---- TP 5 en TRC: Q3 et Q4
--- Q3
---Quelles routes (départ et destination) peuvent ^etre volées par tous les pilotes
---gagnant plus de 100 000 euros?

--- TRAVAIL A FAIRE:
----pour les premieres etapes, identifier la regle d'equivalence,
--- et marquer ou elle est appliquee (avant/apres avec deux couleurs differentes).

--- pour la derniere etape: ecrire la version finale de la formule

```
{ t | exists v in vols: v[dep]=t[dep] and v[arr]=t[arr] and
  --- un vol, tel que pour tous les employes
    forall e in employes:
            (e[salaire]>100000 and exists c in certifications: c[eid]=e[eid])
            -- si un employe est un pilote gagnant plus de 100kE,
            ---alors il existe pour lui
            implies
               exists a in avions, exists c2 in certifications:
               -- un avion pour lequel cet employe est certifie,
            ---de portee permettant de faire ce vol
               a[aid]=c2[aid] and c2[eid]=e[eid] and a[portee]>= v[distance]

---------- regle d'equivalence ICI LA QUANTIFICATION UNIVERSELLE  :

{ t | exists v in vols: v[dep]=t[dep] and v[arr]=t[arr] and
    not exists e in employes:
            not [
            (e[salaire]>100000 and exists c in certifications: c[eid]=e[eid])
            implies
               (exists a in avions, exists c2 in certifications:
               a[aid]=c2[aid] and c2[eid]=e[eid] and a[portee]>= v[distance])
               ]
  }
----------  regle d'equivalence ICI L'IMPLICATION:
{ t | exists v in vols: v[dep]=t[dep] and v[arr]=t[arr] and
    not exists e in employes:
            not [
            not(e[salaire]>100000 and exists c in certifications: c[eid]=e[eid])
            or
               (exists a in avions, exists c2 in certifications:
               a[aid]=c2[aid] and c2[eid]=e[eid] and a[portee]>= v[distance])
               ]
  }
```

---------- derniere etape: LOIS DE MORGAN

```
{ t | exists v in vols: v[dep]=t[dep] and v[arr]=t[arr] and
   not exists e in employes:
         not [
           (e[salaire]>100000 and exists c in certifications: c[eid]=e[eid])
           and
           not(exists a in avions, exists c2 in certifications:
              a[aid]=c2[aid] and c2[eid]=e[eid] and a[portee]>= v[distance])
              ]
}
```

---- en SQL

```
select v.dep, v.arr,v.distance
from vols v
where not exists (
(select eid from certifications c natural join employes e where salaire>100000 and c.eid=e.eid)
and not exists
(select porte in avions a natural join certifications c2 where a.aid=c2.aid and c2.eid=e.eid and
portee>distance)
)
```

---Q4

--Affichez les noms des pilotes qui sont uniquement certifies pour des avions avec une portee superieure a 1500 km

```
{t | exists e in employes, c in certifications:
c[eid]=e[eid] and t[enom]=e[enom]
and forall c2 in certifications:
[
c2[eid]=e.eid implies
                (exists a in avions : c2[aid]=a2[aid] and a2[portee]>1500)
]
}
```

----------regle d’equivalence:Quantification universelle

```
{t | exists e in employes, c in certifications:
c[eid]=e[eid] and t[enom]=e[enom]
and not exists c2 in certifications:
not[
c2[eid]=e.eid implies
                (exists a in avions : c2[aid]=a2[aid] and a2[portee]>1500)
]
}
```

---------regle d’equivalence: implication
{t | exists e in employes, c in certifications:
c[eid]=e[eid] and t[enom]=e[enom]
and not exists c2 in certifications:
not[
not(c2[eid]=e.eid)
        or
                (exists a in avions : c2[aid]=a2[aid] and a2[portee]>1500)
]
}

---------regle d’equivalence: loi de Morgan
{t | exists e in employes, c in certifications:
c[eid]=e[eid] and t[enom]=e[enom]
and not exists c2 in certifications:
not[
(c2[eid]=e.eid)
        and
                not(exists a in avions : c2[aid]=a2[aid] and a2[portee]>1500)
]
}

-----en SQL

select e.enom

from employe e natural join certifications c

where not exists(
(select c2.eid from certifications c2 where c2.eid=e.eid) and not exists
(select portee from avions a where c2.aid=a.aid and a2.portee>1500)
)