Fundamental Counting Principle

Ex 1)
Sportschek sells 4 different styles of volleyball shoes. Each style is available in black or white. How many different possibilities of styles and colours can be purchased?

$4 \cdot 2 = 8$ options for shoes

The Fundamental Counting Principle

If there are n different objects in one set and *m* different objects in a second set, then the number of ways of choosing one object from each set is $n \bullet m$.

Ex 2)
Kelly has 4 shirts, 5 shorts, and 3 pairs of shoes to choose from. How many different ways can Kelly wear a shirt, shorts, and shoes?
(ie how many different outfits could she create?)

$4 \cdot 5 \cdot 3 = 60$ outfits

Ex 3)
In how many ways can a president, VP, and secretary be chosen from a group of 6 people?

$\underset{P}{6} \cdot \underset{VP}{5} \cdot \underset{S}{4} = 120$ groups

Ex 4)
In how many ways can you arrange the letters ABC using all 3 letters?

$3 \cdot 2 \cdot 1 = 6$ ways

ABC BAC CAB
ACB BCA CBA

Ex 5)
In how many ways can a committee choose a female president, a male secretary and a treasurer of either sex from a group of 7 males and 8 females?

$\underset{\text{FP}}{8} \cdot \underset{\text{MS}}{7} \cdot \underset{\text{T}}{13} = 728$ committees

Ex 6) How many 3 digit numbers can be found that are less than 500 with no repeating digits?

different digits

$\underset{\uparrow}{4} \cdot 9 \cdot 8 = 288$ numbers

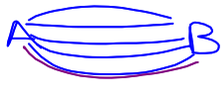
1, 2, 3, 4

Digits 0–9
10 digits

Ex 7)
How many phone numbers are possible in St. James beginning with 888 - . . . . ? (Reps allowed)

$10 \cdot 10 \cdot 10 \cdot 10 = 10{,}000$ phone numbers.

Ex 8)
There are 5 roads containing towns A and B
(a) How many round trip routes are possible?



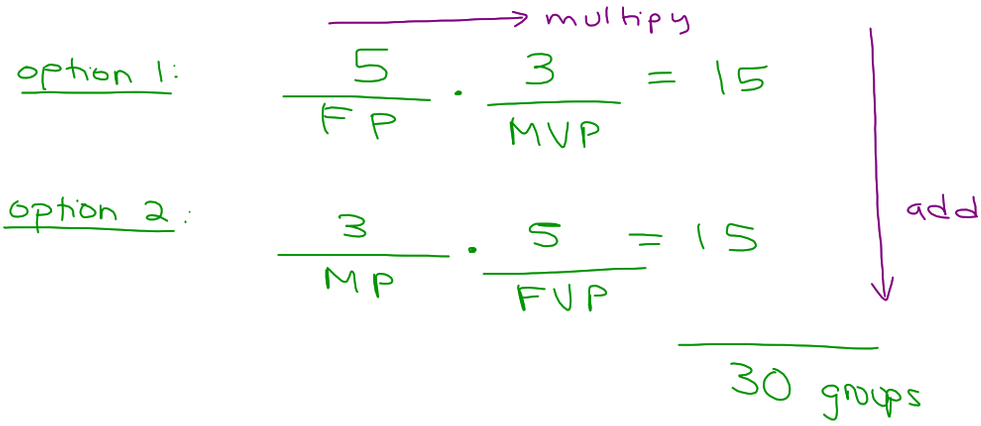
$\underset{\text{there } A \to B}{5} \cdot \underset{\text{back } B \to A}{5} = 25$ ways

(b) How many round trip routes are possible if a different road must be used on the return trip?

$5 \cdot 4 = 20$ ways

The Addition Counting Principle

Ex. Student council consists of 5 female and 3 male students. In how many ways can a president and V.P. be chosen if the president and V.P. are to be of opposite sexes.



Ex. How many positive integers less than 100 can be represented using only the digits 2, 4, 6.

a) Repetitions allowed

b) No repetitions allowed

a) option 1: 3 · 3 = 9

option 2: 3 = 3

12 numbers

b) 3 · 2 = 6

3 = 3

9 numbers

Ex. How many positive even integers less than 1000 can be created using the digits 2, 3, 4, and 5? reps allowed

$4 \cdot 4 \cdot \underset{2,4}{2} = 32$

$4 \cdot \underset{2,4}{2} = 8$

$\underset{2,4}{2} = 2$

42 integers

Ex. How many numbers of at most four different digits can be formed from the integers 3, 4, 5, 6, 7, 8, 9? max 4

$7 \cdot 6 \cdot 5 \cdot 4 = 840$

$7 \cdot 6 \cdot 5 = 210$

$7 \cdot 6 = 42$

$7 = 7$

1099 integers

Ex. How many numbers of at least 2 (min 2) different digits can be formed by using the integers 1, 3, 5, 7?

$4 \cdot 3 = 12$

$4 \cdot 3 \cdot 2 = 24$

$4 \cdot 3 \cdot 2 \cdot 1 = 24$

60 integers

Green WS #1-12