

Combinatorics Review Package

1. How many terms are in the expansion of $(2x + y)^9$
 A. 8 B. 9 C. 10 D. 11

 2. Simplify: $\frac{(n-2)!}{(n-1)!}$
 A. $\frac{n-3}{n-1}$ B. $n-2$ C. $\frac{1}{n-1}$ D. $\frac{1}{n(n-1)}$

 3. Moving only to the right and down, how many different routes are there from A to B?
 A. 10 B. 12 C. 14 D. 18
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4. Car license plates consist of 6 characters. Each of the first 3 characters can be any letter from A to Z inclusive except I or O. Each of the last 3 characters can be any digit from 2 to 9 inclusive. If repetition of letters and digits are not allowed, how many different license plates are possible? An example of this format is G R T 4 9 2.
 A. 4 080 384 B. 5 241 600 C. 7 077 888 D. 11 232 000

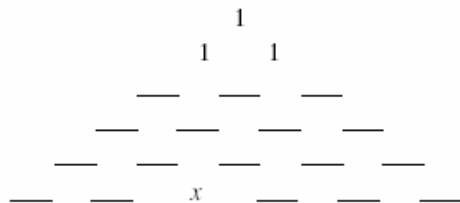
 5. Determine the first three terms in the expansion of $(x + 2y)^{10}$
 A. $x^{10} + 10x^9y + 90x^8y^2$ B. $x^{10} + 20x^9y + 180x^8y^2$
 C. $x^{10} + 10x^9y + 45x^8y^2$ D. $x^{10} + 20x^9y + 45x^8y^2$

 6. From a class of 12 boys and 10 girls a committee of 3 people is selected. How many different committees have at least 1 boy?
 A. 120 B. 540 C. 1420 D. 1540

 7. A couple is planning an evening out. They have a choice of 4 restaurants for dinner, 6 movies following dinner, and 4 coffee establishments for after the dinner. How many different ways can they plan the evening if they choose one of each?
 A. 6 B. 14 C. 48 D. 96

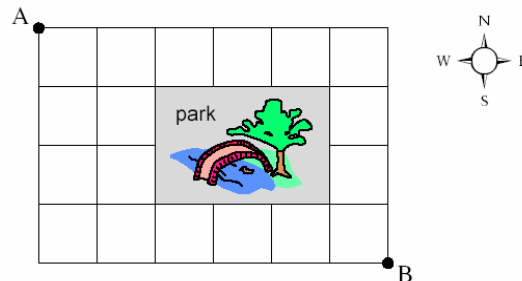
 8. How many different ways are there to arrange the letters in the word TSAWWASSEN?
 A. 25 200 B. 151 200 C. 302 400 D. 3 628 800

9. Given Pascal's triangle below, which of the following is equivalent to the value of x ?



- A. ${}_4C_2$ B. ${}_5C_2$ C. ${}_6C_2$ D. ${}_6C_3$
10. Determine the number of different arrangements of the letters in the word NANAIMO.
- A. 210 B. 1260 C. 2520 D. 5040
11. A student has 7 different textbooks. Which expression gives the number of different ways 4 of these books can be selected and arranged on a shelf?
- A. $4!$ B. $\frac{7!}{4!}$ C. ${}_7C_4$ D. ${}_7P_4$
12. Determine the 8th term in the expansion of $(2x - y)^{11}$.
- A. $-5280x^4y^7$ B. $-2640x^4y^7$ C. $1320x^3y^8$ D. $990x^3y^8$

13. The diagram below represents a street map. If a person can only travel east or south on the streets, how many different routes are there from A to B?



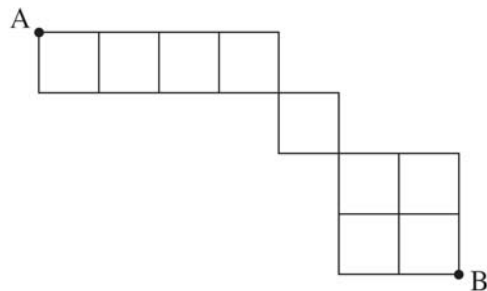
- A. 60 B. 68 C. 80 D. 200

Use the following information to answer questions 14 and 15.

The winner of a lottery chooses 4 vehicles from a warehouse that contains 12 different cars, 8 different trucks and 5 different motorcycles.

