

Multiple Choice Section

1. (specs-01)

How many terms are in the expansion $\left(2x - \frac{1}{y}\right)^{10}$?

- A. 9
- B. 10
- C. 11
- D. 12

2. (specs-02)

A bowl contains an apple, a pear, a plum, and a banana. How many different pairs of fruit can be selected from the bowl?

- A. ${}_4P_2$
- B. ${}_2P_4$
- C. ${}_4C_2$
- D. ${}_2C_4$

3. (specs-03)

A special combination lock that has 60 numbers on the dial works by turning it first to the right, then to the left, and then to the right, with 3 different selected numbers needed to open the lock. The selection of these 3 numbers is an example of

- A. a permutation.
- B. a combination.
- C. both a combination and a permutation.
- D. neither a combination nor a permutation.

4. (specs-04)

There are 45 multiple-choice questions on an exam with 4 possible answers for each question. How many different ways are there to complete the test?

- A. 45
- B. 148 995
- C. 3 575 880
- D. 4^{45}

5. (specs-06)

North American area codes are three digit numbers. Before 1995, area codes had the following restrictions: the first digit could not be 0 or 8, the second digit was either 0 or 1, and the third digit was any number from 1 through 9 inclusive. Under these rules, how many different area codes were possible?

- A. 112
- B. 120
- C. 144
- D. 504

6. (specs-09)

The 10th term of the expansion of $\left(x - \frac{1}{2}\right)^n$ is $-\frac{1001}{256}x^5$. Determine n .

- A. 13
- B. 14
- C. 15
- D. not possible to determine n from the given information

7. (specs-05)

A breakfast special consists of choosing one item from each category in the following menu.

- Juice: apple, orange, grapefruit
- Toast: white, brown
- Eggs: scrambled, fried, poached
- Beverage: coffee, tea, milk

How many different breakfast specials are possible?

- A. 11
- B. 48
- C. 54
- D. 96

8. (specs-07)

Katie wants to colour a rainbow. She knows the seven colours that make up a rainbow, but can't remember the correct order. How many different ways could the colours be arranged assuming each colour is used only once?

- A. 28
- B. 128
- C. 720
- D. 5 040

9. (specs-08)

Simplify the following expression without using the factorial symbol $\frac{(n-2)!(n+1)!}{(n!)^2}$.

- A. $\frac{1}{n}$
- B. $\frac{1}{n-1}$
- C. $\frac{n-1}{n(n+1)}$
- D. $\frac{n+1}{n(n-1)}$

10. (specs-10)

Linda and Sam play a tennis match. The first person to win 2 games wins the match. In how many different ways can a winner be determined?

- A. 3
- B. 5
- C. 6
- D. 8

11. (specs-11)

How many 6 digit numbers greater than 800 000 can be made from the digits 1, 1, 5, 5, 5, 8 ?

- A. 10
- B. 60
- C. 64
- D. 120

12. (specs-12)

In how many ways can four colas, three iced teas, and three orange juices be distributed among ten graduates if each graduate is to receive one beverage?

- A. 36
- B. 4 200
- C. 604 800
- D. 3 628 800

13. (specs-13)

Solve for n : ${}_nP_2 = 42$

- A. 2
- B. 6
- C. 7
- D. 42

14. (specs-14)

Assuming that at least one coin is used, how many different sums of money can be made from the following coins: a penny, a nickel, a dime, a quarter, and a dollar?

- A. 16
- B. 31
- C. 32
- D. 120

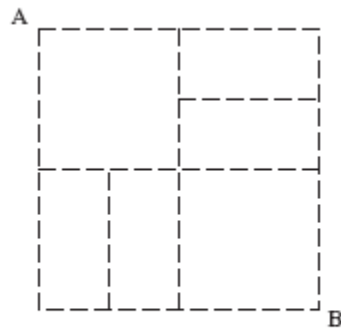
15. (specs-15)

Which term in the expansion of $\left(\frac{1}{2x^2} - x^3\right)^{10}$ is a constant?

- A. 4th
- B. 5th
- C. 6th
- D. 11th

16. (specs-16)

Moving only to the right or down, how many different routes exist to get from point A to point B?



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

17. (sample02-32)

How many different committees of 2 people can be selected from 5 people?

