Section 6.1: cont'd

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10:29 AM

tip: When finding the number of allowable/legal outcomes, sometimes it's easier to calculate the number forbidden/illegal and subtract it from the total number possible

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addition rule:

example: how many natural numbers from 1 to 20 inclusive are

a) evenly divible by 2?
b) " " " 3?
c) " " " 2 or 3?

brute force method:

divisible by 2: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20 (10)

3: 3, 6, 9, 12, 15, 18 (6)

2 or 3: 2, 3, 4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20 (13)

note: $13 \neq 10 + 6$

$10 + 6$ contains duplicates

rule: $n(A \text{ or } B) = n(A) + n(B) - n(AB)$

$n(A \text{ or } B)$: number of ways A or B could happen

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example: How many 5-digit, case-sensitive, alphanumeric passwords are there

a) in total?
b) that contain at least one letter and at least one number?

a) $\underline{62}\ \underline{62}\ \underline{62}\ \underline{62}\ \underline{62}$

$62 = 2(26) + 10$

(2(26): uppercase & lowercase letter; 10: digits)

$$\text{total} = 62^5 = 916,132,832$$

b) total allowed = total possible − total not allowed

$$\text{all letters} = 52^5$$

$$\text{all numbers} = 10^5$$

$$\text{total allowed} = 62^5 - 52^5 - 10^5$$

$$= 535,828,800$$

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example: How many 4-digit PINs

a) start with a 9?

b) end in a 4?

c) start with a 9 or end in a 4?

d) start with a 9 or a 4?

a) $\underline{1}\ \underline{10}\ \underline{10}\ \underline{10} = 1000$

b) $\underline{10}\ \underline{10}\ \underline{10}\ \underline{1} = 1000$

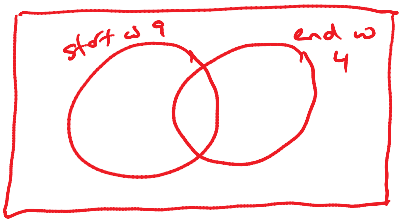
c) n(start with 9 and end in 4) $= \underline{1}\ \underline{10}\ \underline{10}\ \underline{1} = 100$

n(start with 9 or end in 4)

= n(start with 9) + n(end with 4) − n(both)

= 1000 + 1000 − 100

= 1900



d) n(start with 9 or 4) = n(start with 9)

+ n(start with 4) − n(both) → zero

= 1000 + 1000 − 0 = 2000

or

$\underline{2}\ \underline{10}\ \underline{10}\ \underline{10} = 2000$