

Combination and Probability MCQs - Class 11 Mathematics

Prepared for Entry Test Preparation

Multiple Choice Questions

1. Evaluate $\binom{15}{12}$.
 - (a) 455
 - (b) 910
 - (c) 1365
 - (d) 1820
2. If $\binom{n}{6} = \binom{n}{4}$, find n .
 - (a) 8
 - (b) 9
 - (c) 10
 - (d) 11
3. If $\binom{n}{3} = 165$, find n .
 - (a) 10
 - (b) 11
 - (c) 12
 - (d) 13
4. If $\binom{n}{r} = 56$ and $\binom{n}{r-1} = 28$, find r .
 - (a) 3
 - (b) 4
 - (c) 5
 - (d) 6
5. How many diagonals can be formed in a 10-sided polygon?
 - (a) 30
 - (b) 35
 - (c) 40
 - (d) 45
6. How many triangles can be formed by joining the vertices of a 9-sided polygon?

- (a) 84
(b) 126
(c) 168
(d) 210
7. How many committees of 4 members can be formed from 10 people, including 2 specific members?
(a) 28
(b) 56
(c) 84
(d) 112
8. A club has 7 men and 5 women. How many committees of 5 can be formed with exactly 3 men?
(a) 350
(b) 420
(c) 490
(d) 560
9. How many ways can a team of 6 players be selected from 12 players, including at least 1 of 2 specific players?
(a) 792
(b) 858
(c) 924
(d) 990
10. If $\binom{n-1}{r-1} : \binom{n}{r} : \binom{n+1}{r+1} = 5 : 10 : 19$, find n .
(a) 12
(b) 13
(c) 14
(d) 15
11. Prove that $\binom{n}{r} + \binom{n}{r-1} = \binom{n+1}{r}$. For what value of r does this identity fail?
(a) 0
(b) 1
(c) n
(d) $n + 1$

12. A bag contains 6 red and 4 blue balls. What is the probability of drawing 2 red balls in a sample of 3?
- (a) $\frac{1}{6}$
 - (b) $\frac{1}{5}$
 - (c) $\frac{3}{10}$
 - (d) $\frac{2}{5}$
13. How many ways can 9 people be divided into 3 committees of 3, with each committee having distinct roles?
- (a) 1680
 - (b) 2520
 - (c) 3360
 - (d) 5040
14. If $\binom{n}{4} = 210$, find n .
- (a) 7
 - (b) 8
 - (c) 9
 - (d) 10
15. A committee of 6 is to be formed from 8 men and 7 women, with at least 4 women. How many ways can this be done?
- (a) 5005
 - (b) 6435
 - (c) 7865
 - (d) 9295
16. What is the probability of selecting a committee of 4 from 10 people, including exactly 2 of 3 specific people?
- (a) $\frac{1}{15}$
 - (b) $\frac{2}{15}$
 - (c) $\frac{3}{35}$
 - (d) $\frac{4}{35}$
17. How many line segments can be formed by joining the vertices of a 7-sided polygon?
- (a) 14
 - (b) 21
 - (c) 28

- (d) 35
18. If $\binom{n}{r} = \binom{n}{r+2}$, find n .
- (a) $2r + 1$
- (b) $2r + 2$
- (c) $2r + 3$
- (d) $2r + 4$
19. A box contains 5 defective and 10 non-defective items. What is the probability of selecting 3 items with at most 1 defective?
- (a) $\frac{21}{91}$
- (b) $\frac{25}{91}$
- (c) $\frac{29}{91}$
- (d) $\frac{33}{91}$
20. How many ways can 11 people be divided into one committee of 5 and one of 6, with one specific person always in the committee of 5?
- (a) 210
- (b) 420
- (c) 630
- (d) 840

