

1. True or false?

a)  $4 \cdot 3! = 4!$       b)  $\frac{5!}{4!} = 5$

c)  $\frac{2!}{4!} = \frac{1}{2!}$       d)  $(3!) \cdot (6!) = 9!$

e)  $\frac{(4!) \cdot (2!)}{3!} = 8$       f)  $9 \cdot 8 \cdot 7! = 9!$

- g) A set of four books can be arranged on a shelf in only four different ways.
- h) It is possible to form  $5!$  permutations of all the letters in the word LEARN.
- i) A student council of eight people can be seated around a table in  $8!$  ways.
- j) From a group of six people it is possible to form 240 different lists of candidates for the four offices: president, vice-president, secretary, and treasurer.
2. How many different four-digit natural numbers can be formed using the digits 2, 4, 6, and 8 if a digit may be used more than once in a number?
3. How many different four-digit natural numbers can be formed from the digits 1, 3, 5, 7, and 9 if no digit is repeated in a number?
4. How many different four-letter arrangements are there of the letters of the word TRADE?
5. The future football stadium at Grand Centre High will have 9 gates; 5 on the east side and 4 on the west side.
- a) In how many ways will a person be able to enter by an east gate and leave by a west gate?
- b) In how many ways will a person be able to enter and leave by a different gate?
6. How many different automobile license plates can be made using 3 letters followed by 3 digits?
7. If an inmate at the Edmonton penitentiary can manufacture 1 automobile license plate every 30 seconds, and he works 8 hours a day and 5 days a week, how long will he be employed making every possible license plate described in #6 above?
8. How many different signals can be made from 6 differently colored flags if each signal is to consist of 4 flags hung in a vertical column?
9. How many arrangements of 5 different geometry books and 3 different chemistry books can be made if all of the books are

placed on a shelf in such a way that the geometry books are kept together and to the left of the chemistry books?

10. How many natural numbers of one or more digits can be formed using the digits 6, 7, 8, and 9 if a digit may be used more than once in any number and the number must be between 5 and 10 000?
11. In how many ways can a game of doubles in tennis be arranged if each team is to be composed of a boy and a girl selected from a group of 3 boys and 4 girls?
12. In how many ways can the offensive team of the Royals football team form a circular huddle?
13. In how many ways can a group of 4 girls and 4 boys be seated at a circular table if boys and girls must alternate?
14. In how many different orders may a seating arrangement be made at a 5-place round table if 7 people are available?
15. How many committees of 5 people can be formed from a group of 12 people?
16. In how many ways can a class of 20 students be divided into
- a) two groups of 10 students each?
- b) four groups of 5 students each?
17. How many triangles are determined by the vertices of a regular decagon?
18. A legislative body of 13 people passed a law by a vote of 7 to 6. In how many different ways could their vote have resulted?
19. From a standard deck of 52 cards, how many different
- a) 5-card hands can be formed?
- b) 5-card hands with at most 2 red cards can be formed?
- c) 5-card hands with at least 4 black cards can be formed?
- d) 5-card hands can be formed which contain all red cards or all black cards?
20. A student must choose 10 of 15 problems on a final examination. In how many different ways can the student choose the 10 problems?
21. In how many ways can 6 boys be seated in
- a) a row?
- b) a row in which Joe and Bill are not seated together?
- c) a circle?
- d) a circle in which Joe and Bill are not seated together?
22. In how many ways can 10 beads of different colors be strung to form a necklace?

