

Wednesday March 20
Lecture 19

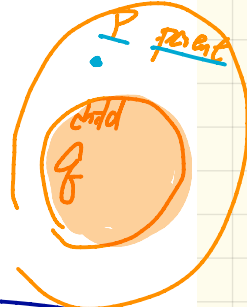
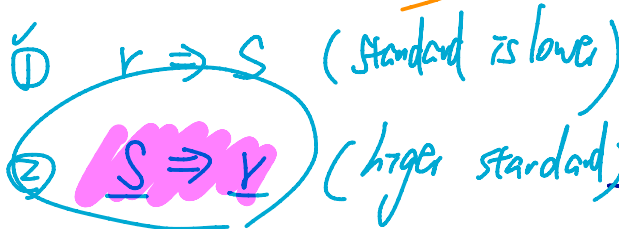
Subcontracting: Architectural View



Preconditions



Substitutability



Subcontracting: Example (1)

```

class SMART_PHONE
  get_reminders: LIST[EVENT]
  require
  → α: battery_level ≥ 0.1 -- 10%
  ensure
  β: ∀ e: Result | e happens today
end
  
```

12%
 0.1
0.11
0.12
0.13
0.14
 0.15
0.16
0.17
 $\gamma \Rightarrow \alpha$
 $bl \geq 0.15 \Rightarrow bl \geq 0.1$ ✓

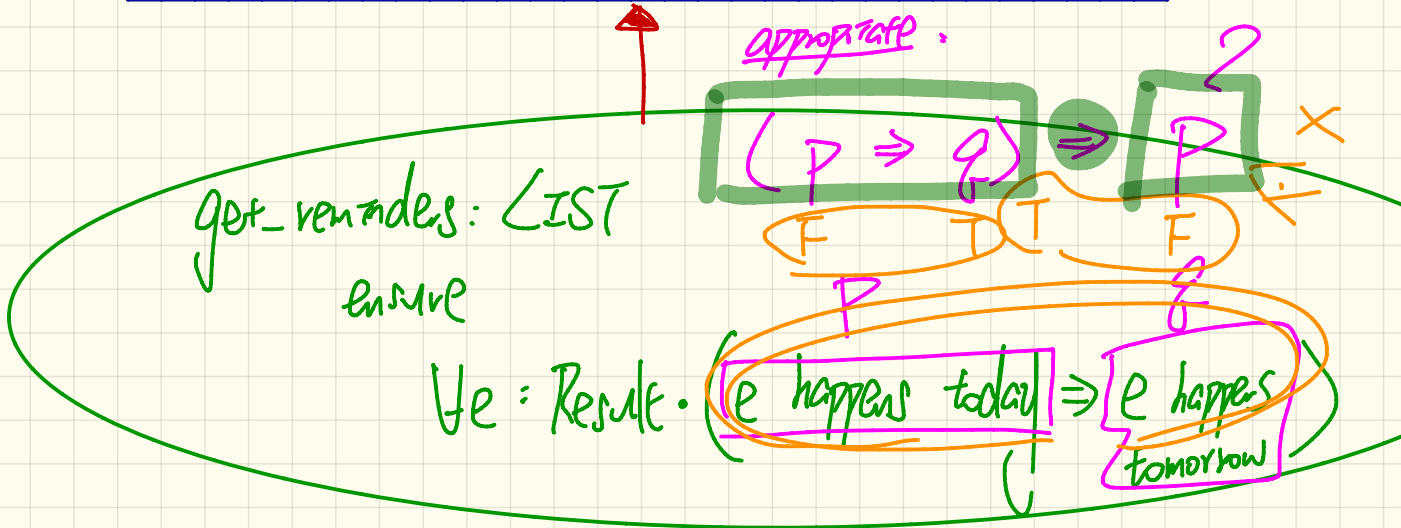
```

class IPHONE_6S_PLUS
  inherit SMART_PHONE redefine get_reminders end
  get_reminders: LIST[EVENT]
  require else
  γ: battery_level ≥ 0.15 -- 15%
  ensure then
  δ: ∀ e: Result | e happens today or tomorrow
end
  
```

not appropriate
 Fix: 0.1
0.09
 D
 E

Counter example: all events reminded happen tomorrow

get_reminders: LIST
 ensure
 $\forall e: \text{Result} \cdot e \text{ happens today}$



$$P \Rightarrow P \vee Q$$

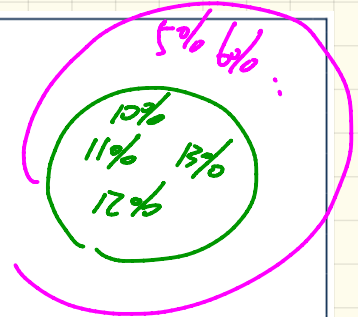
$$P \wedge Q \Rightarrow P$$

$$P \wedge Q \Rightarrow P \vee Q$$

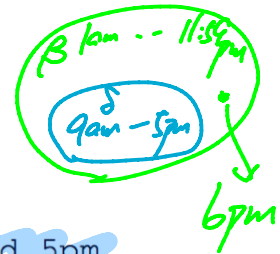
Subcontracting: Example (2)

```
class SMART_PHONE
  get_reminders: LIST[EVENT]
  require
     $\alpha$ : battery_level  $\geq 0.1$  -- 10%
  ensure
     $\beta$ :  $\forall e: \text{Result} \mid e \text{ happens today}$ 
end
```

