Math 12 Combinatorics Review Name:_____

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?

$4C_2 =$

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

order matters!

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?

8 2 9

0, 1

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 $-\frac{1\,001}{256}x^5$. Determine n.

x^{14} x^{13} x^{12} ... count on your fingers!

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

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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

$3 \quad 2 \quad 3 \quad 3$

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

$7!$

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. $\frac{n+1}{n(n-1)}$

$= \frac{(n-2)!}{n!} \times \frac{(n+1)!}{n!} = \frac{(n-2)!}{n(n-1)(n-2)!} \times \frac{(n+1)\,n!}{n!}$

$= \frac{n+1}{n(n-1)}$

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

L = Linda wins
S = Sam wins
$\rightarrow \{LL, SS, LSL, LSS, SLS, SLL\}$

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

$\frac{1}{8} \times \frac{5!}{3!2!} =$

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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

CCCC III 000 → $\frac{10!}{4!3!3!}$

13. (specs-13)
Solve for n: ${}_nP_2 = 42$

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

try the answers on your calc.

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

$5C_1$ or $5C_2$ or $5C_3$ or $5C_4$ or $5C_5$

5 + 10 + 10 + 5 + 1

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

a^{10} a^9b a^8b^2

$\left(\frac{1}{2x^2}\right)^{10}$ $\left(\frac{1}{2x^2}\right)^9(-x^3)$ $\left(\frac{1}{2x^2}\right)^8(-x^3)^2$

$\frac{1}{2^{20}}$ x^{20} $\downarrow$ $\frac{1}{x^{20}}$

$\frac{1}{2^{18}}$ x^3 x^{18} $\downarrow$ $\frac{1}{x^{15}}$

$\frac{1}{2^{16}}$ x^6 x^{16} $\downarrow$ $\frac{1}{x^{10}}$

← see the pattern?

x^0 will occur at the 5th term.

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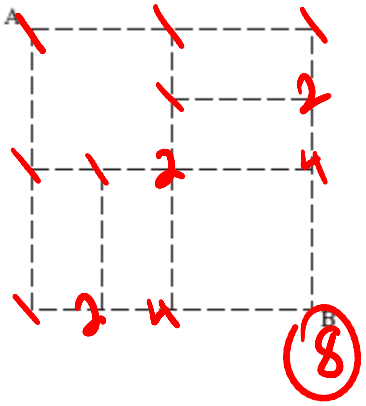
16. (specs-16)
Moving only to the right or down, how many different routes exist to get from point A to point B?



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. $5!$

$5C_2 = \frac{5!}{2!\,3!}$

18. (sample02-33)
Determine the 5th term in the expansion of $\left(x-\frac{1}{2}y\right)^7$.

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

$t_{k+1} = {}_nC_k\, a^{n-k}\, b^k$

$t_5 = {}_7C_4\, x^3 \left(-\frac{1}{2}y\right)^4$

$t_5 = 35x^3\left(\frac{1}{16}\right)y^4$

$k = 4$
$n = 7$
$a = x$
$b = -\frac{1}{2}y$

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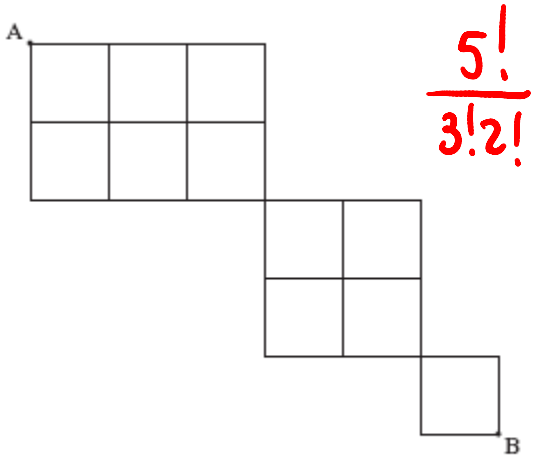
19. (sample02-34)

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



$\frac{5!}{3!2!} \times \frac{4!}{2!2!} \times \frac{2!}{1!1!}$

or ${}_5C_3 \times {}_4C_2 \times {}_2C_1$

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

20. (jan02-33)