23. A railway has 50 stations. If the names of the point of departure and the destination are printed on each ticket, how many different kinds of single tickets must be printed?
24. In how many ways can 15 different gifts be divided among A, B, and C, if A is to receive 2 gifts, B is to receive 3, and C is to receive 10?
25. A ring of 8 boys is to be enlarged by the addition of 5 girls. In how many ways can this be done if no two girls are to stand beside each other?
26. A town council is made up of a mayor and 6 aldermen. How many different committees of 4 can be formed if
  - a) the mayor is on each committee?
  - b) the mayor is on no committee?
27. Four letters of the word ZEPHYR are to be used to form a "word". How many of these "words"
  - a) will not contain the letter R?
  - b) will contain the letter R?
  - c) will begin with Z and end with R?
28. In how many ways can a coach choose a team of 5 from 10 available athletes if
  - a) 2 specified athletes must be selected?
  - b) there are no restrictions?
29. In how many of the numbers between 1000 and 9999 does the digit 3 occur?
30. How many "words", each of 2 vowels and 2 consonants, can be formed from the letters of the word INVOLUTE?
31. How many diagonals are there in a 20-sided polygon?
32. A certain polygon has 35 diagonals. How many sides does it have?
33. A symphony is recorded on 4 discs, both sides of each disc being used. In how many ways can the 8 sides be played on a record player so that some part of the symphony is played out of its correct order?
34. A railway coach has 10 seats facing backwards and 10 facing forwards. In how many ways can 9 passengers be seated if 2 refuse to ride facing forwards and 3 refuse to ride facing backwards?
35. From a company of 20 soldiers, a squad of 3 men is chosen each night.
  - a) For how many consecutive nights could a squad go on duty without any two of the squads being identical?
  - b) In how many of these squads would a given soldier serve?
36. How many 3-digit numbers are divisible by 5?
37. Solve  $\binom{n}{2} = 45$  for n.
38. Show that  ${}_6C_3 + {}_6C_4 = {}_7C_4$ .
39. The central Alberta AA Bantam Hockey League consists of 11 teams. Each team plays each other team 3 times in the season.
  - a) How many games will Grand Centre play?
  - b) How many games must be scheduled for the league?
40. One of two parallel lines contains 5 marked points. The other contains 4 marked points. Using the marked points as vertices, how many different
  - a) triangles can be drawn?
  - b) quadrilaterals can be drawn?
41. An artist has 10 paintings. In how many ways can eight or more of these paintings be selected to be displayed at an art show?
42. How many permutations are there for the letters of the word SHUFFLE?
43. An exam has 20 multiple choice questions. Each of these questions has 4 possible choices. How many different answer keys could be formed?
44. Ten players are competing for the 5 starting positions on the basketball team. Those positions are 1 centre, 2 forwards, and 2 guards. Of those competing, 3 are centres, 4 are guards, and 3 are forwards. In how many different ways can the coach make his selection?
45. A lottery ticket is made as shown: CD-4577-B. How many different tickets can be made?
46. How many even 4-digit natural numbers are there?
47. If  ${}_6P_k = 120$ , find k.
48. If  ${}_nP_5 = 15\ 120$ , find n.
49. In how many ways can 4 identical pennies be arranged in a row?
50. In a group of 8 people, each person shakes hands with each of the others. How many handshakes are made?

Perms & Combs WS

(Answers)

- 1a) T b) T c) F d) F e) T  
f) T g) F h) T i) F j) T  
2) 256 3) 120 4) 120  
5a) 20 b) 72 6) 17 576 000  
7) 70.4 a 8) 360 9) 720  
10) 340 11) 36  
12) 39 916 800 13) 144  
14) 504 15) 792 16a) 92 378  
16b) 488 864 376 17) 120  
18) 1716 19a) 2 598 960  
19b) 1 299 480 c) 454 480  
19d) 131 560 20) 3003  
21a) 720 b) 480 c) 120 d) 72  
22) 181 440 23) 2450  
24) 30 030 25) 6720 26a) 20  
26b) 15 27a) 120 b) 240  
27c) 12 28a) 56 b) 252  
29) 3168 30) 864 31) 170  
32) 10 33) 40 319  
34) 2 122 848 000 35a) 1140  
35b) 171 36) 180 37) 10  
38)  $20 + 15 = 35$  39a) 30  
39b) 165 40a) 70 b) 60  
41) 56 42) 2520 43)  $4^{20}$   
44) 54 45) 175 760 000  
46) 4500 47) 3 48) 9  
49) 16 50) 28