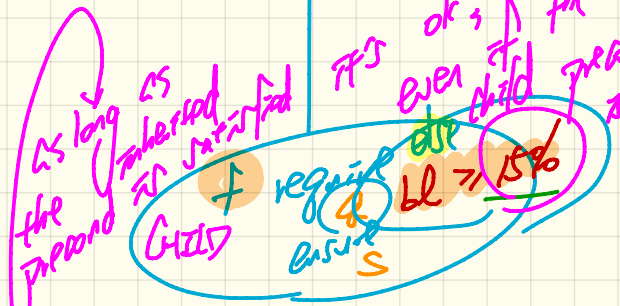
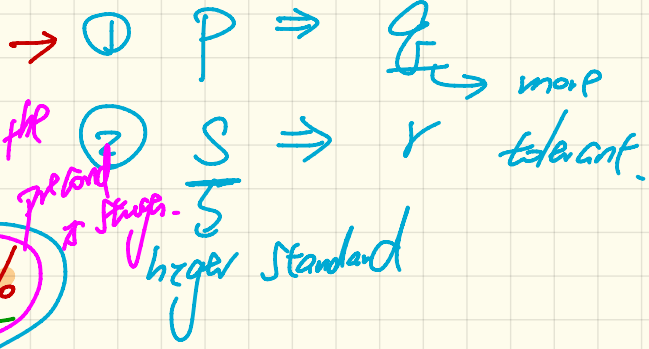
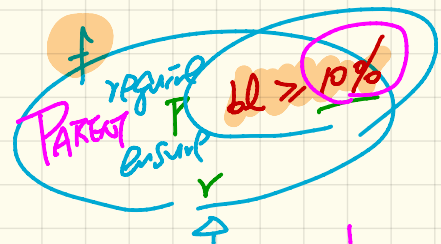
$\alpha \Rightarrow \gamma$



```
class IPHONE_6S_PLUS
inherit SMART_PHONE redefine get_reminders end
  get_reminders: LIST[EVENT]
  require else
     $\gamma$ : battery_level  $\geq 0.05$  -- 5%
  ensure then
     $\delta$ :  $\forall e: \text{Result} \mid e \text{ happens today between 9am and 5pm}$ 
end
```

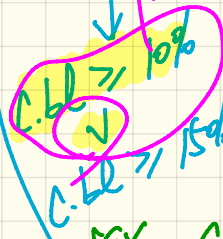


1.



as long as the person is satisfied as inherited or satisfied

ok's if the even child pretend to stage.



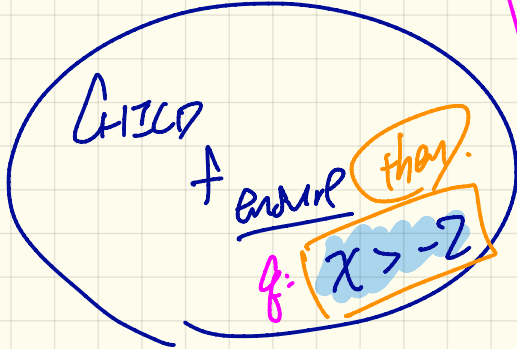
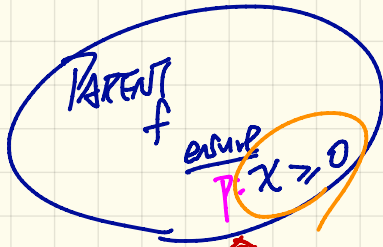
bl >= 10% => ll >= 15% X
 ↳ not appropriate.

P: PARENT
 C: CHILD

say C.bl is 16%
 C.f ✓
 say C.bl is 12%
 C.f ✓ ← no precond violation

→ say p.bl is 9%
 p.f precond. violation
 → say p.bl is 12%
 p.f ✓

1.



To be appropriate:

$$q \Rightarrow P$$

but

$$x > -2 \Rightarrow x \neq 0$$

\Rightarrow not the case.

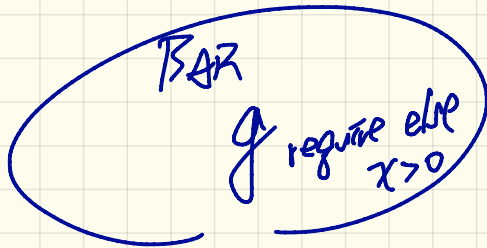
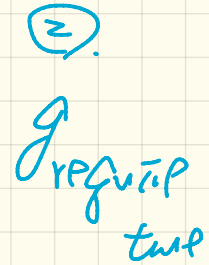
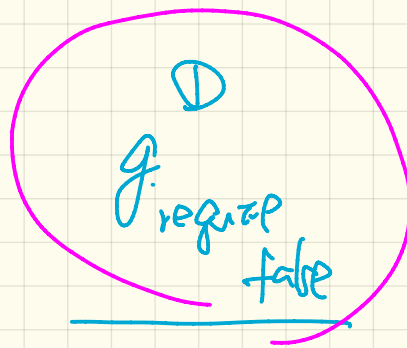
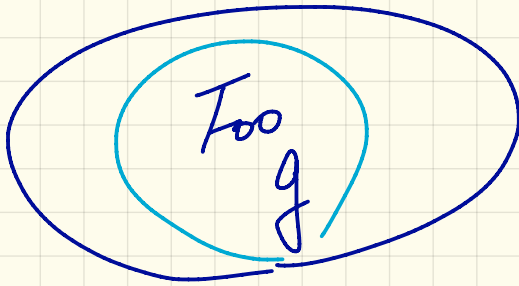
\therefore not appropriate.

C: CHILD

C.f say upon termination, check:

$$x \neq -1$$

$$x > -2 \text{ (N) } x \neq 0$$



f: Foo

g: BAR

f . g x precond violation
 -- x is S
 b . g