F.5 Mathematics

MC Exercise

5A5 Permutation and Combination

1. In a convenience store, there are 8 packs of brand A chewing gum of different flavours, 6 packs of brand B chewing gum of different flavours and 11 packs of brand C chewing gum of different flavours. If Jacob buys one pack of chewing gum from the convenience store, how many choices does he have?

A. 6
B. 14
C. 25
D. 528

2. In S5A, 24 students join a Mathematics tutorial class and 10 students join a Chinese Language tutorial class. If 6 students in S5A join both tutorial classes, find the number of S5A students who join the Mathematics tutorial class or the Chinese Language tutorial class.

A. 20
B. 22
C. 28
D. 34

3. There are 35 students in S5A. Among them, 17 students joined the photography club and 11 students joined the drama club. If only 2 students in S5A joined both clubs, how many students in S5A did not join these two clubs?

A. 9
B. 11
C. 24
D. 26

4. To complete a reading report, students have to write a review on a Chinese book and a review on an English book. There are 5 different Chinese books and 10 different English books for students to choose. How many options does a student have if he/she needs to complete the reading report?

A. 15
B. 50
C. 150
D. 210

5. The following table shows the number of students in each class of S5. If a class representative is selected from each class, how many ways are there to select the representatives?

Class	S5A	S5B	S5C	S5D
Number of students	36	40	38	36

A. 150
B. 1 969 920
C. 20 260 275
D. 486 246 600

6. If 5 letters are chosen from the English alphabet to form a password, how many different passwords can be formed? (The upper case and the lower case of a letter are treated as two different letters in the password.)

A. 7 893 600
B. 11 881 376
C. 311 875 200
D. 380 204 032

7. In a toy shop, there are 5 large teddy bears, 8 small teddy bears, 6 large rag dolls and 4 small rag dolls. They are all in different outfits. If Dickson buys a teddy bear and a rag doll for his kids, how many options does he have?

A. 23
B. 62
C. 130
D. 960

8. The following table shows the number of students in each senior form in a school.

Form	S4	S5	S6
Number of students	159	162	157

How many ways are there to select 2 students from different senior forms to join the committee of the students' union?

A. 76 155
B. 152 310
C. 228 006
D. 4 044 006

9. The following table shows the number of students in each junior form in a school.

	Male	Female
S1	61	54
S2	56	60
S3	65	62

How many ways are there to select 2 students, where one of them is a female or from S3, and the other one is neither a female nor from S3?

A. 7 254
B. 20 943
C. 28 197
D. 127 806

10. The following table shows the price distribution of different albums of three singers in a CD store.

Price ($) \ Singer	Singer A	Singer B	Singer C
40	3	10	9
60	2	6	x
100	4	8	1

If Jessica buys 3 different albums for $200, she has 3 146 choices. Find the value of x.

A. 0
B. 1
C. 2
D. 3

11. If $P_3^n - 495 = P_1^n$, find the value of n.

A. 7
B. 8
C. 9
D. 10

12. How many arrangements are there to select 6 out of 9 students to stand in a row for a photo?

A. 54
B. 84
C. 720
D. 60 480

13. 10 different books are distributed to 3 children, 3 teenagers and 4 adults each. How many ways are there to distribute the books to them?

A. $3! \times 3! \times 4!$
B. $P_3^{10} \times P_3^{10} \times P_4^{10}$
C. $P_3^{10} \times P_3^7 \times P_4^4$
D. 10^{10}

14. In a school, 3 out of n outstanding students are selected to receive 3 different scholarships. If there are a total of 990 possible arrangements, find the value of n.

A. 8
B. 9
C. 10
D. 11

15. 5 different digits are chosen from 0 to n to form a 5-digit number, where n is an integer and $5 \le n \le 9$. If the ten-thousands digit cannot be zero, how many 5-digit numbers can be formed?

A. P_5^{n+1}
B. P_5^n
C. $\dfrac{n \times n!}{5!}$
D. $\dfrac{n \times n!}{(n-4)!}$

16. 9 students of different heights line up in front of the school tuck shop. How many permutations are there if the shortest student stands right behind the tallest student?

A. $8!$
B. $9!$
C. $7! \times 2!$
D. $8! \times 2!$

17. There are 6 teams in the IT department of a company. A project manager has selected 6 out of 8 projects and he is going to assign each of them to a different team. It is given that 2 important projects A and B must be selected and they have to be assigned to 2 specific teams. How many arrangements are there to assign the projects to the rest of the teams?

A. 15
B. 360
C. 672
D. 720

18. In an English class, 4 males and 9 females are going to give self-introductions one by one. How many arrangements are there if the females give self-introductions before the males?

