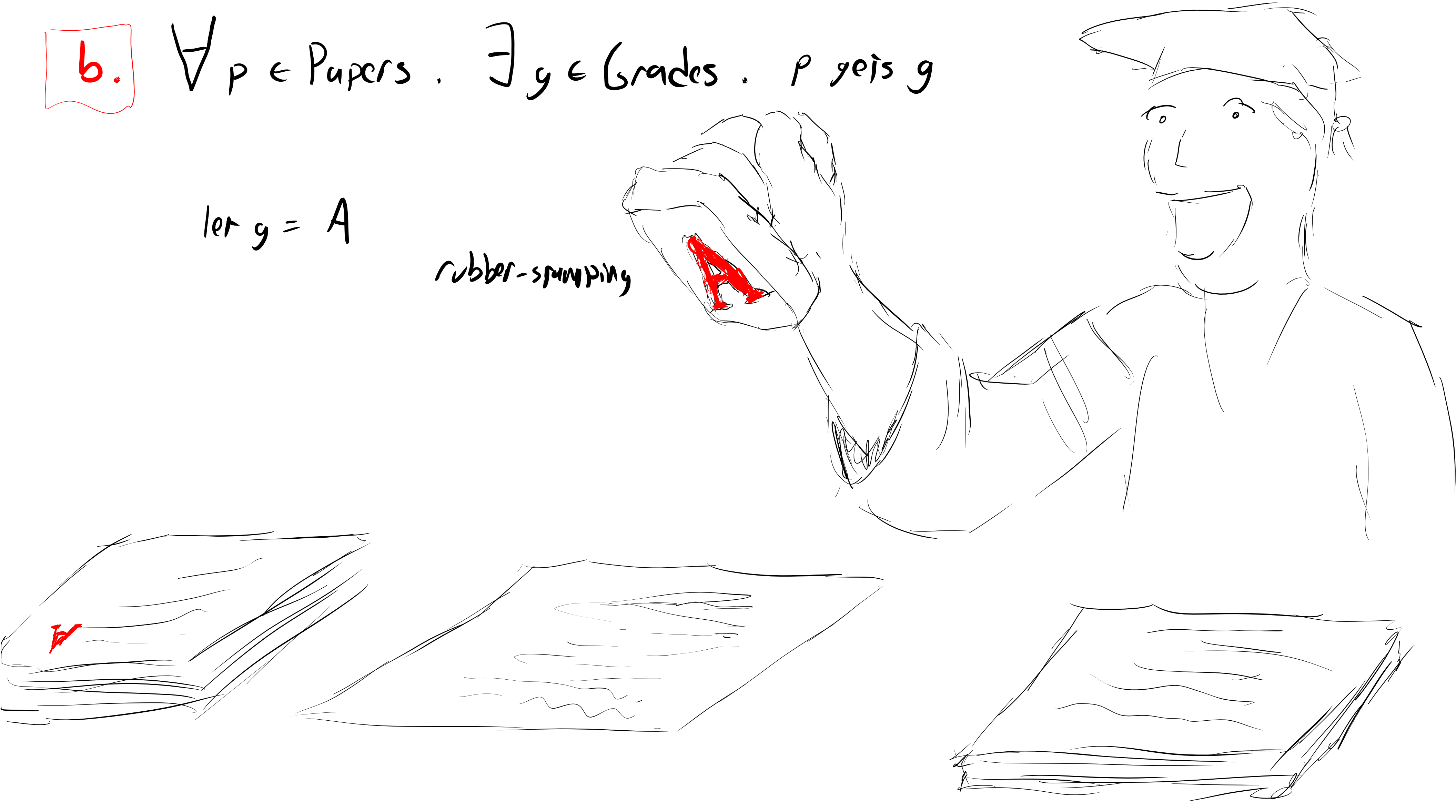
M: grades
P: papers
$E(x, y)$: x gets y

$\boxed{a.}$ $\underbrace{\exists g \in \overset{M}{Grades}}$. $\forall p \in \overset{P}{\underline{Papers}}$. $\overset{E(p,g)}{p \text{ gets } g}$

