Combinatorics (Advanced)

Standard difficulty · 20 questions · 40 marks · Time: 32 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. In a race of 6 runners, in how many ways can Gold, Silver and Bronze be awarded (no ties)?
(a) 216 **(b)** 20 **(c)** 30 **(d)** 120

2. In how many ways can a panel of 5 be chosen from 15 people?
(a) 75 **(b)** 1,365 **(c)** 3,003 **(d)** 360,360

3. 0! is taken to be:
(a) 10 **(b)** −1 **(c)** 0 **(d)** 1

4. If n! ÷ (n − 2)! = 182, then n is:
(a) 14 **(b)** 15 **(c)** 13 **(d)** 16

5. How many 4-digit numbers greater than 4,000 can be formed from the digits 3, 4, 6, 7, 8, 9 with no digit repeated?
(a) 1,080 **(b)** 360 **(c)** 300 **(d)** 240

6. Seating people in a row of chairs is a problem of:
(a) sets **(b)** permutations **(c)** combinations **(d)** factors

7. 11 points lie in a plane, and exactly 3 of them are on one straight line (no other three are). How many different straight lines pass through at least two of them?
(a) 53 **(b)** 29 **(c)** 55 **(d)** 52

8. A dhaba offers 5 starters, 2 main dishes and 5 desserts. A guest orders exactly one dish in all. In how many ways?
(a) 12 **(b)** 50 **(c)** 15 **(d)** 11

Section B — Short answer — 8 × 2 = 16 marks

9. Find x if 1/8! − 1/9! = x/10!.

10. How many 5-letter words (with or without meaning) can be formed from the letters of PLANET if no letter is repeated?

11. A paper has 8 questions in Part A and 4 in Part B. A student must answer 6 questions, at least 2 from each part. In how many ways can the questions be chosen?

12. At a party everyone shook hands with everyone else exactly once. There were 15 handshakes. How many people were there?

13. 6 different Mathematics books and 4 different Science books are to be arranged on a shelf so that the Science books are always together. In how many ways?

14. How many 3-digit even numbers can be formed from the digits 1, 3, 6, 7, 9 if no digit is repeated?

15. If ${}^{n}C_3 = {}^{n}C_2$, find n and ${}^{n}C_3$.

16. $1 \times 1! + 2 \times 2! + \ldots + 10 \times 10! = x! - 1$. Find x.

Section C — Word problems — 4 × 4 = 16 marks

17. A committee of 5 is to be chosen from 8 men and 5 women so that it has at least 4 women. In how many ways can this be done?

18. In how many ways can the letters of MOTHER be arranged so that (a) all the vowels come together (b) the vowels do not all come together?

19. A door code has 5 digits, each one of the 10 digits 0 to 9. How many codes are possible if (a) digits may repeat (b) no digit repeats (c) no digit repeats and the first digit is not 0?

20. There are 14 points in a plane; exactly 9 of them lie on one straight line and no other three are in a line. Find (a) the number of straight lines through two or more of the points (b) the number of triangles with corners at the points.

Want another sheet on this chapter? In the Ambiful Worksheets app every sheet is new, with its answer key, and your child never gets the same question twice.
Scan the code to get the free app, or open **worksheets.ambiful.com/get**

Answer key

Combinatorics (Advanced) · AW-9M-ACB-2026-V1 · For parents — fold back or tear off before handing the sheet to your child.

Q	Answer	Working
1	**(d) 120**	${}^{6}P_{3} = 6 \times 5 \times 4$
2	**(c) 3,003**	${}^{15}C_{5} = 360{,}360 \div 5!$
3	**(d) 1**	so that formulas like ${}^{n}C_{n} = n! \div (n! \times 0!) = 1$ work
4	**(a) 14**	$n! \div (n-2)! = n(n-1) = 14 \times 13$
5	**(c) 300**	the thousands digit must be 4 or larger (5 choices); the other 3 places: ${}^{5}P_{3} = 60$; 5×60
6	**(b) permutations**	the order matters
7	**(a) 53**	${}^{11}C_{2} - {}^{3}C_{2} + 1 = 55 - 3 + 1$
8	**(a) 12**	OR: 5 + 2 + 5
9	**x = 80**	multiply by 10!: $x = 10 \times 9 - 10 = 80$
10	**720**	PLANET has 6 different letters: ${}^{6}P_{5} = 6 \times 5 \times 4 \times 3 \times 2$
11	**672**	${}^{8}C_{2} \times {}^{4}C_{4} + {}^{8}C_{3} \times {}^{4}C_{3} + {}^{8}C_{4} \times {}^{4}C_{2}$
12	**6**	${}^{n}C_{2} = n(n-1)/2 = 15$, so $n = 6$
13	**120,960**	treat the Science books as one block: $7! \times 4! = 5{,}040 \times 24$
14	**12**	by units digit: $6 \rightarrow 12$
15	**n = 5; 10**	${}^{n}C_{r} = {}^{n}C_{n-r}$, so $n = 3 + 2 = 5$; ${}^{5}C_{3} = 10$
16	**x = 11**	each term $r \times r! = (r+1)! - r!$; the sum telescopes to $11! - 1!$
17	**41**	${}^{5}C_{4} \times {}^{8}C_{1} + {}^{5}C_{5} \times {}^{8}C_{0}$
18	**(a) 240; (b) 480**	(a) 4 consonants + 1 vowel block: $5! \times 2!$; (b) $6! - (a) = 720 - 240$
19	**(a) 100,000; (b) 30,240; (c) 27,216**	(a) 10^{5}; (b) ${}^{10}P_{5}$; (c) $9 \times {}^{9}P_{4}$
20	**(a) 56; (b) 280**	(a) ${}^{14}C_{2} - {}^{9}C_{2} + 1$; (b) ${}^{14}C_{3} - {}^{9}C_{3}$

Ambiful Worksheets · worksheets.ambiful.com · Not affiliated with CBSE / NCERT