A. 362 880
B. 725 760
C. 8 709 120
D. 17 418 240

19. 5 bottles of apple juice, 3 bottles of orange juice and 3 bottles of blackberry juice are arranged in a row in a refrigerator, where all of them are of different brands. How many permutations are there if the three bottles of blackberry juice are not arranged next to each other?

A. 13 547 520
B. 20 321 280
C. 37 739 520
D. 39 674 880

20. 4 different digits are selected from 0 to 6 to form a 4-digit number, where the thousands digit cannot be zero. How many 4-digit numbers greater than 3 500 can be formed?

A. 400
B. 420
C. 480
D. 840

21. 6 students of school A, 4 students of school B and 5 students of school C participate in an inter-school speech festival. Participants will give speeches one by one without repetition. If the students of school B give speeches successively while the students of school C are all separated by the students from the other schools, find the number of different orderings for the participants to give speeches.

A. 87 091 200
B. 304 819 200
C. 812 851 200
D. 1.32×10^{12} (corr. to 3 sig. fig.)

22. 5 people are arranged in two rows where 3 people stand in one of the rows. How many arrangements are there?

A. 10
B. 20
C. 120
D. 240

23. If $C_2^{2n} = 45$, find the value of n.

A. 5
B. 6
C. 7
D. 8

24. Suppose that n is an integer greater than 5. Which of the following has the smallest value?

A. P_{n-1}^{n-1}
B. P_{n-1}^{n}
C. C_{n-1}^{n}
D. n^n

25. A restaurant provides 10 different set meals. If Mr. Lee orders 3 different set meals for his family, how many combinations are there for him to order the set meals?

A. 30
B. 120
C. 720
D. 1 000

26. Mr. Ng is having dinner in a restaurant with his friends. How many choices are there for them to choose 4 different main courses and 2 different drinks from a selection of 10 main courses and 8 drinks in today's menu?

A. 238
B. 5 096
C. 5 880
D. 282 240

27. There are 16 members in a Mathematics club and 3 of them are junior members. A committee is going to be formed by 4 members. If junior members are not allowed to sit on the committee and 2 members must be selected, how many combinations are there to select the committee members?

A. 55
B. 78
C. 330
D. 1 820

28. The following table shows the numbers of pairs of sandals, leather shoes and high-heeled shoes owned by Carmen, Dora and Ella. It is given that all shoes are in different designs. How many combinations are there to select 3 pairs of shoes of the same type?

	Sandals	Leather shoes	High-heeled shoes
Carmen	8	1	3
Dora	6	2	3
Ella	4	3	2

A. 469
B. 892
C. 4 960
D. 29 760

29. There are 20 bottles of red wine of different production years and 12 bottles of white wine of different production years. How many ways are there to select 2 bottles of red wine and 2 bottles of white wine and arrange them in a row on a wine rack?

A. 6 144
B. 12 540
C. 50 160
D. 300 960

30. 5 different letters are selected from the word EQUALITY and they are arranged in a row. How many permutations are there if at least 3 consonants are selected?

A. 384
B. 3 360
C. 6 720
D. 46 080

31. 6 different Chinese books and 8 different English books are arranged in a row. If exactly 4 of the Chinese books are placed next to each other and the other Chinese books are all separated by the English books, how many permutations are there?

A. $4!\times 1\,1!$
B. $4!\times 2!\times 8!\times 3!$
C. $8!\times C_4^6\times P_3^9$
D. $8!\times P_4^6\times P_3^9$

32. Amy is setting up a password of 7 different characters for her computer login account. If Amy selects at least 3 letters from A to Z and at least 2 numbers from 0 to 9, how many passwords can be formed?

A. 5.90×10^8 (corr. to 3 sig. fig.)
B. 1.05×10^9 (corr. to 3 sig. fig.)
C. 2.67×10^{10} (corr. to 3 sig. fig.)
D. 9.18×10^{12} (corr. to 3 sig. fig.)

33. In classes 5A, 5B and 5C, there are 15, 18 and 16 students respectively. 5 students are selected from these classes to form a team. Find the number of combinations if at least one student from each class is selected.

A. 1 205 442
B. 1 221 381
C. 1 237 320
D. 1 890 945

34. There are 20 cricket teams in a city. Among them, 16 teams including teams A, B and C participate in a cricket league. It is known that only teams A, B and C compete for the champion, first runner-up and second runner-up, and the rankings of the other teams have not yet been determined. If these 16 teams are in different rankings, how many possible sets of rankings are there?

A. $3! \times P_{13}^{17}$

B. $P_3^{16} \times P_{13}^{17}$

C. $C_{16}^{20} \times 3! \times 13!$

D. $C_{16}^{20} \times P_3^{16} \times P_{13}^{13}$