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

$t_{k+1} = {}_nC_k\, a^{n-k}\, b^k$

$n = 6$
$k = 3$
$a = x$
$b = -2$

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

$t_4 = {}_6C_3\, x^3 (-2)^3$

$= -160x^3$

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. $\frac{30!}{5!}$

${}_{30}C_5 = \frac{30!}{5!\,25!}$

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

$\frac{8!}{3!\,2!}$

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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

6 5 4 9 8 7 3

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. $\frac{10!}{3!3!4!}$

order matters, so permutation

$10P_3 = \frac{10!}{7!}$

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. $80x^2y^3$

$t_{k+1} = {}_nC_k\, a^{n-k}\, b^k$

$t_4 = {}_5C_3\,(x)^2\,(-2y)^3 = -80x^2y^3$

$k=3$, $n=5$, $a=x$, $b=-2y$

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. $120x^7y^3$

$t_3 = {}_{10}C_2\,(x)^8(-y)^2$

$= 45x^8y^2$

$k=2$, $n=10$, $a=x$, $b=-y$

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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

$\frac{4}{P}$ $\frac{2}{S}$

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?

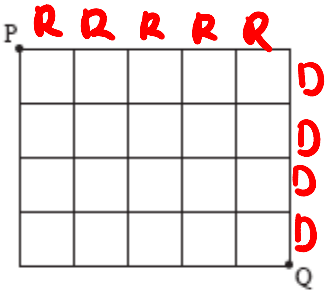
order matters

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

$_7P_3$

30. (aug02-35)

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



$\frac{9!}{5!4!}$ or $_9C_5$

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. $160x^3y^3$

$t_3 = {}_6C_2\,(2x)^4(y)^2$

$k=2$
$n=6$
$a=2x$
$b=y$

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. $\frac{1}{2}(n^2-n)$

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

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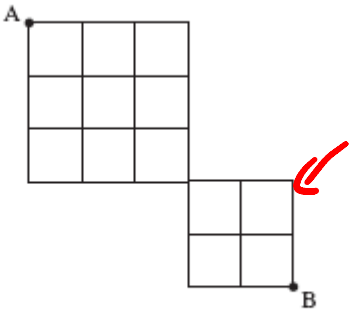
33. (jan03-34)
Moving only to the right or down, how many different paths are there from A to B?



$\frac{6!}{3!3!} = 20$ → ← $\frac{4!}{2!2!} = 6$

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

20×6

34. (jan03-35)
Simplify: $\frac{n(n+1)!}{(n-1)!}$

$= \frac{n(n+1)(n)(n-1)!}{(n-1)!} = n^2(n+1)$

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. ← term 3

A. −4 320
B. 864
C. 2 160
D. 2 880

$t_3 = {}_6C_2 (2a)^4 (-3b)^2 = 2160\, a^4b^2$

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. $\frac{49!}{6!}$

${}_{49}C_6 = \frac{49!}{6!\,43!}$

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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

RRRR GGGG YYYY

$\frac{12!}{4!\,4!\,4!} =$

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

$\frac{9}{\not 0} \quad \frac{10}{} \quad \frac{5}{}$

1,3,5,7,9

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

A. $\frac{n-3}{n-1}$

B. $n-2$

C. $\frac{1}{n-1}$

D. $\frac{1}{n(n-1)}$

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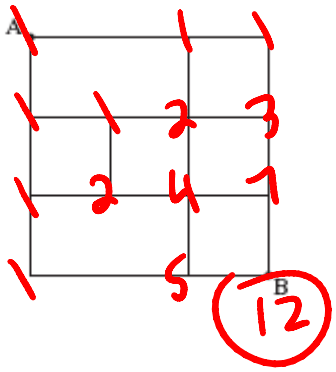
41. (jun03-36)

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

24 23 22 8 7 6

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

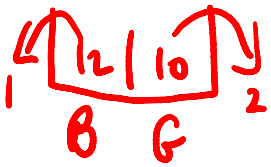
$10C_0\,x^{10} + 10C_1\,x^9(2y)^1 + 10C_2\,x^8(2y)^2$

$= x^{10} + 20x^9y + 180x^8y^2$

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



1 or 2 or 3

$12C_1\,10C_2 + 12C_2\,10C_1 + 12C_3\,10C_0$

$= 540 + 660 + 220$

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

$4 \times 6 \times 4$

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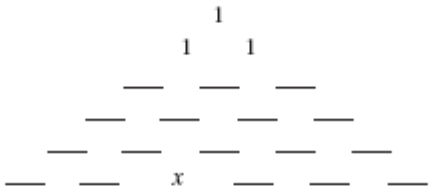
46. (jan04-30)
How many different ways are there to arrange the letters in the word T S A W W A S S E N ?

