

## Basic translations for homework 2

1. OO with gen → OO without gen (parent only)
2. OO with gen → OO without gen (children only)
3. OO with gen → OO without gen (parent and children)
4. 5. 6. ER with gen → ER without gen (three alternatives)
7. OO → (Full) ER
8. Full ER → ER without attributes for relationships
9. ER w/o attributes for relationships → ER w/o M:N relationships
10. ER w/o M:N relationships and w/o attributes for rels → OO
11. OO without gen → relational
12. relational → OO
13. ER without gen → relational
14. relational → ER

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## Test schema for examples 1 & 3

- Classes with lexical attributes (with identifiers underlined and nullability with a star; types can be chosen freely) and reference attributes (ext id underlined and optionality with a star)
  - C1, attr A11 A12 A13\* ref R11\*(C2), R12(C2), R13(C7)
  - C2, attr A21 A22
  - C3, attr A31
  - C4, attr A41 ref R41(C1), R42(C9)
  - C5, attr A51
  - C6, attr A61
  - C7, attr A71, A72
  - C8, attr A81, A82\* ref R81(C2)
  - C9, attr A91, A92
- Generalizations:
  - Parent C1 Children C2, C3 (total)
  - Parent C1 Child C4 (partial)
  - Parent C4 Children C5, C6 (partial)

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## Test schema for example 2 (1)

- Classes with lexical attributes (with identifiers underlined and nullability with a star; types can be chosen freely) and reference attributes (ext id underlined and optionality with a star)
  - C1, attr A11 A12 A13\*
  - C2, attr A21 ref R21(C4)
  - C3, attr A31
  - C4, attr A41
  - C5, attr A51
  - C6, attr A61
  - C7, attr A71, A72
  - C8, attr A81, A82\*
  - C9, attr A91, A92
- Generalizations:
  - Parent C1 Children C2, C3 (total)
  - Parent C1 Children C4, C5 (total)
  - Parent C2 Children C6, C7 (total)
  - Parent C4 Children C8, C9 (total)

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## Test schema for example 2 (2)

- Classes with lexical attributes (with identifiers underlined and nullability with a star; types can be chosen freely) and reference attributes (ext id underlined and optionality with a star)
  - C1, attr A11 A12 A13\* ref R11\*(C2), R12(C4)
  - C2, attr A21 A22
  - C3, attr A31
  - C4, attr A41, A42
- Generalizations:
  - Parent C1 Children C2, C3 (total)

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## Test schema for examples 4 & 6

- Entities with attributes (with identifiers underlined and nullability with a star; types can be chosen freely)
  - E1, attr A11 A12 A13\*
  - E2, attr A21 A22
  - E3, attr A31
  - E4, attr A41
  - E5, attr A51
  - E6, attr A61
  - E7, attr A71, A72
  - E9, attr A91, A92
- Relationships:
  - R1 on E1 (1,1) and E2 (0,N)
  - R2 on E1 (1,1,id) and E7 (0,N)
  - R3 on E4 (0,N) and E1 (0,N)
  - R4 on E4 (0,1) and E9 (0,N)
- Generalizations:
  - Parent E1 Children E2, E3 (total)
  - Parent E1 Child E4 (partial)
  - Parent E4 Children E5, E6 (partial)

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## Test schema for example 5 (1)

- Entities with attributes (with identifiers underlined and nullability with a star; types can be chosen freely)
  - E1, attr A11 A12 A13\*
  - E2, attr A21
  - E3, attr A31
  - E4, attr A41
  - E5, attr A51
  - E6, attr A61
  - E7, attr A71, A72
  - E8, attr A81, A82\*
  - E9, attr A91
- Relationship
  - R1 on E2 (1,1) and E4 (0,N)
- Generalizations:
  - Parent E1 Children E2, E3 (total)
  - Parent E1 Children E4, E5 (total)
  - Parent E2 Children E6, E7 (total)
  - Parent E4 Children E8, E9 (total)

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### Test schema for example 5 (2)

- Classes with attributes (with identifiers underlined and nullability with a star; types can be chosen freely) and references (ext id underlined and optionality with a star)
  - E1, attr A11 A12 A13\*
  - E2, attr A21 A22
  - E3, attr A31
  - E4, attr A41, A42
- Relationships
  - R1 on E1 (0,N) and E2 (0,N)
  - R2 on E1 (1,1,id) and E4 (0,N)
- Generalizations:
  - Parent E1 Children E2, E3 (total)

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### Test schema for example 7

- Classes with lexical attributes (with identifiers underlined and nullability with a star; types can be chosen freely) and reference attributes (ext id underlined and optionality with a star)
  - C1, attr A11 A12 A13\* ref R11(C2) R12(C2)
  - C2, attr A21 ref R21(C4)
  - C3, attr A31\* ref R31(C2) R32\*(C3)
  - C4, attr A41
  - C5, attr A51 A52\*
  - C6, attr A61 A62 A63 A64\* ref R61(C1)
  - C7, attr A71 A72 A73\* ref R71(C6)
- Generalizations:
  - Parent C1 Children C2, C3 (partial)
  - Parent C3 Children C4, C5 (total)

