)	30
(Q)	Maximum number of points of intersection of 10 straight lines in a plane is	(ii)	60
(R)	Maximum number of points of intersection of 6 circles in a plane is	(iii)	40
(S)	Maximum number of points of intersection of 6 parabolas in a plane is	(iv)	45

Codes:

- A. $P \quad Q \quad R \quad S$
 $iii \quad iv \quad ii \quad i$
- B. $P \quad Q \quad R \quad S$
 $i \quad iv \quad iii \quad ii$
- C. $P \quad Q \quad R \quad S$
 $iii \quad ii \quad i \quad iv$

D. P Q R S
 iii iv i ii

Answer: D



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10. If ${}^{2n}C_r : {}^nC_2 = 44 : 3$ then for which of the following values of r , the value of nC_r will be 15?

A. $r = 3$

B. $r = 4$

C. $r = 6$

D. $r = 5$

Answer: B



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