

Assignment 1 Relational Algebra

1. Consider a database with the following schema:

<i>Product (maker, model, type)</i>	// model is a key
<i>PC (model, speed, ram, hd, price)</i>	// model is a key
<i>Laptop(model, speed, ram, hd, screen, price)</i>	// model is a key
<i>Printer (model, color, type, price)</i>	// model is a key

Product

	model	maker	type
▶	1001	A	pc
	1002	A	pc
	1003	A	pc
	1004	B	pc
	1005	B	pc
	1006	B	pc
	1007	C	pc
	1008	D	pc
	1009	D	pc
	1010	D	pc
	1011	E	pc
	1012	E	pc
	1013	E	pc
	2001	E	laptop
	2002	E	laptop
	2003	E	laptop
	2004	A	laptop
	2005	A	laptop
	2006	A	laptop
	2007	B	laptop
	2008	F	laptop
	2009	F	laptop
	2010	G	laptop
	3001	E	printer
	3002	E	printer
	3003	E	printer
	3004	D	printer
	3005	D	printer
	3006	H	printer
	3007	H	printer

Laptop

	model	speed	ram	hd	screen	price
	2001	2.8	16	512	17	1299
	2002	1.73	8	256	16	949
	2003	1.8	8	256	15.4	549
	2004	2.8	8	256	13.3	1150
	2005	2.8	16	512	17	1199
	2006	2.8	16	256	15.4	1199
	2007	1.83	16	512	13.3	1129
	2008	1.6	16	512	15.4	899
	2009	1.6	8	256	14.1	649
	2010	2	16	512	15.4	1049

PC

	model	speed	ram	hd	price
►	1001	2.66	8	512	899
	1002	2	8	512	629
	1003	2	4	256	478
	1004	2.8	8	512	649
	1005	3.2	4	512	630
	1006	3.5	8	2048	1049
	1007	2.2	8	512	510
	1008	2.2	16	768	770
	1009	2	8	1024	650
	1010	2.8	16	1024	770
	1011	1.86	16	1024	749
	1012	2.8	8	512	649
	1013	3.06	4	256	529

Printer

	model	color	type	price
►	3001	1	ink-jet	99
	3002	0	laser	239
	3003	1	laser	799
	3004	1	ink-jet	120
	3005	0	laser	120
	3006	1	ink-jet	100
	3007	1	laser	200

Write relational algebra expressions for the following eleven queries. (Warning: some queries are a bit challenging.)

1. What PC **model** have a speed of at least 3.00?

model
1005
1006
1013

2. Which **manufacturers** make laptops with a hard disk of at least 512GB?

maker
E
A
B
F
G

3. Find the **model number and price** of all products (of any type) made by manufacturer B.

model	price
1004	649
1005	630
1006	1049
2007	1129

4. Find the **model numbers** of all color laser printers.

model
3003
3007

5. Find those **manufacturers** that sell Laptops, but not PC's.

maker
F
G

6. Find those **hard-disk sizes** that occur in two or more PC's.

hd
512
256
1024

7. Find those **pairs of PC models** that have both the same speed and RAM. A pair should be listed only once; list (i,j) but not (j,i).

	model	model
▶	1002	1009
	1004	1012

8. Find those manufacturers of at least two different computers (PC's or laptops) with speeds of at least 2.80.

	maker
▶	B
	A

9. Find the manufacturer(s) of the computer (PC or laptop) with the highest available speed.

	maker
▶	B
	E
	A

10. Find the manufacturer of PC's with at least three different speeds.

	maker
▶	B
	D
	E

11. Find the manufacturer who sell exactly three different models of PC.

	maker
▶	A
	B
	D
	E