

UNIT REVIEW of Permutations and Combinations (part 1)

Use the following information to answer the next eleven questions.

Consider a standard deck of playing cards.

1. If all the cards in the deck are dealt, then the number of different ways of dealing the cards is
2. If all the cards in the deck are dealt, then the different number of ways of dealing the ace of spades and the king of spades consecutively is
3. All the clubs are dealt to a player. In how many ways can she arrange the thirteen clubs ?
4. A player is dealt all the hearts. A game has five rounds with a single card played each round. In how many different ways can he play a card in five rounds.
5. A player is dealt all the face cards and three aces. If suit is irrelevant, then the number of ways of arranging the cards in her hand is
6. How many different thirteen card hands are possible ?
7. How many different thirteen card hands will have two aces ?
8. How many different thirteen card hands will have seven hearts, five clubs, and the ace of spades ?
9. How many different thirteen card hands will have at least twelve spades ?
10. How many different 13 card hands, which already has all the face cards, will have 4 diamonds ?
11. How many different thirteen card hands, which already has all the aces and kings and the queen of hearts, will have at least four clubs ?

Use the following information to answer the next eight questions.

Use the letters of the word COMMITMENT.

12. The number of unique arrangements of these letters is
13. The number of unique arrangements of these letters if it must begin with a vowel is
14. The number of unique arrangements of these letters if all the vowels must be together is
15. The number of unique arrangements of these letters if all the vowels must be at the front is
16. The number of unique arrangements of these letters, if the three M's are at the front, is
17. The number of unique arrangements of these letters, if it begins with an M followed by a vowel, is
18. The number of unique four-letter words from the above letters, if repetition is allowed, is
19. The number of unique four-letter words from the above letters, if repetition is not allowed, is

Answers to UNIT REVIEW of Permutations and Combinations (part 1)

1. $52!$
2. $(51!)(2!)$
3. $13!$
4. ${}_{13}P_5$
5. 15 765 750
6. ${}_{52}C_{13}$
7. $({}_4C_2)({}_{48}C_{11})$
8. $({}_{13}C_7)({}_{13}C_5)({}_1C_1)$
9. $({}_{13}C_{12})({}_{39}C_1) + ({}_{13}C_{13})$
10. ${}_{10}C_1$
11. $({}_{11}C_2)({}_{32}C_2) + ({}_{11}C_3)({}_{32}C_1) + ({}_{11}C_4)({}_{32}C_0)$
12. $\frac{10!}{3! \times 2!}$
13. $\frac{3 \times 9!}{3! \times 2!}$
14. $\frac{8!}{3! \times 2!} \times 3!$
15. $\frac{7!}{3! \times 2!} \times 3!$
16. $\frac{7!}{2!}$
17. $3 \times 3 \times \frac{8!}{3! \times 2!}$
18. 7^4
19. 840

UNIT REVIEW of Permutations and Combinations (part 2)

Use the following information to answer the next eighteen questions.

A school has a teaching staff of six Math teachers, eight Science teachers, seven English teachers, four Social Studies teachers, three Physical Education teachers, and five option teachers.

1. In how many ways can the Science Department line up in a row for a photograph ?
2. In how many ways can the English and Social Studies Departments stand for a photo if they must stand next to their department members ?
3. The staff pose for a school photo in six rows. Two members from the Science department must stand together and three members from the Social Studies department must stand together. Each department stands in their own row. How many ways can this photo be taken ?
4. The Principal wants to be in a photo with the Science Department, but he must stand in the middle of the picture. In how many ways can this be done ?
5. In how many ways can ten staff members be selected for a committee ?
6. In how many ways can four teachers be selected to supervise the gym, the halls, the cafeteria, and the library during lunch hour ?
7. In how many ways can six teachers, one from each department, be selected to represent their department ?
8. In how many ways can a thirteen member committee be selected with at least two teachers from each department ?
9. Each teacher must buy a Christmas present for every other teacher. How many total gifts are bought by the staff ?
10. At the initial staff meeting each teacher is required to shake hands with every other teacher once. How many hand shakes are there ?

