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Problem Sheet #04

Problem 4.1:

a-). the function f is injective since every number in the domain maps to a distinct number in the codomain. if $f(x_1)=f(x_2)$, then $x_1=x_2$.

- the fct f is surjective, ~~....~~ for any real number y, you can find an x such as $f(x)=y$.
- Since the function is both injective and surjective it is indeed bijective.

b-). the function g is injective because every number in the domain maps to a distinct number in the codomain. if $g(x_1)=g(x_2)$, then $x_1=x_2$.

- this fct is not surjetive since it only maps to odd natural numbers
- Since this fct is injective but not surjective, it is not bijective.

c-) • the function h is injective, every number in the domain maps to a distinct number in the codomain.

• it is surjective, $\forall y \in [-1, 1]$, you can find an x such as $h(x) = \sin(x) = y$

• Since the fct is both injective and surjective it's bijective.

Problem 4.3:

a-) C:= Customers ; ~~tickets~~

T:= tickets (representing set of all tickets)

CA:= [illegible] Cashier

M:= movie theaters

E:= cinema employees

D:= drinks menu ; TT:= ticket taker

b-)

_ is-a (Cashier x employees) $\Longrightarrow$ (CA x E)

_ Order $\subseteq$ (C x T)

_ Entrance $\subseteq$ (T x M)

_ Server $\subseteq$ (E x D), (relation between cinema employees and the drinks they serve)

- Drinks order $\subseteq (C \times D)$
- is_a $(TT \times E)$
- check $\subseteq (TT \times T)$

c-) * Partial Order Relation:

- Denoted as V (validity), $V \subseteq (T \times M)$ represents the relation indicating whether one ticket is valid for the same movie theater as another ticket. Relation is reflexive, antisymmetric and transative.

* Equivalence Relation:

- Denoted as C (capacity), $C \subseteq (M \times M)$ represents the relation indicating whether or not two movie theathers have the same ~~seating~~ seating capacity. This relation is reflexive, transative and symmetric. Hence, it's an equivalence relation.

* Strict Partial Order Relation:

- Denoted as H (Hierarchy), $H \subseteq (E \times E)$ represents the relation indicating a hierarchy among employees. This relation is irreflexive, assymmetric and transative. Hence, it's strict partial order relation.

* **Equivalence Relation:**

_ Denoted as T(taste), $T \subseteq (C \times C)$ represents the relation indicating whether two customers have the same preference to the same movie theather. the relation is reflexive, transative and symmetric.

* **Partial Order Relation:**

_ Denoted as P(price order), $P \subseteq (D \times D)$ represents the relation indicating different drinks with different associated prices, meaning a drink can be priced higher than or equal ~~than~~ to another drink. the later relation is reflexive, antisymmetric and transative.

Problem 4.4:

a-)
```
import Data.char
main :: IO()
main = print (ord '=')
```

_ the following code would print the char code of '=' which is 61.

5-) import Data.Char

```
main :: IO()
main = print(chr 128119)
```

- the char with the code point 128119 represents emoji (hugging face emoji)