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### Test schema for example 8

- Entities with attributes (with identifiers underlined and nullability with a star; types can be chosen freely) and references (ext id underlined and optionality with a star)
  - E1, attr A11 A12 A13\*
  - E2, attr A21 A22
  - E3, attr A31
  - E4, attr A41 A42
  - E5, attr A51 A52
  - E6, attr A61 A62 A63
- Relationships
  - R1 on E1 (1,N) and E2 (1,1), attr AR11 AR12\*
  - R2 on E3 (0,N) and E3 (1,N), attr AR21 AR22\*
  - R3 on E3 (1,1) and E4 (1,N)
  - R4 on E4 (0,1) and E5 (1,N), attr AR41\* AR42\*
  - R5 on E5 (1,N) and E6 (1,1,id), attr AR51
- Generalizations:
  - Parent E1 Children E2, E3 (partial)

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### Test schema for example 9

- Entities with attributes (with identifiers underlined and nullability with a star; types can be chosen freely) and references (ext id underlined and optionality with a star)
  - E1, attr A11 A12 A13\*
  - E2, attr A21 A22\*
  - E3, attr A31\*
  - E4, attr A41 A42
  - E5, attr A51 A52 A53
- Relationship
  - R1 on E2 (1,N) and E3 (1,N)
  - R2 on E3 (0,N) and E3 (1,N)
  - R3 on E1 (1,N) and E4 (1,N)
  - R4 on E4 (1,N) and E5 (1,1,id)
- Generalizations:
  - Parent E1 Children E2, E3 (total)

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### Test schema for example 10

- Entities with attributes (with identifiers underlined and nullability with a star; types can be chosen freely) and references (ext id underlined and optionality with a star)
  - E1, attr A11 A12 A13\*
  - E2, attr A21 A22\*
  - E3, attr A31\*
  - E4, attr A41
  - E5, attr A51 A52\*
  - E6, attr A61 A62 A63 A64\*
  - E7, attr A71 A72 A73
- Relationships
  - R1 on E2 (0,N) and E6 (0,1)
  - R2 on E6 (0,1) and E6 (1,N)
  - R3 on E1 (0,N) and E2 (1,1)
  - R4 on E1 (0,1) and E7 (1,1,id)
  - R5 on E1 (0,1) and E5 (1,1)
- Generalizations:
  - Parent E1 Children E2, E3 (partial)
  - Parent E3 Children E4, E5 (total)

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### Test schema for example 11

- Classes with lexical attributes (with identifiers underlined and nullability with a star; types can be chosen freely) and reference attributes (ext id underlined and optionality with a star)
  - C1, attr A11 A12 A13\*, ref R11(C1) R12\*(C2) R13(C2)
  - C2, attr A21 A22 A23\*, ref R21\*(C2)
  - C3, attr A31 A32\*, ref R31(C2)
  - C4, attr A41 A42 A43, ref R41(C3)
  - C5, attr A51 A52 A53, ref R51(C4)

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### Test schema for example 13

- Entities with attributes (with identifiers underlined and nullability with a star; types can be chosen freely) and references (ext id underlined and optionality with a star)
  - E1, attr A11 A12 A13\*
  - E2, attr A21 A22
  - E3, attr A31 A32
  - E4, attr A41 A42 A43\*
  - E5, attr A51 A52\*
  - E6, attr A61 A62 A63 A64\*
- Relationships
  - R1 on E1 (0,n) and E2 (1,N), attr AR11 AR12\*
  - R2 on E2 (0,1) and E3 (0,1), attr AR21
  - R3 on E3 (1,1) and E4 (1,N), attr AR31
  - R4 on E3 (1,1) and E5 (1,1), attr AR41 AR42\*
  - R5 on E5 (1,1,id) and E6 (1,1)
  - R6 on E6 (1,1,id) and E1 (1,N), attr AR61 AR62\*

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### Test schema for example 12-14

- Tables with attributes (with identifiers underlined and nullability with a star; types can be chosen freely) and references (ext id underlined and optionality with a star)
  - R1, attr A11 A12 A13 A14\*
  - R2, attr A21 A22 A23\*
  - R3, attr A31 A32 A33 A34 A35\*
  - R4, attr A41 A42 A43 A44
  - R5, attr A51 A52 A53 A54 A55 A56 A57\*
  - R6, attr A61 A62 A63
- Foreign keys:
  - FK1 From R3(A31,A32) To R1(A11,A12)
  - FK2 From R3(A33) To R2(A21)
  - FK3 From R4(A42,A43) To R1(A11,A12)
  - FK4 From R5(A52,A53,A54) To R4(A41,A42,A43)
  - FK5 From R5(A55,A56) To R6(A61,A62)

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