Week 03/04 Term 1 2020

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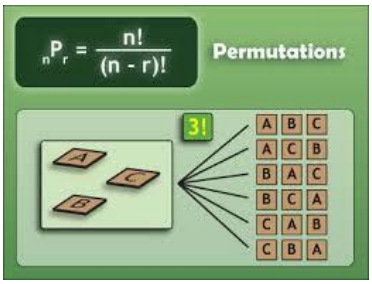
SMM1 Learning Brief: Counting and Probability

Goals



By the end of this week, you should be able to:

- Apply basic probability rules
- Use ^nP_r to count number of possible arrangements (permutations)
- Compute number of ways of arranging *n* objects which include *p* identical objects of one type, *q* identical objects of another type, *r* identical objects of yet another type…
- Compute number of arrangements when *n* objects divided into *m* groups
- Compute number of arrangements when distinguishable objects are arranged in a circle
- Use combinations to count selections of objects where order is not important; use the ^nC_r notations to represent selections where order is not important; use CAS to compute ^nC_r for a given n and a given r
- Investigate patterns in Pascal's triangle and the relationship to combinations, establish counting principles and use them to solve simple problems involving numerical values for *n* and *r*.

Theoretical Components

You will require Chapter 12 of Maths Quest 11 Mathematical Methods (pdf - Google Classroom)

- ✓ Read through Section 12D on. Study and make notes on Examples 11 -14.
- ✓ Read through Section 12E on Permutations with restrictions. Study examples 15 - 18.
- ✓ Read through Section 12F on Arrangement in a circle. Study examples 19 - 21.
- ✓ Read through Section 12G on Combinations. Study and make notes on Examples 22 -25.

Make your notes on the following key concepts:

- Permutations with restrictions, repetitions
- Arrangements in a circle

Permutations:
http://www.regentsprep.org/Regents/math/ALGEBRA/APR2/Lperm.htm

http://www.knowmia.com/watch/lesson/1355

http://www.tutors4you.com/circularpermutations.htm
http://www.mathsisfun.com/combinatorics/combinations-permutations.html

http://prezi.com/vjvjclbxn8zc/combinations/

How can you use Pascal's Triangle to find combinations or how can you use combinations to find a value in Pascal's Triangle?

http://www.mathsisfun.com/pascals-triangle.html

http://www.mathsisfun.com/data/binomial-distribution.html

$(x+y)^0 = 1$ — 0th row
$(x+y)^1 = 1x + 1y$ — 1st row
$(x+y)^2 = 1x^2 + 2xy + 1y^2$ — 2nd row
$(x+y)^3 = 1x^3 + 3x^2y + 3xy^2 + 1y^2$ — 3rd row
$(x+y)^4 = 1x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + 1y^4$ — 4th row
$(x+y)^5 = 1x^5 + 5x^4y + 10x^3y^2 + 10x^2y^3 + 5xy^4 + 1y^5$ — 5th row

Read this task on mathspace.co called Pascal's Triangle.

Then complete questions: 3-7, 18-22 on
https://mathspace.co/ebook/chapter/237691

Practical Components

You will require Chapter 12 of Maths Quest 11 Mathematical Methods (pdf - Google Classroom)
Make sure you have completed the following questions from last week. Organise your solutions neatly in your exercise book:

This week:

EX 12D: ALL even numbered questions.

EX 12E: ALL odd numbered questions.

EX 12F: ALL odd numbered questions.

EX 12G: ALL the odd numbered questions.

Investigation

See next page

QFO

Quiz/Forum/Other

No quiz this week. Make sure you have completed questions for Pascal's Triangle on mathspace.

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Investigation

Question 1. Prove:

$$^{n+1}P_r = {}^{n}P_r + r.{}^{n}P_{r-1}$$

Question 2. Four men and four women are to be seated alternatively:

a. in a row,
b. at a round table.

In how many ways can this be done?

Question 3. In the expansion of $(2 + 3x)^n$ the coefficients of x^3 and x^4 are in the ratio 8: 15. Find *n.*

Question 4. To win LottoMania, the 5 numbers entered on the player's entry ticket must be the same as 5 numbers that are randomly selected from the numbers 1 to 30.

(i) How many different entries are possible?

(ii) What is the percentage increase in the number of possible combinations if the numbers are randomly selected from the numbers 1 to 35?

(Total: 20 marks)