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

$\frac{10!}{3!2!2!}$

47. (apr04-29)
Given Pascal's triangle below, which of the following is equivalent to the value of x ?



6th row
3rd term

A. ${}_4C_2$
B. ${}_5C_2$
C. ${}_6C_2$
D. ${}_6C_3$

$5C_2$

48. (apr04-30)
Determine the number of different arrangements of the letters in the word NANAIMO.

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

$\frac{7!}{2!2!}$

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. ${}_7P_4$

$7P_4 =$

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. $990x^3y^8$

$t_8 = {}_{11}C_7(2x)^4(-y)^7$

$k = 7$
$n = 11$
$a = 2x$
$b = -y$

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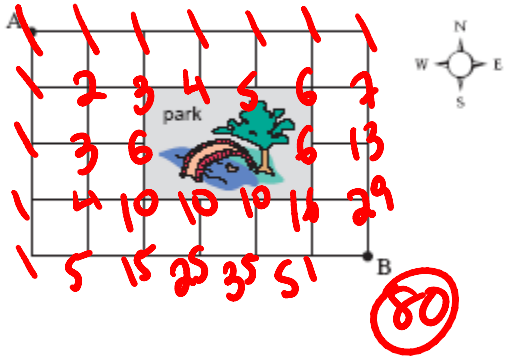
51. (jun04-31)

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

$25C_4$

$_1\overbrace{12 \mid 13}^{C \text{ others}}{}_3$

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

1 or 2 or 3 or 4

$12C_1 13C_3 + 12C_2 13C_2 + 12C_3 13C_1 + 12C_4 13C_0$

54. (jan04-14)

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

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

OMIT

55. (aug04-29)

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

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

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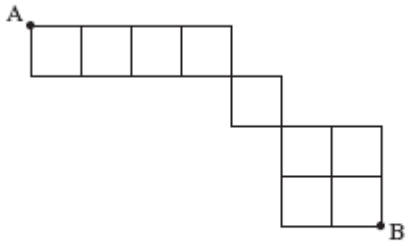
56. (aug04-30)
Moving only to the right or down, determine the number of different pathways from A to B.



$\frac{5!}{4!1!} \times \frac{2!}{1!1!} \times \frac{4!}{2!2!}$

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.

5 4 4 3 2

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.

$_8C_3 \times {}_6C_2$

3 | 8 | 6 | 2
B G

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.

1 or 0

$_8C_1 \times {}_6C_4 + {}_8C_0 \, {}_6C_5$

$120 + 6$

A. 23
B. 30
C. 120
D. 126

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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

$6C_2 \times 5C_3 \times 4C_1 \times 5C_2$

$= 6000$

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 $\left(2x - \frac{1}{y}\right)^{10}$?

$k = 9 \quad n = 10 \quad a = 2x \quad b = -\frac{1}{y}$

$10C_9 (2x)^1 \left(-\frac{1}{y}\right)^9 = \frac{-20x}{y^9}$

3. (specs-19)

Solve: $\frac{n!}{(n-2)!3!} = 5$ ← 6

$\frac{n(n-1)\cancel{(n-2)!}}{\cancel{(n-2)!}(6)} = 5$

$n(n-1) = 30$

$n^2 - n - 30 = 0$

$(n-6)(n+5) = 0$

$n = 6, \cancel{-5}$

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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.)

7 lines can be turned on or off

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$ ← 2 choices for each line

$= 2^7 = 128$

However, one of the possibilities includes every line turned off. The question says that at least one line must be turned on.

