

CH-5

Counting

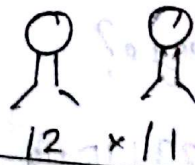
- Sum rule

~~product rule~~

- 1) We need to perform task 1 or task 2
- 2) n_1 ways for task 1
 n_2 ways for task 2
- 3) Then total $(n_1 + n_2)$ ways

- product rule

* A company - 2 employees. each employee get into office.
L 12 offices



* CSE Dept - 37 members

EEE " - 83 member

we have to select one member from CSE or
EEE How many ways?

$$37 + 83$$



How many different license plates

are available if each plate

contains a sequence of three letters followed by three digits?

26	26	26	10	10	10
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Three projects list contain 23, 15 and 19 distinct projects.

A student have to choose 1 project from the list. How many ways?

$$23 + 15 + 19$$

Example 4: The name of a variable is a string of one or two alphanumeric characters.

(An alphanumeric character is either 26 english letters or one of 10 digits)

Moreover, a variable must begin with a letter and must be different from five strings that are reserved for key words.

How many different variable

$$V_1 = 26$$

$$V_2 = 26 * (36 - 5) - 5$$

$$\text{Ans} = V_1 + V_2$$



$$\underline{1} \quad \text{or} \quad \underline{1}$$

Example

A password which is 6 to 8 characters long, where each character is letter or digit.

Each password contains at least one digit.

$$P_6 = 36^6 - 26^6$$

$$P_7 = 36^7 - 26^7$$

$$P_8 = 36^8 - 26^8$$

Examp 12 17

How many bit strings of length 8

either start with

1 or 2 + 3 = 5

Also 6:15 PM,

but not both.

P-1

$P_2 = 11.50$

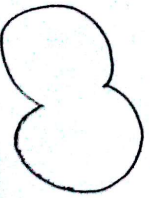
$$D_3 = 1 - 0.00$$

27
P

$$P_2 = 26$$

$P_3 = 25$

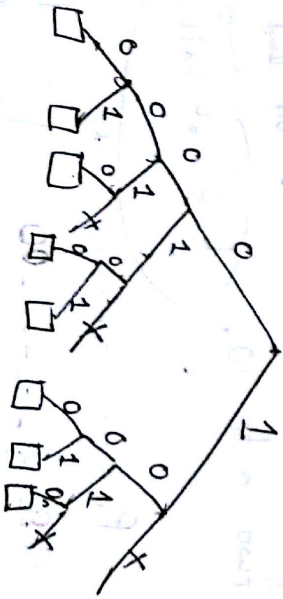
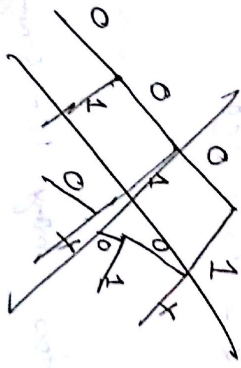
$$P = A_1 + A_2 - A_3$$



Tree diagram

How many bit strings of length four
don't have two consecutive 1s?

2^4



Ans: 8

Pigeon hole principle

at least



at least 2 will go into 1 box.

Generalized pigeon hole principle

If N objects are placed into k boxes,

then there is at least one box containing at least $\lceil \frac{N}{k} \rceil$ objects

$$\lceil 3.5 \rceil = 4$$

$$\lceil 10.2 \rceil = 11$$

$$\lceil 7.2 \rceil = 8$$

Tree diagram

What is minimum no. of students

- Required min ~~one~~ a class to be be sure that at least 6 will receive same grade same grade.

Grades are $\boxed{A, B, C, D, E}$

$$\left\lceil \frac{\text{unknown}}{5} \right\rceil = 6$$

Example 7 Golf

Conditional probability

$$P(E|F) = \frac{P(E \cap F)}{P(F)}$$

A bit string of length 4 ...

what is the probability it contains at

least two consecutive 0s given that it's

first bit is 0.

$$P(E|F) = \frac{5}{16}$$

$$P(F) = \frac{8}{16}$$

$$P(E|F) = \frac{\frac{5}{16}}{\frac{8}{16}} = \frac{5}{8}$$

0000 ✓
0001 ✓
0010 ✓
0011 ✓
0100 ✓
0101
0110
0111

What is the probability that a family of 2 children has two boys given that at least one is boy?

$$P(B) = \frac{3}{4}$$

$$P(2B | B) = \frac{1}{4}$$

BB
BG
GB
GG

$$P(2B | B) = \frac{1/4}{3/4} = \frac{1}{3}$$

Independence

$$\text{If } P(E \cap F) = P(E) * P(F)$$

E and F are independent.

}

Let E be the event of generating a bit of 1's
of length 4 begins with 1 and F is
the event which contains an even number
of 1's.

$$P(F) = \frac{8}{16} = \frac{1}{2}$$

$$P(E) = \frac{8}{16} = \frac{1}{2}$$

$$P(F) * P(E) = \frac{1}{4}$$

$$P(E \cap F) = \frac{4}{16} = \frac{1}{4}$$

Example 6