- A. $\frac{5!}{2!}$
- B. $\frac{5!}{3!}$
- C. $\frac{5!}{2!3!}$
- D. $5!$

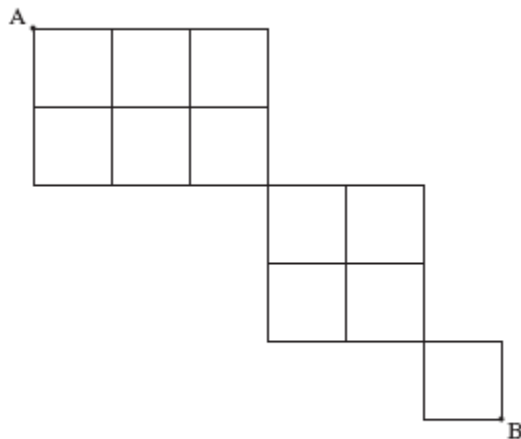
18. (sample02-33)

Determine the 5th term in the expansion of $(x - \frac{1}{2}y)^7$.

- A. $\frac{35}{8}x^4y^3$
- B. $\frac{35}{16}x^3y^4$
- C. $-\frac{35}{8}x^4y^3$
- D. $-\frac{35}{16}x^3y^4$

19. (sample02-34)

Moving only to the right or down, how many different paths exist to get from point A to point B?



- A. 22
- B. 60
- C. 120
- D. 144

20. (jan02-33)

Determine the 4th term of $(x - 2)^6$.

- A. $120x^2$
- B. $240x^2$
- C. $-160x^3$
- D. $-320x^3$

21. (jan02-32)

When you play lotto 5-30, you must choose 5 different integers from 1 to 30. How many combinations are possible?

- A. $\frac{30!}{5! 25!}$
- B. $\frac{30!}{25!}$
- C. $25!$
- D. $\frac{30!}{5!}$

22. (jan02-34)

Determine the number of different arrangements of all the letters in APPLEPIE.

- A. 3 360
- B. 6 720
- C. 40 312
- D. 40 320

23. (jan02-35)

Assume a car license plate consists of 7 characters. The first 3 characters can be any of the letters from A to F, but no letter can be repeated. The next 3 characters can be any of the digits from 1 to 9, but no digit can be repeated. The last character can be any of the letters X, Y or Z. An example of this format is: BFA648Y. How many license plates are possible?

- A. 5 040
- B. 181 440
- C. 472 392
- D. 4 084 080

24. (apr02-32)

A soccer coach must choose 3 out of 10 players to kick tie-breaking penalty shots. Assuming the coach must designate the order of the 3 players, determine the number of different arrangements she has available.

- A. $\frac{10!}{7!}$
- B. $\frac{10!}{3!}$
- C. $\frac{10!}{3! 7!}$
- D. $\frac{10!}{3! 3! 4!}$

25. (apr02-33)

Determine the 4th term in the expansion of $(x - 2y)^5$.

- A. $-80x^2y^3$
- B. $-40x^3y^2$
- C. $40x^3y^2$
- D. $80x^2y^3$

26. (jun02-32)

Express ${}_{33}C_5$ using factorial notation.

- A. $\frac{33!}{5!}$
- B. $\frac{33!}{28!}$
- C. $\frac{33!}{5! 28!}$
- D. $28!$

27. (jun02-33)

Determine the 3rd term in the expansion of $(x - y)^{10}$.

- A. $-45x^8y^2$
- B. $-120x^7y^3$
- C. $45x^8y^2$
- D. $120x^7y^3$

28. (aug02-32)

How many different pasta meals can be made from 4 choices of pasta and 2 choices of sauces, if only one pasta and one sauce is selected for each meal?

- A. 4
- B. 6
- C. 8
- D. 16

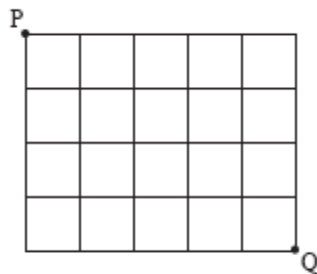
29. (aug02-33)

A man has 7 different pets and wishes to photograph them 3 at a time arranged in a line. How many different arrangements are possible?

- A. 21
- B. 35
- C. 210
- D. 840

30. (aug02-35)

Moving only to the right or down, how many different paths exist to get from point P to point Q?



- A. 120
- B. 126
- C. 180
- D. 480

31. (aug02-34)

Determine the 3rd term of $(2x + y)^6$.

- A. $15x^4y^2$
- B. $240x^4y^2$
- C. $120x^3y^3$
- D. $160x^3y^3$

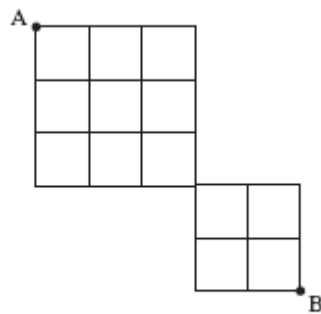
32. (aug02-36)

Which expression is equivalent to ${}_nC_2$?