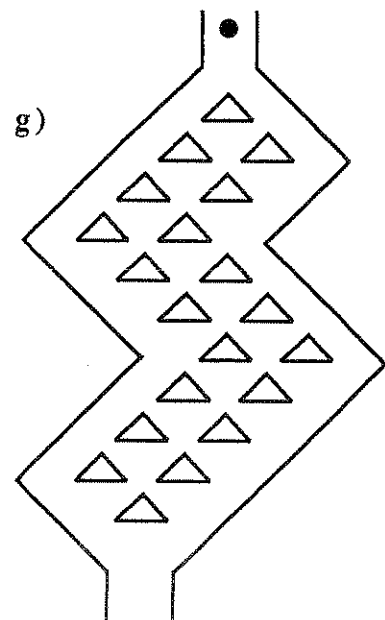
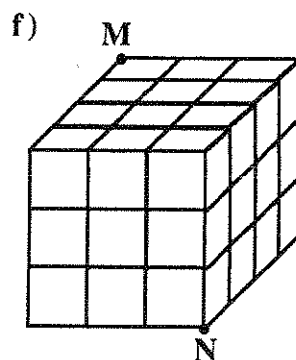
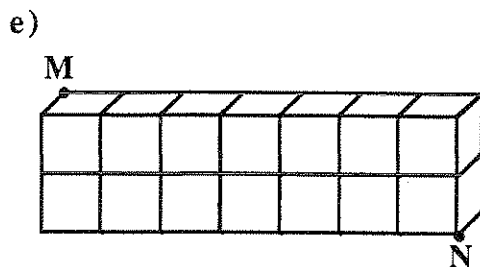
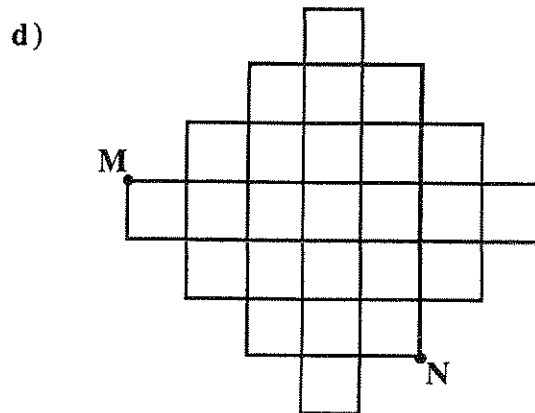
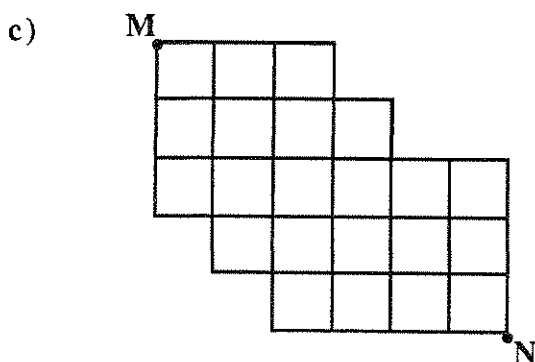
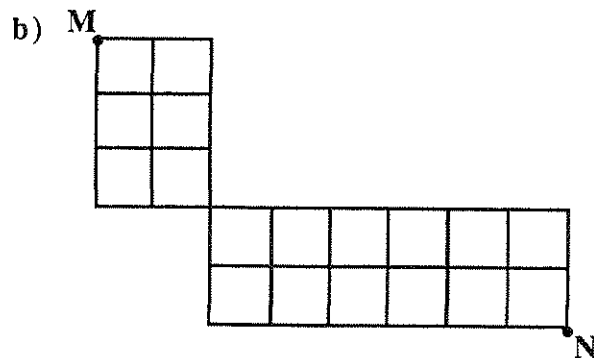
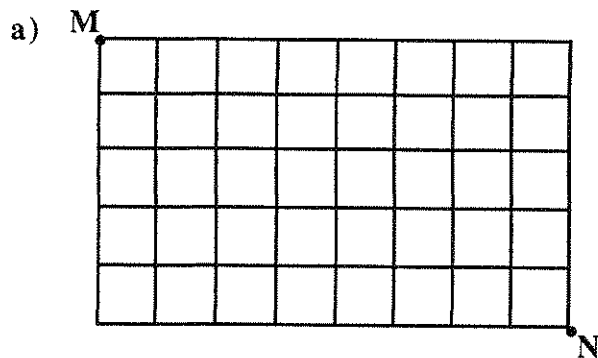
11. Each member of the P.E. Department is required to be the head coach of two teams.
How many ways can these teachers coach six teams ?
12. The English Department was asked to attend a poetry reading.
In how many ways can at least five of them attend ?
13. A ten-teacher committee has the following positions:
 a math teacher who is in charge of the grade 10 math curriculum
 a math teacher who is in charge of the grade 11 math curriculum
 a math teacher who is in charge of the grade 12 math curriculum
 two science teachers, in charge of the physics and chemistry programs
 any five teachers to help coordinate the programs
 How many ways can this committee be struck ?
14. There are eight positions for a group of teachers to attend a conference. Find the number of ways of sending this group if the five option teachers must attend.
15. There are eight positions for a group of teachers to attend a conference. Find the number of ways of sending this group if exactly four option teachers must attend.
16. There are eight positions for a group of teachers to attend a conference. Find the number of ways of sending this group if at most two option teachers must attend.
17. There are eight positions for a group of teachers to attend a conference. Find the number of ways of sending this group if at least one member from each department must attend.
18. There are eight positions for a group of teachers to attend a conference. Find the number of ways of sending this group if at least three Social Studies teachers must attend and exactly three P.E. teachers must attend and Stan, from the Science department must attend the conference.

