Unit 1: Combinatorics

Do you think you know how to count? Are you sure?

Combinatorics is the branch of mathematics dealing with ideas and methods for counting, particularly for complicated situations.

A wide range of possible applications/uses:
- Counting # of arrangements of objects;
- Counting # of options / groupings / possibilities;
- Counting # of routes.

Sep 6-12:32 AM

Example: In his drawer, Johnny has two shirts, red and yellow. He has four pants: grey, black, navy, and white. In how many different "outfits" can he get dressed?

Feb 3-12:25 PM

Fundamental (Multiplicative) Counting Principle

If a task or process is made up of **stages** with **separate choices**, the **total number of choices** is
m × n × p × ...,

where **m** is the **number of choices** for the **first stage**

n is the **number of choices** for the **second stage**

p is the **number of choices** for the **third stage**
and so on.

Feb 3-12:22 PM

Students' Council Elections

A students' council executive could consist of a president, vice-president, secretary, treasurer, social convenor, fundraising chair

Eleven students have been nominated to fill these positions.
- **Five** of the nominees are from **grade 12**
- **Three** are from **grade 11**
- **Two** are **grade 9** students and **one grade 10** student.

1) In how many ways could the position of president and vice-president be filled by these **eleven** students if **all eleven** are eligible for these positions?

Jan 25-7:33 AM

2) In how many ways could the position of president and vice-president be filled if only grade 11 and grade 12 students are eligible?

3) How many different ways can the six member student council executive be created if all students are eligible for each position?

4) How many different ways can the six member student council executive be created if the positions of President and Vice President can only be filled by Gr 12 students?

Jan 25-7:38 AM

YOUR TURN- Solve the following problem using the two different strategies we have used so far (tree diagram and the fundamental counting principle)

Martin lives in Kingston and is planning a trip to Vienna, Austria. He checks a web site offering inexpensive airfares and finds that if he travels through London, England, the fare is much lower. There are
There is a **bus or train** from Kingston to Toronto.

- three flights available from Toronto to London
- two flights from London to Vienna.

Feb 3-12:22 PM

Harsimran is looking at phones accessories in an electronics store. The store has **five types** of otter boxes, ten **types** of headphones, and **five types** of **bluetooth headsets**. How many different choices of accessories does this store offer if you choose one of each type of accessory?

Hint: Which strategy is the most useful?

Sep 2-11:28 PM

License plates in Ontario currently use a 4 letter followed by 3 number system. How many license plates are available if:

a) there are no restrictions on the letters or numbers used (any number or letter may be used or repeated

b) No letter or number may be repeated.

c) No number or letters may repeated and the first digit cannot be zero.

d) How could the Onatrio goverment increase the number of licence plates available if they are still limited to 7 characters? How many licence plate possibilites are there according the system you created?

Sep 4-10:43 AM