$\therefore 128 - 1 = 127$

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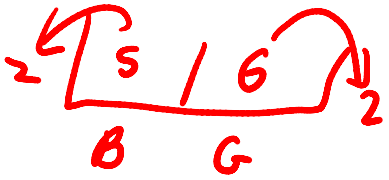
5. (specs-21)

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

a) In how many ways can a sub-committee of two boys and two girls be selected from the committee?

b) 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?



a) $5C_2 \times 6C_2 = 150$

b) 1 or 2 or 3 or 4

$= 5C_3 \times 6C_1 + 5C_2 \times 6C_2 + 5C_1 \times 6C_3 + 5C_0 \times 6C_4$

$= 60 + 150 + + 100 + 15$

$= 325$

6. (sample02-03)

Solve algebraically: $\frac{n!}{(n-2)!4!} = 10$ ← $4! = 24$ **(4 marks)**

$\frac{n(n-1)(n-2)!}{(n-2)!\,24} = 10$

$n(n-1) = 240$

$n^2 - n - 240 = 0$

$(n-16)(n+15) = 0$

$n = 16, -15$

Math 12 Combinatorics Review Name:_____

7. (apr02-05)

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

$$\frac{(n-1)(n-2)(n-3)!}{(n-3)!} = 30$$

$$(n-1)(n-2) = 30$$

$$n^2 - 3n + 2 = 30$$

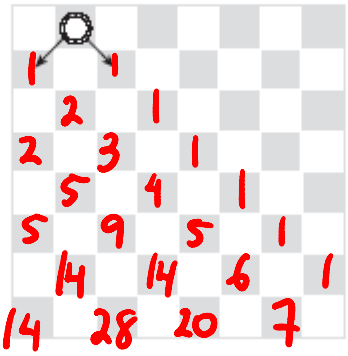
$$n^2 - 3n - 28 = 0$$

$$(n-7)(n+4) = 0$$

$n = 7, \cancel{-4}$

Math 12 Combinatorics Review Name:_____

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?



use pascal's Δ

← 14 + 28 + 20 + 7 = 69 ways

9. (jun02-04)
A class has 30 students.

a) How many ways can a committee of 3 people be selected from the class? **(2 marks)**

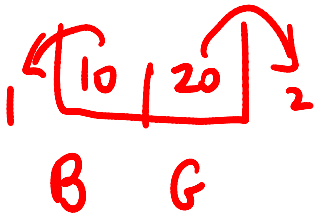
b) How many ways can an executive committee consisting of 3 people (president, vice-president, secretary) be selected from the class? **(1 mark)**

c) 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)**

a) $30C_3 = 4060$

b) $30 \times 29 \times 28$ or $30P_3 = 24,360$

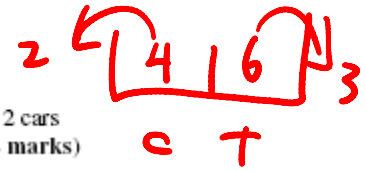
c)



$10C_1 \times 20C_2 = 1900$

Math 12 Combinatorics Review Name:_____

10. (jan03-04)
A toy box contains 4 different cars and 6 different trucks.



a) 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)**

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

a) $4C_2 \times 6C_3 = 120$

b) $4C_3 \times 6C_2 + 4C_4 \times 6C_1 = 66$

11. (apr03-04)
Determine the first 3 terms of the expansion: $(x-2y)^7$ **(4 marks)**

$$7C_0(x)^7 + 7C_1(x)^6(-2y)^1 + 7C_2(x)^5(-2y)^2$$

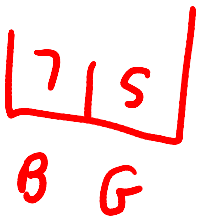
$$= x^7 - 14x^6y + 84x^5y^2$$

Math 12 Combinatorics Review Name:_____

12. (jun03-04)
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. **(2 marks)**

b) 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)**



a) $_7C_1 \times {}_5C_3 = 70$

b) $\underset{FP}{5} \times \underset{MVP}{7} \times {}_{10}C_2 = 1575$

13. (aug03-04)

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

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.) **(2 marks)**

a) ${}_7C_3 = 35$

b) BBYYYRG ← Hey! That's a word!

$$\frac{7!}{2!3!} = 420 \text{ ways}$$

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)**

8 | 5
m w

a) $_8C_3 \times {}_5C_4 = 280$

b) 4 or 5

$_8C_2 \times {}_5C_4 + {}_8C_1 \times {}_5C_5 = 148$

15. (apr04-05)

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

$$\frac{n!}{(n-2)!} = 90$$

$$\frac{n(n-1)(n-2)!}{(n-2)!} = 90$$

$$n(n-1) = 90$$

$$n^2 - n - 90 = 0$$

$$(n-10)(n+9) = 0$$

$n = 10$, ~~-9~~