$\boxed{b.}$ $\forall p \in Papers$. $\exists g \in Grades$. p gets g

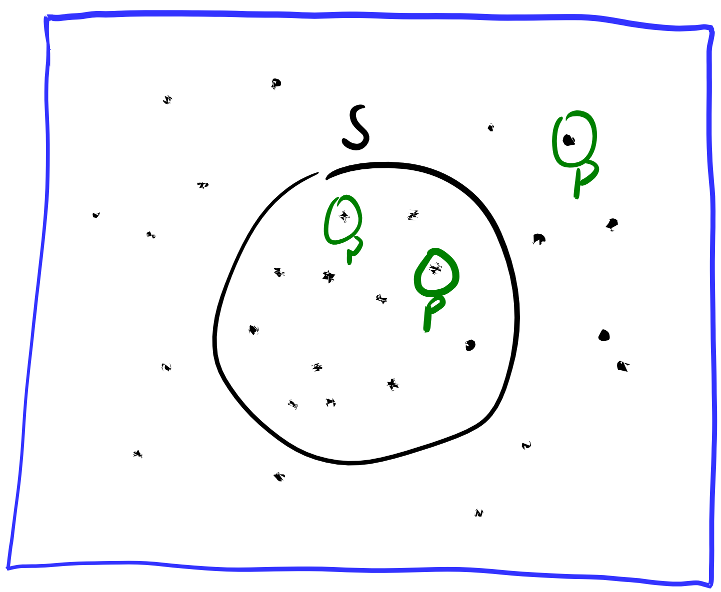
let $g = A$

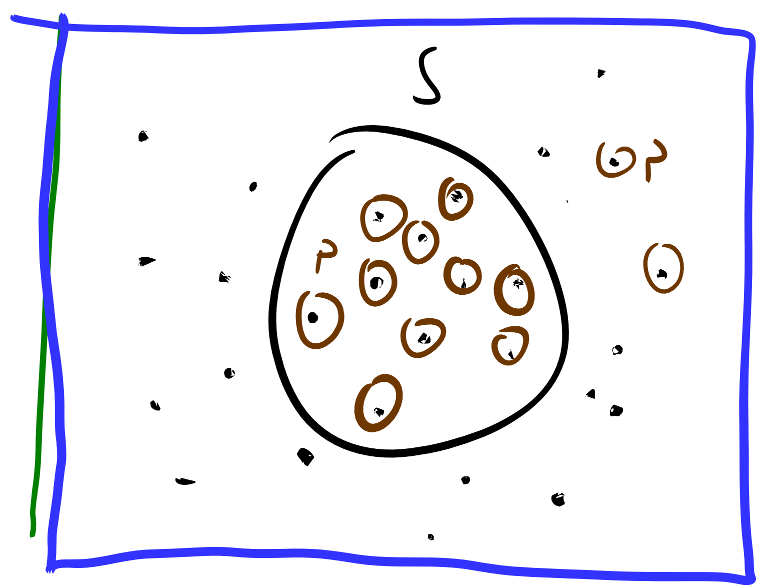


P: get a perfect score

$\exists x \in S.\ P(x)$ ~ easy to prove : 1 example is enough

$\forall x \in S.\ P(x)$ ~ easy to disprove : 1 example



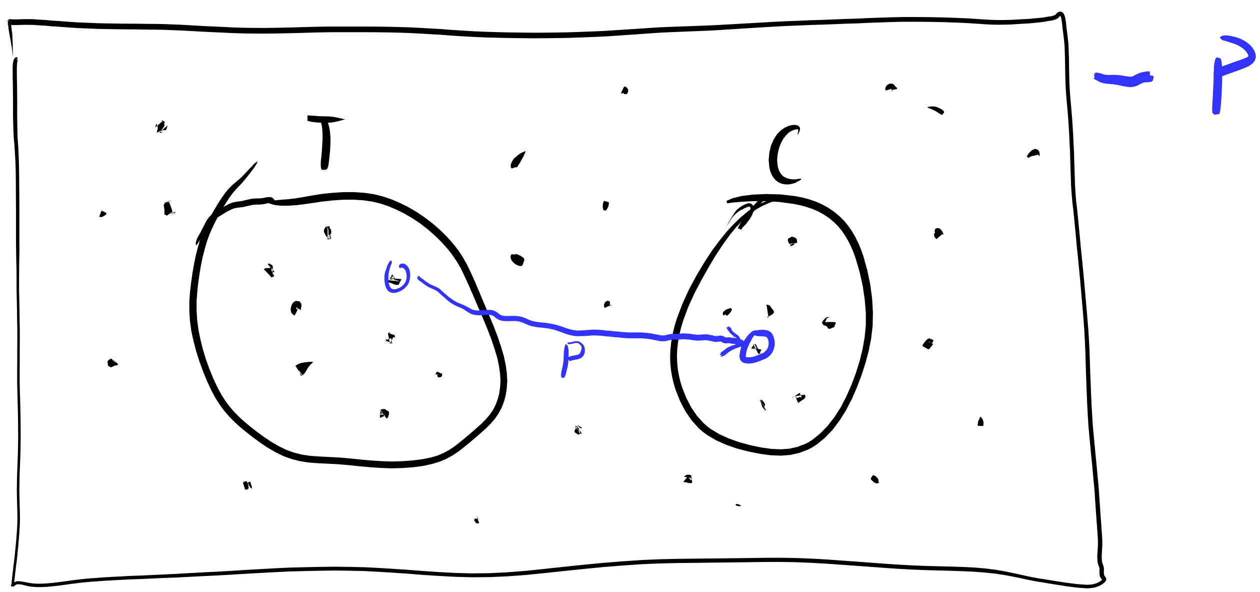


$\exists x \in T \, . \, \exists y \in C \, . \, P(x,y)$

T : set of all teachers

C : set of candy types

$P(x,y)$: x likes y

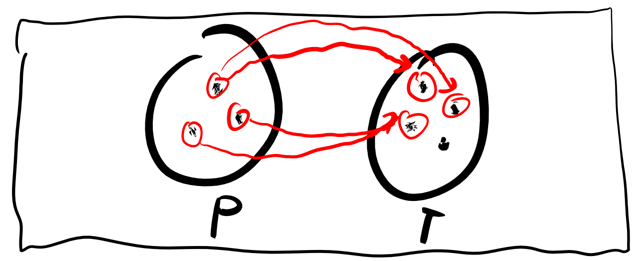


T : set of tests

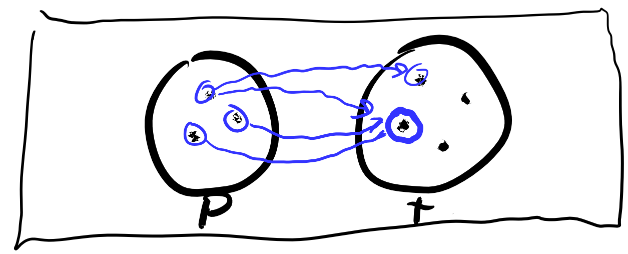
P : set of programs

$M(x,y)$: program x ~~meets~~ passes test y

$$\underbrace{\forall p \in P}\,.\,\underbrace{\exists t \in T}\,.\; M(p,t)$$



$$\underbrace{\exists t \in T}\,.\,\underbrace{\forall p \in P}\,.\; M(p,t)$$



For any prog you pick,
I can find a test it meets

I can pick a test
such that no matter which prog
you pick,
the prog meets test

```
b = F
for each thing x
    if P(x):
        b = T
return b
```

```
b = T
for each thing x
    if ¬P(x):
        b = F
return b
```

$$\exists x . P(x)$$

$$\forall x . P(x)$$

$$\exists x \in S . \boxed{\forall y \in T . P(x,y)}$$

```
b = F
for each x in S
    c = T
    for each y in T
        if ¬P(x,y):
            c = F
    if c:
        b = T
return b
```

Entailment

$$X \models Y$$

$$X \rightarrow Y \equiv T$$

$$X \leftrightarrow Y \equiv T$$

$$X \equiv T$$

$$\underbrace{|S|>0,\ \forall x\in S.\ P(x)} \models \exists x\in S.\ P(x)$$

$$\underbrace{\exists x\in S.\ \forall y\in T.\ P(x,y)} \models \forall y\in T.\ \exists x\in S.\ P(x,y)$$