14. How many different choices of 4 vehicles are possible?
- A. 480 B. 570 C. 12 650 D. 303 600
15. How many different choices of vehicles are possible if there must be at least one car?
- A. 1 171 B. 3 432 C. 9 218 D. 11 935
16. Determine the number of terms in the expansion of $(a + b)^7$.
- A. 6 B. 7 C. 8 D. 9

17. Moving only to the right or down, determine the number of different pathways from A to B.



- A. 13 B. 24 C. 60 D. 80
18. Codes with 5 digits are made from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9. If repetitions are not permitted and each code must contain 2 odd digits followed by three even digits, determine the number of different codes that can be made.
- A. 126 B. 480 C. 1 600 D. 15 120

Use the following information to answer questions 19 and 20.

A class of 14 students is made up of 6 girls and 8 boys. From this class, a group of 5 students is chosen to represent the class at a competition.

19. Determine the number of different groups of 5 that can be formed if there must be 2 girls and 3 boys in each group.
- A. 71 B. 560 C. 840 D. 10 080
20. Determine the number of different groups of 5 that can be formed if there must be at most 1 boy in each group.
- A. 23 B. 30 C. 120 D. 126
21. Evaluate: $\frac{200!}{198!}$
- A. 2 B. 200 C. 39 800 D. infinity
22. A postal code consists of three letters and three digits arranged with a letter first, then a digit, a letter, then a digit, and a letter and a digit. If the first letter must be V, W or X and there are no other restrictions on the other letters or digits, determine how many different postal codes are possible. (An example of a postal code is V0N 5Y2.)
- A. 1 259 712 B. 1 478 412 C. 1 728 000 D. 2 028 000
23. Determine the coefficient of the 3rd term in the expansion of $(x + 2y)^7$.
- A. 21 B. 35 C. 84 D. 140
24. Determine the number of different arrangements of all the letters in the word BALLOON.
- A. 210 B. 1260 C. 2520 D. 5040

25. A class of 34 students consists of 20 girls and 14 boys. How many different committees of 5 girls and 3 boys can be formed from this class?
- A. 2 282 280 B. 5 643 456 C. 18 643 456 D. 40 632 288 320
26. How many permutations are there using all of the letters in the word P E P P E R ?
- A. 60 B. 120 C. 360 D. 720
27. In a particular city, all of the streets run continuously north-south or east-west. The mayor lives 4 blocks east and 5 blocks north of city hall. Determine the number of different routes, 9 blocks in length, that the mayor can take to get to city hall.
- A. 20 B. 126 C. 3 024 D. 15 120
28. In the expansion of $(x + y)^{10}$, determine the coefficient of the term containing $x^8 y^2$.
- A. 9 B. 10 C. 36 D. 45
29. In a standard deck of 52 cards, how many different 4-card hands are there that contain at most one heart?
- A. 91 403 B. 118 807 C. 188 474 D. 201 058
30. In a library, 4 different English books, 2 different Chemistry books and 3 different Mathematics books are arranged on a shelf. Determine the number of different arrangements for the 9 books if the books on each subject must be kept together.
- A. 24 B. 288 C. 1260 D. 1728

Written:

1. There are 7 boys and 5 girls in a group of students.
 - a) Calculate the number of ways that a committee of 4 students can be chosen from this group if the committee must have exactly 1 boy.
 - b) If the committee of 4 students must have a female president, a male vice-president, and 2 other members chosen from the remaining student, how many ways can such a committee be chosen?

2.
 - a) How many groups of 3 chairs can be chosen from 7 chairs if the chairs are all different colours?
 - b) How many different ways can 7 chairs be arranged in a row if 2 of the chairs are blue, 3 are yellow, 1 is red and 1 is green? (assume that all of the chairs are identical except for colour.)

3.
 - a) A theatre company of 13 actors consists of 8 men and 5 women. How many different ways are there to choose from the theater company a group of 7 with exactly 3 men?
 - b) A theatre company of 13 actors consists of 8 men and 5 women. How many different ways are there to choose from the theater company a group of 6 with at least 4 women?

4. Solve algebraically using factorial notation: ${}_nP_2 = 90$

Key

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|-------|-------|-------|-------|-------|-------|-------|-------|
| 1. C | 2. C | 3. B | 4. A | 5. B | 6. C | 7. D | 8. B |
| 9. B | 10. B | 11. D | 12. A | 13. C | 14. C | 15. D | 16. C |
| 17. C | 18. B | 19. C | 20. D | 21. C | 22. D | 23. C | 24. B |
| 25. B | 26. A | 27. B | 28. D | 29. D | 30. D | | |

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|---------------|---------------|
| 1a) 70 ways | 1b) 1575 ways |
| 2a) 35 groups | 2b) 420 ways |
| 3a) 280 ways | 3b) 148 ways |
| 4. $n = 10$ | |