Answers to UNIT REVIEW of Permutations and Combinations (part 2)

1. $8!$
2. $(7!)(4!)(2!)$
3. $(6!)(7!2!)(7!)(3!2!)(3!)(5!)(6!)$
4. $8!$
5. ${}_{33}C_{10}$
6. ${}_{33}P_4$
7. $({}_6C_1)({}_8C_1)({}_7C_1)({}_4C_1)({}_3C_1)({}_5C_1)$
8. $({}_6C_2)({}_8C_2)({}_7C_2)({}_4C_2)({}_3C_2)({}_5C_2)({}_{21}C_1)$
9. $(33)(32)$
10. ${}_{33}C_2$
11. $\frac{6!}{2!2!2!}$
12. $({}_7C_5) + ({}_7C_6) + ({}_7C_7)$
13. $({}_6P_3)({}_8P_2)({}_{28}C_5)$
14. $({}_5C_5)({}_{28}C_3)$
15. $({}_5C_4)({}_{28}C_4)$
16. $({}_5C_0)({}_{28}C_8) + ({}_5C_1)({}_{28}C_7) + ({}_5C_2)({}_{28}C_6)$
17. $({}_6C_1)({}_8C_1)({}_7C_1)({}_4C_1)({}_3C_1)({}_5C_1)({}_{27}C_2)$
18. $({}_1C_1)({}_3C_3)({}_4C_3)({}_{25}C_1) + ({}_3C_3)({}_4C_4)({}_{25}C_0)({}_1C_1)$

UNIT REVIEW of Permutations and Combinations (part 3)

1. How many paths are there from **M** to **N** if each movement gets closer to **N**? (a to f)
Also, find the different number of paths as the ball drops from the top to the bottom in diagram g.



2. A small town has thirteen avenues (running east to west) and ten streets (running north to south). How many different routes exist if Cartman wants to travel from the NW corner to the SE corner?
3. The sale of a new computer requires the choice of three different hardwares, six different amounts of RAM, four processors, and two monitors. How many different computers can be built?

4. Wendy wants to arrange sixteen different length spoons. How many ways can this be done ?
5. Marg wants to arrange 10 blue spoons, 4 green spoons, and 2 red spoons, all of different length, in a row. If the spoons of the same color must be together, the number of arrangements is
6. There are twelve pairs of seats on a small airplane which has 24 passengers. Seven pairs of the passengers wish to sit together and ten single passengers do not care where they sit. How many ways can the passengers be seated so that the pairs sit together ?
7. Solve ${}_nC_3 = 20$ for n .
8. Solve $(7)({}_6P_3) = (12)({}_nC_4)$ for n .
9. How many diagonals does a 99-sided regular polygon have ?
10. If a regular polygon has 1175 diagonals, then its number of sides is
11. Solve ${}_nP_5 = 15\,120$ for n .
12. Solve ${}_nP_2 = 110$ for n .
13. Solve ${}_nC_2 = 105$ for n .
14. Solve ${}_nC_3 = \frac{{}_nP_3}{{}_nC_1}$ for n .
15. Solve ${}_nC_3 = \frac{{}_nP_3}{{}_nC_2}$ for n .
16. Write the values of the tenth row in Pascals Triangle.
17. What is the sum of the eighth row in Pascals Triangle ?
18. If $\left(20x^8 - \frac{15y^{11}}{m^\pi}\right)^{7p+3}$ has eighteen terms, then the value of p is
19. Expand $(3x+2)^4$.
20. Find the middle term of $(5p-3c^2)^{10}$.
21. Find the constant term of $\left(10x^2 - \frac{4}{x^3}\right)^{15}$.
22. Find the third term of $\left(\frac{4x^2}{3y} - \frac{9y^3}{10x}\right)^8$.
23. If one of the terms of $(9x^2 - W)^6$ is $-88\,573.5\,x^{10}$, then W , to the nearest hundredth, is
24. What is the coefficient of the x^6y^6 term in $\left(\frac{6x^4}{5} - \frac{100y^3}{3x}\right)^4$?

Answers to UNIT REVIEW of Permutations and Combinations (part 3)

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|---|---------------------------------|---------------------------------|------------------------|----------------------------|---------|--------|
| 1a. 1287 | b. 280 | c. 410 | d. 48 | e. 360 | f. 4200 | g. 426 |
| 2. 293 930 | 3. 144 | 4. $16!$ | 5. $(3!)(10!)(4!)(2!)$ | 6. $({}_{12}C_7)(2!)(10!)$ | 7. 6 | |
| 8. 8 | 9. 4752 | 10. 50 | 11. 9 | 12. 11 | 13. 15 | |
| 14. 6 | 15. 4 | 16. 1,9,36,84,126,126,84,36,9,1 | 17. 128 | 18. 2 | | |
| 19. $81x^4 + 216x^3 + 216x^2 + 96x + 16$ | 20. $-191\,362\,500\,p^5c^{10}$ | | | | | |
| 21. 6 304 858 560
2.05×10^{16} | 22. $\frac{28672}{225}x^{10}$ | 23. 0.25 | 24. 9600 | | | |