2.4.1

(a) 哪种PC模型具有最少3.00的速度?

Operating Relation 目标列 select condition

$$R_1 := \sigma_{speed \geq 3.00}(PC)$$
$$R_2 := \pi_{model}(R_1)$$
$$Answer := R_2$$

$$\Rightarrow Answer := \pi_{model}(\sigma_{speed \geq 3.00}(PC))$$

Result:

model
1005
1006
1013

(b) 哪个生产厂商笔记本的硬盘(HD)容量至少100GB? (注意题目意思为有哪些厂商手hd≥100GB的laptop, 而非该厂商手的laptop. hd均大于100GB)

目标列 Relation condition

$$R_1 := product \bowtie Laptop$$
$$R_2 := \sigma_{hd \geq 100}(R_1)$$
$$R_3 := \pi_{maker}(R_2)$$
$$Answer := R_3$$

$$\Rightarrow Answer := \pi_{maker}(\sigma_{hd \geq 100}(product \bowtie Laptop))$$

Result:

maker
A
B
E
F
G

E和A要换吗! 为什么?

(c) 查询厂商B生产的所有产品的型号和价格.

condition 三种 目标列

$$P_{PT(model, color, PType, price)}(P_{Printer})$$

$R_1 := product \bowtie PC$

$R_2 := product \bowtie Laptop$

$R_3 := product \bowtie Printer$

$R_1' := \pi_{model, price}(\sigma_{maker = B}(R_1))$

$R_2' := \pi_{model, price}(\sigma_{maker = B}(R_2))$

$R_3' := \pi_{model, price}(\sigma_{maker = B}(R_3))$

$R\_result := R_1' \cup R_2' \cup R_3'$

$Answer := R\_result$

$\Rightarrow$

$P_{PT}(model, color, PType, price)(Printer)$

Answer :=

$\pi_{model, price}(\sigma_{maker = B}(product \bowtie PC)) \cup \pi_{model, price}(\sigma_{maker = B}(product \bowtie Laptop)) \cup \pi_{model, price}(\sigma_{maker = B}(product \bowtie Printer))$

model	price
1004	649
1005	630
1006	1049
2007	1429

(d) 查询所有彩色：激光 打印机 型号.

condition, 2 relation 目标列

$Answer := \pi_{model}(\sigma_{color = true \ AND \ type = laser}(Printer))$

Result :

model
3003
3007

(e) 查询那些只出售笔记本，不出售PC的厂商.

A − B

$R_1 :=$ product ⋈ PC

$R_2 :=$ product ⋈ Laptop

$R_1' := \pi_{maker}(R_1)$

$R_2' := \pi_{maker}(R_2)$

$R_3 := R_2' - R_1'$

Answer := R_3

⇒ Answer :=

π_{maker}(product ⋈ Laptop) − π_{maker}(product ⋈ PC)

Result:

maker
F
G

(g) 查询具有同样处理速度与同样内存大小的PC对。每对只被列表一次，即列表给出(i, j)但不给出(j, i)

$\rho_{LaptopB(Model, Speed, Ram, Hd, Screen, Price)}$(Laptop)

R_1 = Laptop B × Laptop

R_2 = $\sigma_{Speed = speed\ AND\ Ram = ram\ AND\ Model > model}(R_1)$

Answer = $\pi_{Model, model}(R_2)$

Result:

Model	model
1012	1004

(2') 查询平均处理速度（PC或是笔记本电脑）最高的所有厂商.

condition　relation　目标列

$$
\begin{cases}
R_1 := \pi_{model,\ speed}(PC) \\
R_2 := \pi_{model,\ speed}(Laptop) \quad \Big\} \text{取出相关的} \\
R_3 := R_1 \cup R_2 \\
R_4 := \rho_{(model2,\ speed2)}(R_3) \\
R_5 := R_3 \bowtie_{(speed < speed2)} R_4 \quad \Rightarrow \text{保留非最大的} \\
R_6 := \pi_{model,\ speed}(R_5) \\
R_7 := R_3 - R_6 \quad \Rightarrow \text{得到最大的 model. speed Relation} \\
R_8 := product \bowtie R_7 \Rightarrow join. \\
R_9 := \pi_{maker}(R_8) \\
Answer := R_9
\end{cases}
$$