1 List Comprehension

- set comprehension: $\{x : T | R : E\}$

- x is the dummy variable

- E is an expression

- R is a predicate

- Modified version: $\{x : T | R \wedge P : E\}$

- $\{x : N | x \in [1..10] : x^2\}$

- $\{x : N | x \in [1..10] \wedge x^2 \geq 12 : x^2\}$

2 MIS class example

- Insert an element in a sequence

$$s := s[0..i-1] || <p> || s[i..|s|-1]$$

- delete an element from a sequence

$$s := s[0..i-1] || <p> || s[i+1..|s|-1]$$

- intersect(ci) ci and self are two circle

$$\exists(p : \text{pointT} | \text{insideCircle}(p, ci) : \text{insideCircle}(p, self))$$

- insideCircle: pointT $\times$ circleT $\rightarrow$ boolean

- insideCircle$(p, c) \equiv p.\text{dist}(c.\text{centre}) \leq c.\text{radius}$

- disjoint():

$$out := \forall(i, j : \mathbb{N} | i \in [0..|s|-1] \wedge j \in [0..|s|-1] \wedge i \neq j : \neg s[i].\text{intersect}(s[j]))$$

- Condition, if else, seq_add(i, p)

$$(|s| = \text{MAX\_SIZE} \Rightarrow s := s | |s| < \text{MAX\_SIZE} \Rightarrow s := s[0..i-1] || <p> || s[i..|s|-1])$$

3 MIS frequent use

- element in set of two sequences are equal

$$out := \exists(s : \text{MapInd2LOsT}|s \in m : s.ind = indicator \land \forall(x : \text{LOsT}| : x \in s.LOs \leftrightarrow x \in outcomes))$$

- counting
$$+(x : \mathbb{N}|x \in [0..5] \land x\%2 == 0 : 1)$$

- sum
$$+(x : \mathbb{N}|x \in [0..5] \land x\%2 == 0 : x)$$

- find all index with x value in Set B

$$\text{indexSet}(x, B) \equiv \{i : \mathbb{N}|i \in [0..|B| - 1] \land B_i = x : i\}$$

- sort(f): sort student gap base on filter f $out := L$: sequence of string, such that
  $(\forall\langle m, i\rangle : \text{StudentT}|\langle m, i\rangle \in s \land f(i) : (\exists j : \mathbb{N}|j \in [0..|s| - 1] : L_j = m)) \land (\forall k : \mathbb{N}|k \in [0..|L| - 2] : \text{get\_gpa}(L_k, s) \geq \text{get\_gpa}(L_{k+1}, s))$

- average(f): find the average of student base on filter f

$$out := \frac{(+i : \text{SInfoT}|i \in fset : i.\text{gpa})}{|fset|} \text{ where } fset = \{\langle m, i\rangle : \text{StudentT}|\langle m, i\rangle \in s \land f(i) : i\}$$

- the lagest absolute value in x_s

$$m \text{ such that } (m \in x_s \lor -m \in x_s) \land \forall(x : \mathbb{R}|x \in x_s : m \geq |x|)$$

- max in x_s
$$m \text{ such that } (m \in x_s) \land \forall(x : \mathbb{R}|x \in x_s : m \geq x)$$

- min in x_s
$$m \text{ such that } (m \in x_s) \land \forall(x : \mathbb{R}|x \in x_s : m \leq x)$$

- add a tuple to a set or sequence

$$maze := maze \cup \{< c1, c2 >\}$$