Practical 3c

Finding the following for a given partially ordered set
i. Covering relations.
ii. Minimal and maximal elements.

Greatest and Least elements

1 Greatest Element

```
(%i1) kill(all);
(%o0) done

(%i2) gElement(A, R):=block(
    [s, f:0, t:0],
    for j:1 thru length(A) do(
        s:0,
        for i:1 thru length(A) do(
            if(member([A[i], A[j]], R)) then(s:s+1)
        ),
        if(s=length(A)) then(t:j, return(t))
    ),
    if(t=0) then(return("no greatest element")) else(return(concat(A[t], " is the grea
);
(%o1) gElement(A,R):=block([s,f:0,t:0],for j thru length(A)
 do (s:0,for i thru length(A) do if member([A_i,A_j],R) then s
:s+1 ,if s=length(A) then (t:j,return(t)) ),if t=0 then
return(no greatest element) else
return(concat(A_t, is the greatest element)))
```

1.1

```
(%i3) A:[2, 3, 4, 6, 8];
(%o2) [2,3,4,6,8]

(%i4) R:[[8,8],[6,6],[4,8],[4,4],[3,6],[3,3],[2,8],[2,6],[2,4],[2,2]];
(%o3) [[8,8],[6,6],[4,8],[4,4],[3,6],[3,3],[2,8],[2,6],[
2,4],[2,2]]

(%i5) gElement(A, R);
(%o4) no greatest element
```

1.2

```
→  B2:[2,  4,  8,  16];
(%o5) [2,4,8,16]

→  C2:[[16,16],[8,16],[8,8],[4,16],[4,8],[4,4],[2,16],[2,8],[2,4],[2,2]];
(%o6) [[16,16],[8,16],[8,8],[4,16],[4,8],[4,4],[2,16],[
2,8],[2,4],[2,2]]

→  gElement(B2,  C2);
(%o7) 16 is the greatest element
```

1.3

```
→  A:[2,4,5,10,12,20,25];
(%o8) [2,4,5,10,12,20,25]

→  R:[[25,25],[20,20],[12,12],[10,20],[10,10],[5,25],[5,20],[5,10],[5,5],
   [4,20],[4,12],[4,4],[2,20],[2,12],[2,10],[2,4],[2,2]];
(%o9) [[25,25],[20,20],[12,12],[10,20],[10,10],[5,25],[
5,20],[5,10],[5,5],[4,20],[4,12],[4,4],[2,20],[2,12],[2
,10],[2,4],[2,2]]

→  gElement(A,  R);
(%o10) no greatest element
```

2 Least Element

```
→  kill(all);
(%o0) done
```

```
(%i1) sElement(A, R):=block(
        [s, f:0, t:0],
        for i:1 thru length(A) do(
          s:0,
          for j:1 thru length(A) do(
            if(member([A[i], A[j]], R)) then(s:s+1)
          ),
          if(s=length(A)) then(t:i, return(t))
        ),
        if(t=0) then(return("no least element")) else(return(concat(A[t], " is the least ele

      );
```

(%o1) sElement(A,R):=block([s,f:0,t:0],for i thru length(A) do (s:0,for j thru length(A) do if member([A_i,A_j],R) then s:s+1 ,if s=length(A) then (t:i,return(t))),if t=0 then return(no least element) else return(concat(A_t, is the least element)))

2.1

```
(%i2) A:[2, 3, 4, 6, 8];
```

(%o2) [2,3,4,6,8]

```
(%i3) R:[[8,8],[6,6],[4,8],[4,4],[3,6],[3,3],[2,8],[2,6],[2,4],[2,2]];
```

(%o3) [[8,8],[6,6],[4,8],[4,4],[3,6],[3,3],[2,8],[2,6],[2,4],[2,2]]

```
(%i4) sElement(A, R);
```

(%o4) *no least element*

2.2

```
(%i5) B2:[2, 4, 8, 16];
```

(%o5) [2,4,8,16]

```
(%i6) C2:[[16,16],[8,16],[8,8],[4,16],[4,8],[4,4],[2,16],[2,8],[2,4],[2,2]];
```

(%o6) [[16,16],[8,16],[8,8],[4,16],[4,8],[4,4],[2,16],[2,8],[2,4],[2,2]]

```
(%i7) sElement(B2, C2);
```

(%o7) *2 is the least element*

2.3

```
(%i8) A:[2,4,5,10,12,20,25];
(%o8) [2,4,5,10,12,20,25]

(%i9) R:[[25,25],[20,20],[12,12],[10,20],[10,10],[5,25],[5,20],[5,10],[5,5],
       [4,20],[4,12],[4,4],[2,20],[2,12],[2,10],[2,4],[2,2]];
(%o9) [[25,25],[20,20],[12,12],[10,20],[10,10],[5,25],[
5,20],[5,10],[5,5],[4,20],[4,12],[4,4],[2,20],[2,12],[2
,10],[2,4],[2,2]]

(%i10) sElement(A,  R);
(%o10) no least element
```