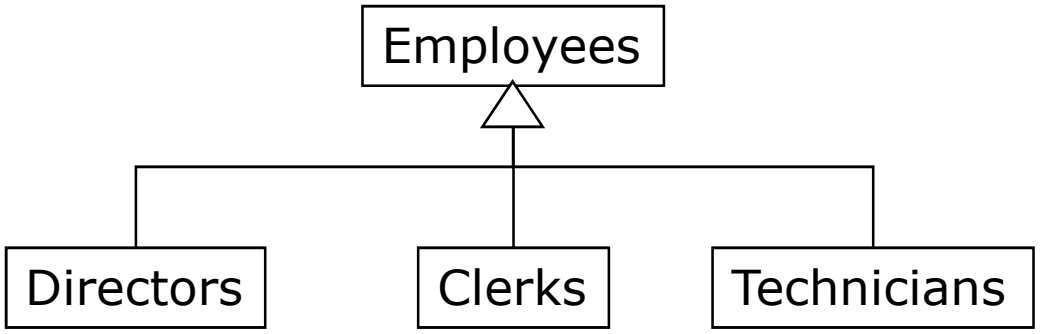
Generalization/Specialization (I)



Employees (<u>emp</u>, generic attributes)

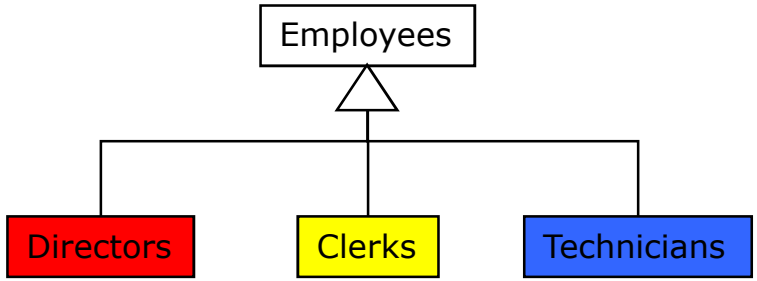
Technicians (<u>emp</u>, specific attributes)

Directors (<u>emp</u>, specific attributes)

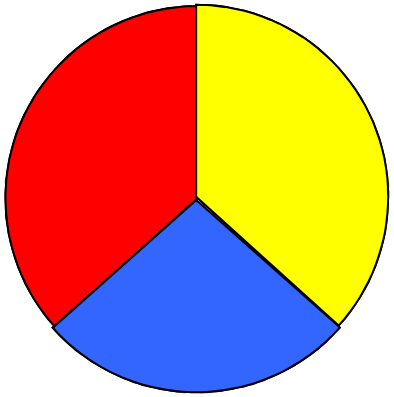
Clerks (<u>emp</u>, specific attributes)

Generalization/Specialization (II)

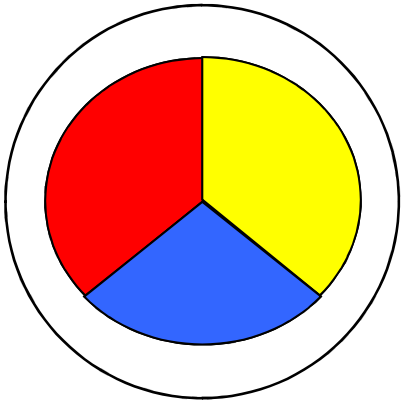
- Complete/Incomplete
- Disjoint/Overlapping