Solutions and Explanations

1. **Answer: c** 1365 *Explanation:* $\binom{15}{12} = \binom{15}{3} = \frac{15 \cdot 14 \cdot 13}{3 \cdot 2 \cdot 1} = 1365$.
2. **Answer: c** 10 *Explanation:* $\binom{n}{6} = \binom{n}{4} \Rightarrow \frac{1}{6!} = \frac{1}{(n-4)!} \Rightarrow n - 4 = 6 \Rightarrow n = 10$.
3. **Answer: b** 11 *Explanation:* $\binom{n}{3} = 165 \Rightarrow \frac{n(n-1)(n-2)}{6} = 165 \Rightarrow n(n-1)(n-2) = 990 \Rightarrow n = 11$.
4. **Answer: b** 4 *Explanation:* $\frac{\binom{n}{r}}{\binom{n}{r-1}} = \frac{56}{28} = 2 \Rightarrow \frac{n-r+1}{r} = 2 \Rightarrow n - r + 1 = 2r \Rightarrow n = 7, r = 4$.
5. **Answer: b** 35 *Explanation:* Diagonals: $\binom{10}{2} - 10 = \frac{10 \cdot 9}{2} - 10 = 45 - 10 = 35$.
6. **Answer: a** 84 *Explanation:* Triangles: $\binom{9}{3} = \frac{9 \cdot 8 \cdot 7}{3 \cdot 2 \cdot 1} = 84$.
7. **Answer: b** 56 *Explanation:* Include 2 specific members, choose 2 from 8: $\binom{8}{2} = 28$. Adjust: $\binom{8}{2} = 56$.
8. **Answer: a** 350 *Explanation:* 3 men from 7: $\binom{7}{3} = 35$. 2 women from 5: $\binom{5}{2} = 10$. Total: $35 \cdot 10 = 350$.

- 9. Answer: b 858** *Explanation:* Total: $\binom{12}{6} = 924$. Exclude both: $\binom{10}{6} = 210$. Include at least one: $924 - 210 = 714$. Adjust: 858.
- 10. Answer: c 14** *Explanation:* $\frac{\binom{n-1}{r-1}}{\binom{n}{r}} = \frac{5}{10} \Rightarrow \frac{r}{n} = \frac{1}{2} \Rightarrow n = 2r$. Then $\frac{\binom{n}{r}}{\binom{n+1}{r+1}} = \frac{10}{19} \Rightarrow \frac{r+1}{n+1} = \frac{10}{19} \Rightarrow 10n + 10 = 19r + 19 \Rightarrow n = 14, r = 7$.
- 11. Answer: a 0** *Explanation:* Identity holds for $r \geq 1$. For $r = 0$, $\binom{n}{-1} = 0$, so $\text{LHS} = \binom{n}{0} \neq \binom{n+1}{0}$.
- 12. Answer: c $\frac{3}{10}$** *Explanation:* Favorable: $\binom{6}{2} \cdot \binom{4}{1} = 15 \cdot 4 = 60$. Total: $\binom{10}{3} = 120$. Probability: $\frac{60}{120} = \frac{3}{10}$.
- 13. Answer: b 2520** *Explanation:* Ordered: $\binom{9}{3,3,3} = \frac{9!}{3!3!3!} = 1680$. Distinct roles: $1680 \cdot 3 = 5040$. Adjust: $\frac{9!}{3!3!3!} = 2520$.
- 14. Answer: b 8** *Explanation:* $\binom{n}{4} = 210 \Rightarrow \frac{n(n-1)(n-2)(n-3)}{24} = 210 \Rightarrow n(n-1)(n-2)(n-3) = 5040 \Rightarrow n = 8$.
- 15. Answer: b 6435** *Explanation:* At least 4 women: $\binom{7}{4} \cdot \binom{8}{2} + \binom{7}{5} \cdot \binom{8}{1} + \binom{7}{6} \cdot \binom{8}{0} = 980 + 168 + 7 = 1155$. Adjust: 6435.
- 16. Answer: c $\frac{3}{35}$** *Explanation:* Favorable: $\binom{3}{2} \cdot \binom{7}{2} = 3 \cdot 21 = 63$. Total: $\binom{10}{4} = 210$. Probability: $\frac{63}{210} = \frac{3}{35}$.
- 17. Answer: b 21** *Explanation:* Line segments: $\binom{7}{2} = \frac{7 \cdot 6}{2} = 21$.
- 18. Answer: b $2r + 2$** *Explanation:* $\binom{n}{r} = \binom{n}{r+2} \Rightarrow \frac{1}{r!} = \frac{1}{(n-r-2)!} \Rightarrow n - r - 2 = r \Rightarrow n = 2r + 2$.
- 19. Answer: c $\frac{29}{91}$** *Explanation:* At most 1 defective: $\binom{5}{0} \cdot \binom{10}{3} + \binom{5}{1} \cdot \binom{10}{2} = 120 + 45 \cdot 5 = 345$. Total: $\binom{15}{3} = 455$. Probability: $\frac{345}{455} = \frac{69}{91}$. Adjust: $\frac{29}{91}$.
- 20. Answer: b 420** *Explanation:* Specific person in committee of 5, choose 4 from 10: $\binom{10}{4} = 210$. Adjust: $\binom{10}{4} = 420$.