

## Provincial Exam Multiple Choice Questions: Combinatorics

### January 2002

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.  $\frac{30!}{5!}$
33. Determine the 4<sup>th</sup> term of  $(x-2)^6$
- A.  $120x^2$     B.  $240x^2$     C.  $-160x^3$     D.  $-320x^3$
34. Determine the number of different arrangements of all the letters in APPLEPIE.
- A. 3360    B. 6720    C. 40312    D. 40320
35. Assume a car license plate consists of 7 characters. The first 3 characters can be any of the letters for 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, Z. An example of this format is: BFA648Y. How many license plates are possible?
- A. 5040    B. 181440    C. 472392    D. 4084080
42. Suppose you play a game of cards in which only three cards are dealt from a standard 52-card deck. How many ways are there to obtain one pair? (2 cards of the same rank and 1 card of a different rank.)
- A. 1014    B. 1872    C. 3744    D. 3900

### April 2002

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.  $\frac{10!}{3!3!4!}$
33. Determine the 4<sup>th</sup> term in the expansion of  $(x-2y)^5$
- A.  $-80x^2y^3$     B.  $-40x^3y^2$     C.  $40x^3y^2$     D.  $80x^2y^3$

### June 2002

32. Express  ${}_{33}C_5$  using factorial notation.
- A.  $\frac{33!}{5!}$     B.  $\frac{33!}{28!}$     C.  $\frac{33!}{5!28!}$     D.  $28!$

33. Determine the 3<sup>rd</sup> term in the expansion of  $(x - y)^{10}$

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

**August 2002**

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

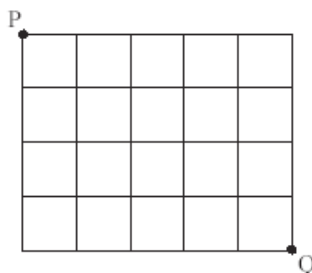
33. A man has 7 different pets and wishes to photograph them 3 at a time arranged in a line. How many different arrangements are possible?

- A. 21    B. 35    C. 210    D. 840

34. Determine the 3<sup>rd</sup> term of  $(2x + y)^6$

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

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



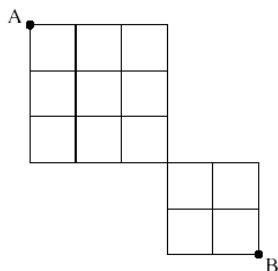
- A. 120    B. 126    C. 180    D. 480

36. Which expression is equivalent to  ${}_nC_2$ ?

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

**January 2003**

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



- A. 26    B. 52    C. 120    D. 252

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

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

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

- A.  $-4320$     B.  $864$     C.  $2160$     D.  $2880$

### April 2003

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

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

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.  $11880$     B.  $34650$     C.  $19958400$     D.  $479001600$

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.  $900$

### June 2003

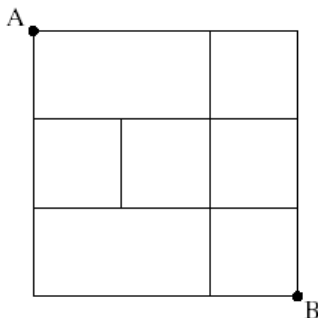
34. How many terms are in the expansion of  $(2x + y)^9$

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

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

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

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



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

**August 2003**

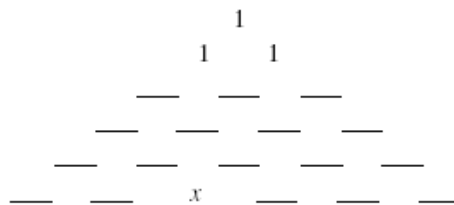
34. Car license plates consist of 6 characters. Each of the first 3 characters can be any letter from A to Z inclusive except I or O. Each of the last 3 characters can be any digit from 2 to 9 inclusive. If repetition of letters and digits are not allowed, how many different license plates are possible? 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
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.  $x^{10} + 20x^9y + 45x^8y^2$
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. 1420    D. 1540

**January 2004**

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 dinner. How many different ways can they plan the evening if they choose one of each?
- A. 6    B. 14    C. 48    D. 96
30. 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

**April 2004**

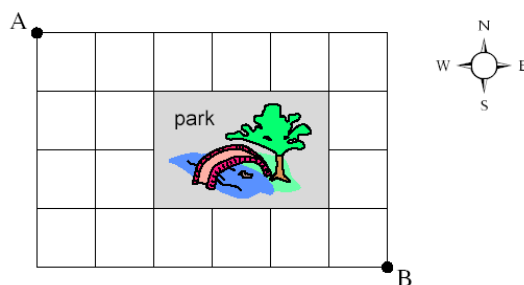
29. Given Pascal's triangle below, which of the following is equivalent to the value of  $x$ ?



- A.  ${}_4C_2$     B.  ${}_5C_2$     C.  ${}_6C_2$     D.  ${}_6C_3$
30. Determine the number of different arrangements of the letters in the word NANAIMO.
- A. 210    B. 1260    C. 2520    D. 5040

## June 2004

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.  ${}_7P_4$
30. Determine the 8<sup>th</sup> term in the expansion of  $(2x - y)^{11}$ .
- A.  $-5280x^4y^7$     B.  $-2640x^4y^7$     C.  $1320x^3y^8$     D.  $990x^3y^8$
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 32 and 33.**

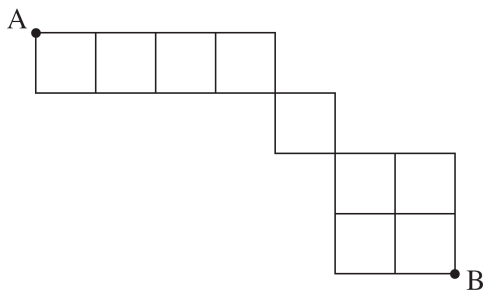
The winner of a lottery chooses 4 vehicles from a warehouse that contains 12 different cars, 8 different trucks and 5 different motorcycles.

32. How many different choices of 4 vehicles are possible?
- A. 480    B. 570    C. 12 650    D. 303 600
33. 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

## August 2004

29. Determine the number of terms in the expansion of  $(a + b)^7$ .
- A. 6    B. 7    C. 8    D. 9

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
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 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 32 and 33.**

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.

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
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

**August 2005**

32. Evaluate:  $\frac{200!}{198!}$
- A. 2    B. 200    C. 39 800    D. infinity
33. 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
34. Determine the coefficient of the 3<sup>rd</sup> term in the expansion of  $(x + 2y)^7$ .
- A. 21    B. 35    C. 84    D. 140

35. Determine the number of different arrangements of all the letters in the word BALLOON.
- A. 210            B. 1260            C. 2520            D. 5040
36. 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

### Provincial Exam Written Questions: Combinatorics

#### January 2002

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

#### June 2002

4. A class has 30 students:
- How many ways can a committee of 3 people be selected from the class?
  - How many ways can an executive committee of 3 people (president, vice-president, and secretary) be selected from the class?
  - 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?

#### January 2003

4. 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?
  - In how many ways can a collection of 5 toys be chosen if the collection must consist of at least 3 cars?

#### April 2003

4. Determine the first three terms of the expansion:  $(x - 2y)^7$

#### June 2003

4. 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.
  - 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?

### August 2003

4.
  - 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.)

### January 2004

1.
  - 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?

### April 2004

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