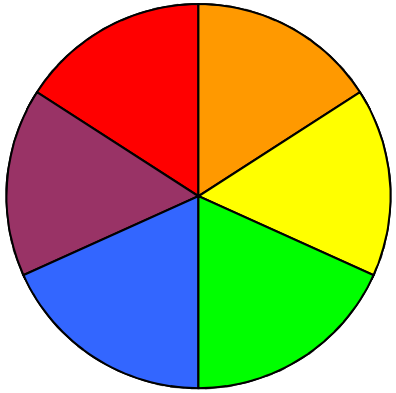
Complete Disjoint



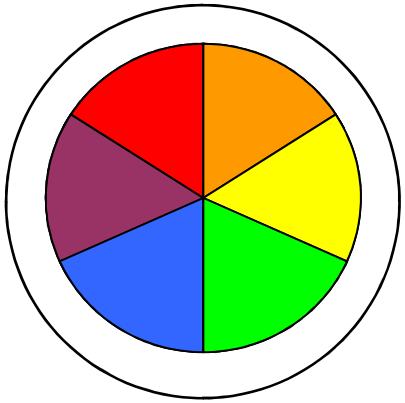
Incomplete Disjoint



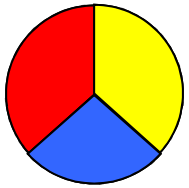
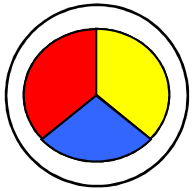
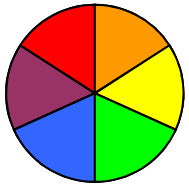
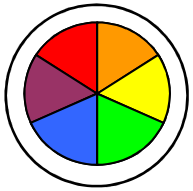
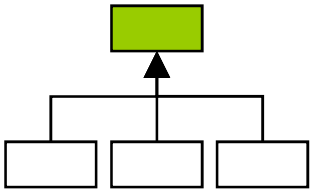
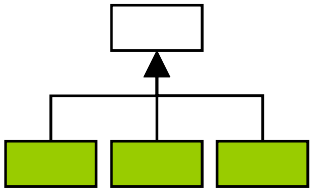
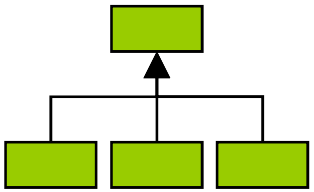
Complete Overlapping



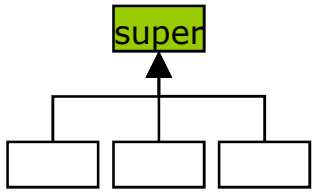
Incomplete Overlapping



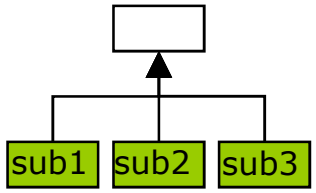
Generalization/Specialization (III)

				
	**tota instància de la classe super estarà dividida en una sola de les subclasses**	**alguna instància de la classe super estarà dividida en una sola de les subclasses**	**tota instància de la classe super estarà dividida en una o més de les subclasses**	**alguna instància de la classe super estarà dividida en una o més de les subclasses**
				
				

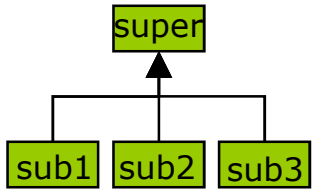
Generalization/Specialization (IV)



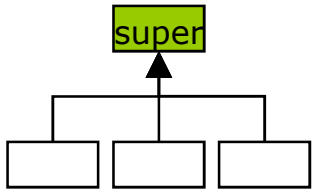

```
SELECT *
FROM super;
```



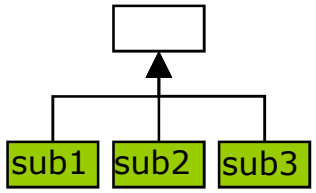

```
SELECT *
FROM sub1
UNION
SELECT *
FROM sub2
UNION
SELECT *
FROM sub3;
```



Generalization/Specialization (IV)




```
SELECT *
FROM super;
```



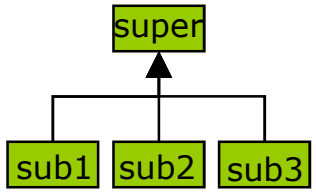

```
SELECT *
FROM sub1
UNION
SELECT *
FROM sub2
UNION
SELECT *
FROM sub3;
```

super(	a,	b,	c,	d,	e)
	1	b1	c1	d1	e1
	2	b2	c2	d2	e2
	3	b3	c3	d3	e3

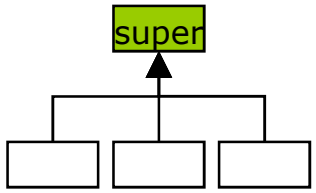
sub1(	a,	f)
	1	f1
	2	f2
	3	f3

sub2(	a,	g)
	1	g1

sub3(	a,	h)
	1	h1
	2	h2

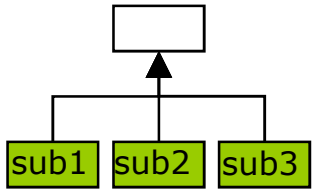


Generalization/Specialization (IV)




```
SELECT *
FROM super;
```

sub1(	a,	f)
	1	f1
	2	f2
	3	f3

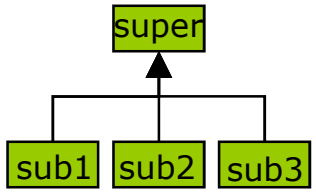



```
SELECT *
FROM sub1
UNION
SELECT *
FROM sub2
UNION
SELECT *
FROM sub3;
```

super(	a,	b,	c,	d,	e)
	1	b1	c1	d1	e1
	2	b2	c2	d2	e2
	3	b3	c3	d3	e3

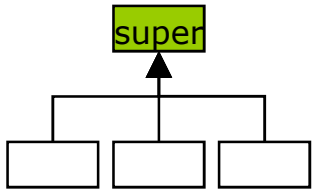
sub2(	a,	g)
	1	g1

sub3(	a,	h)
	1	h1
	2	h2



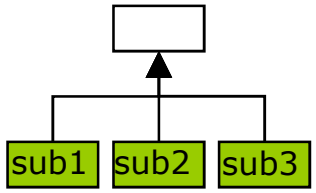

```
SELECT *
FROM super p, sub1 b1, sub2 b2, sub3 b3
WHERE p.a=b1.a AND p.a=b2.a AND p.a=b3.a;
```