- A. $n^2 - 2n$
- B. $n^2 - n$
- C. $\frac{1}{2}(n^2 - 2n)$
- D. $\frac{1}{2}(n^2 - n)$

33. (jan03-34)

Moving only to the right or down, how many different paths are there from A to B?



- A. 26
- B. 52
- C. 120
- D. 252

34. (jan03-35)

Simplify: $\frac{n(n+1)!}{(n-1)!}$

- A. $2n!$
- B. $n!(n^2 + n)$
- C. $2n$
- D. $n^3 + n^2$

35. (jan03-36)

In the expansion of $(2a - 3b)^6$, determine the coefficient of the term containing a^4b^2 .

- A. -4 320
- B. 864
- C. 2 160
- D. 2 880

36. (apr03-34)

When playing the 6/49 lottery, a customer must choose 6 different numbers from 1 to 49 inclusive. How many combinations are possible?

- A. 49!
- B. $\frac{49!}{6!43!}$
- C. $\frac{49!}{43!}$
- D. $\frac{49!}{6!}$

37. (apr03-35)

Twelve buttons differ only by colour. There are 4 red buttons, 4 green buttons and 4 yellow buttons. If the buttons are placed in a row, how many different arrangements are possible?

- A. 11 880
- B. 34 650
- C. 19 958 400
- D. 479 001 600

38. (apr03-36)

How many odd 3-digit whole numbers are there? For example, 203 is acceptable but 023 is not.

- A. 360
- B. 450
- C. 500
- D. 900

39. (jun03-34)

How many terms are in the expansion of $(2x + y)^9$?

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

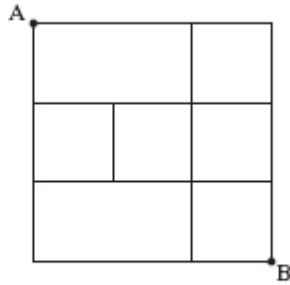
40. (jun03-35)

Simplify: $\frac{(n-2)!}{(n-1)!}$

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

41. (jun03-36)

Moving only to the right or down, how many different routes are there from A to B?



- A. 10
- B. 12
- C. 14
- D. 18

42. (aug03-34)

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 repetitions 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

43. (aug03-35)

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. $x^{10} + 20x^9y + 45x^8y^2$

44. (aug03-36)

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. 1 420
- D. 1 540

45. (jan04-29)

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 movie. How many different ways can they plan the evening if they choose one of each?

- A. 6
- B. 14
- C. 48
- D. 96

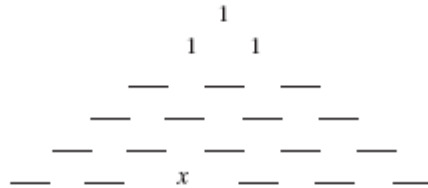
46. (jan04-30)

How many different ways are there to arrange the letters in the word T S A W W A S S E N ?

- A. 25 200
- B. 151 200
- C. 302 400
- D. 3 628 800

47. (apr04-29)

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. ${}_6C_3$

48. (apr04-30)

Determine the number of different arrangements of the letters in the word NANAIMO.

- A. 210
- B. 1260
- C. 2520
- D. 5040

49. (jun04-29)

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. ${}_7P_4$

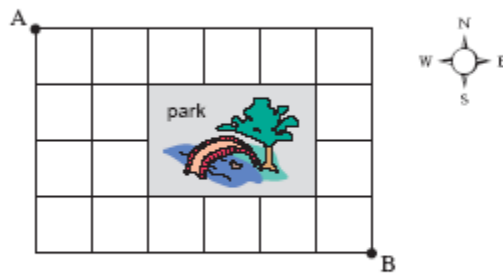
50. (jun04-30)

Determine the 8th term in the expansion of $(2x - y)^{11}$.

- A. $-5280x^4y^7$
- B. $-2640x^4y^7$
- C. $1320x^3y^8$
- D. $990x^3y^8$

51. (jun04-31)

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 52 and 53.

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

52. (jun04-32)

How many different choices of 4 vehicles are possible?

- A. 480
- B. 570
- C. 12 650
- D. 303 600

53. (jun04-33)

How many different choices of 4 vehicles are possible if there must be at least one car?

- A. 1 171
- B. 3 432
- C. 9 218
- D. 11 935

54. (jan04-14)

Consider the geometric sequence $1, (a + b), (a + b)^2, \dots$

Which term of this geometric sequence, when expanded, contains the expression $35a^4b^3$?