Generalization/Specialization (IV)




```
SELECT *
FROM super;
```

```
sub1(  a,  f)
       1   f1
       2   f2
       3   f3
```

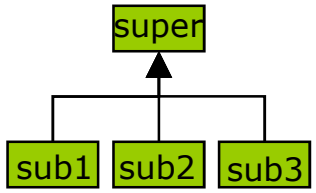



```
SELECT *
FROM sub1
UNION
SELECT *
FROM sub2
UNION
SELECT *
FROM sub3;
```

```
super(  a,  b,  c,  d,  e)
        1   b1  c1  d1  e1
        2   b2  c2  d2  e2
        3   b3  c3  d3  e3
```

```
sub2(  a,  g)
       1   g1
```

```
sub3(  a,  h)
       1   h1
       2   h2
```




```
SELECT *
FROM super p, sub1 b1, sub2 b2, sub3 b3
WHERE p.a=b1.a AND p.a=b2.a AND p.a=b3.a;
```

```
(  a,  b,  c,  d,  e,  a,  f,  a,  g,  a,  h)
   1   b1  c1  d1  e1  1   f1  1   g1  1   h1
```

Generalization/Specialization (V)

R(	a,	b)
	1	a
	2	b
	3	?

S(	b,	c)
	a	4
	c	5

R LeftOuterJoin S(a, b, b', c)

1	a	a	4
2	b	?	?
3	?	?	?

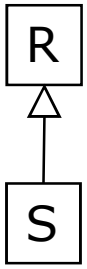
R RightOuterJoin S(a, b, b', c)

1	a	a	4
?	?	c	5

R FullOuterJoin S(a, b, b', c)

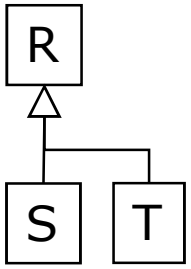
1	a	a	4
2	b	?	?
3	?	?	?
?	?	c	5

Generalization/Specialization (VI)




```
SELECT R.a, R.b, S.c
FROM R, S
WHERE R.b=S.b
UNION
SELECT R.a, R.b, NULL
FROM R
WHERE R.b NOT IN (    SELECT S.b
                      FROM S);
```

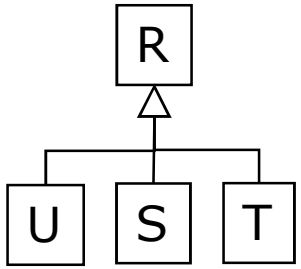
Generalization/Specialization (VI)




```
SELECT R.a, R.b, S.c
FROM R, S
WHERE R.b=S.b
UNION
SELECT R.a, R.b, NULL
FROM R
WHERE R.b NOT IN (    SELECT S.b
                      FROM S);
```

How many "UNION" are needed with 2 subclasses?

Generalization/Specialization (VI)




```
SELECT R.a, R.b, S.c
FROM R, S
WHERE R.b=S.b
UNION
SELECT R.a, R.b, NULL
FROM R
WHERE R.b NOT IN (    SELECT S.b
                      FROM S);
```

How many "UNION" are needed with 2 subclasses?
And with 3?

Outer Join in SQL'99 (I)

<table1> [CROSS | INNER | [LEFT|RIGHT|FULL] OUTER] JOIN <table2> [ON <condition>]

- The order in the FROM clause is not commutative now
  - Joins are performed from left to right
- Predicate is evaluated after the outer join

Outer Join in SQL'99 (II)

Left

```
SELECT p.a, b, c, d, e, f, g, h
FROM super p LEFT OUTER JOIN sub1 b1 ON p.a=b1.a
     LEFT OUTER JOIN sub2 b2 ON p.a=b2.a
     LEFT OUTER JOIN sub3 b3 ON p.a=b3.a;
```

(	a,	b,	c,	d,	e,	f,	g,	h)
	1	b1	c1	d1	e1	f1	g1	h1
	2	b2	c2	d2	e2	f2	?	h2
	3	b3	c3	d3	e3	f3	?	?

Right

```
SELECT p.a, b, c, d, e, f, g, h
FROM super p RIGHT OUTER JOIN sub1 b1 ON p.a=b1.a
     RIGHT OUTER JOIN sub2 b2 ON p.a=b2.a
     RIGHT OUTER JOIN sub3 b3 ON p.a=b3.a;
```

Full

```
SELECT p.a, b, c, d, e, f, g, h
FROM super p FULL OUTER JOIN sub1 b1 ON p.a=b1.a
     FULL OUTER JOIN sub2 b2 ON p.a=b2.a
     FULL OUTER JOIN sub3 b3 ON p.a=b3.a;
```