- A. 5th term
- B. 6th term
- C. 7th term
- D. 8th term

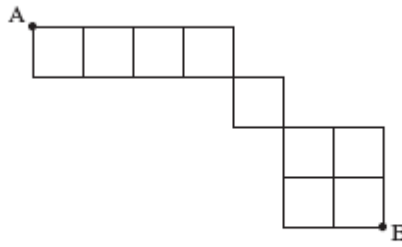
55. (aug04-29)

Determine the number of terms in the expansion of $(a + b)^7$.

- A. 6
- B. 7
- C. 8
- D. 9

56. (aug04-30)

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

57. (aug04-31)

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 3 even digits, determine the number of different codes that can be made.

- A. 126
- B. 480
- C. 1600
- D. 15 120

Use the following information to answer questions 58 and 59.

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.

58. (aug04-32)

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

59. (aug04-33)

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

Written Section

1. (specs-17)

Sears wants to build 8 new stores in western Canada. They have the following information.

Province	Number of stores to be built	Number of possible locations
BC	2	6
Alberta	3	5
Saskatchewan	1	4
Manitoba	2	5

If Sears wants to study all possibilities for the location of the 8 new stores, how many different possibilities would the company have to consider?

2. (specs-18)

What is the 10th term of $\left(2x - \frac{1}{y}\right)^{10}$?

3. (specs-19)

Solve: $\frac{n!}{(n-2)!3!} = 5$

4. (specs-20)

Numbers are formed on a calculator using seven lines which are either lit or not lit. The diagram below shows the number 8 formed using all 7 lines lit. How many different symbols can be created by lighting one or more of these 7 lines? (Count all the symbols, not just the ones that represent numbers.)



5. (specs-21)

There are five boys and six girls on a grad committee.

- In how many ways can a sub-committee of two boys and two girls be selected from the committee?
- In how many ways can a sub-committee of four people be selected if there must be at least one girl on the sub-committee?

6. (sample02-03)

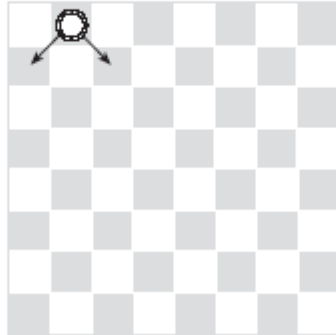
Solve algebraically: $\frac{n!}{(n-2)!4!} = 10$ (4 marks)

7. (apr02-05)

Solve algebraically: $\frac{(n-1)!}{(n-3)!} = 30$ (4 marks)

8. (specs-22)

A checkerboard is an 8×8 game board, as shown below. Game pieces can travel only diagonally on the dark squares, one diagonal square at a time, and only in a downward direction. If a checker is placed as shown, how many possible paths are there for the checker to reach the opposite side of the game board?



9. (jun02-04)

A class has 30 students.

- How many ways can a committee of 3 people be selected from the class? **(2 marks)**
- How many ways can an executive committee consisting of 3 people (president, vice-president, secretary) be selected from the class? **(1 mark)**
- If there are 10 boys and 20 girls in the class, how many ways can a committee of 3 people be selected from the class if the committee must contain 1 boy and 2 girls? **(1 mark)**

10. (jan03-04)

A toy box contains 4 different cars and 6 different trucks.

- In how many ways can a collection of 5 toys be chosen if the collection must consist of 2 cars and 3 trucks? **(2 marks)**
- In how many ways can a collection of 5 toys be chosen if the collection must consist of at least 3 cars? **(2 marks)**

11. (apr03-04)

Determine the first 3 terms of the expansion: $(x - 2y)^7$ **(4 marks)**

12. (jun03-04)

There are 7 boys and 5 girls in a group of students.

- 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. **(2 marks)**
- If the committee of 4 students must have a female president, a male vice-president, and 2 other members chosen from the remaining students, how many ways can such a committee be chosen? **(2 marks)**

13. (aug03-04)

- How many groups of 3 chairs can be chosen from 7 chairs if the chairs are all different colours? **(2 marks)**
- 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.) **(2 marks)**

Math 12 Combinatorics Review Name: _____

14. (jan04-01)

- a) A theatre company of 13 actors consists of 8 men and 5 women. How many different ways are there to choose from the theatre company a group of 7 with exactly 3 men? **(2 marks)**
- b) A theatre company of 13 actors consists of 8 men and 5 women. How many different ways are there to choose from the theatre company a group of 6 with at least 4 women?
(2 marks)

15. (apr04-05)

Solve algebraically using factorial notation: ${}_nP_2 = 90$ **(4 marks)**