
ORACLE
Academy

Database Design

4-1
Supertypes and Subtypes

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Objectives

This lesson covers the following objectives:

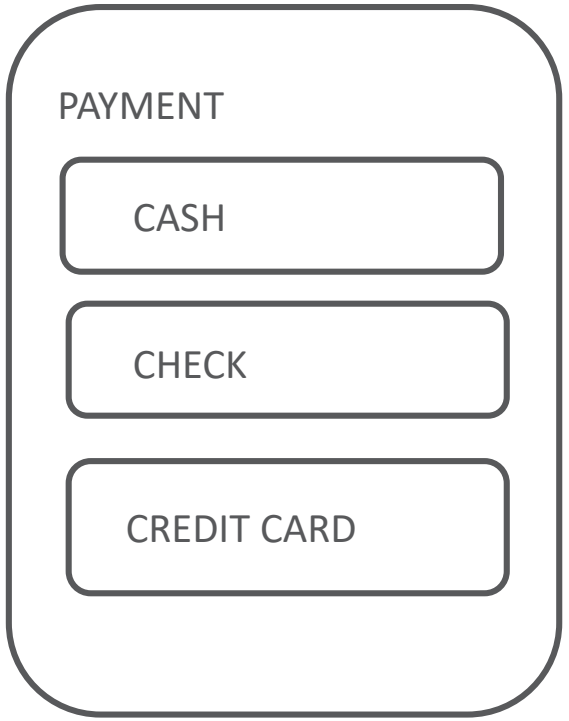
- Define and give an example of a subtype
- Define and give an example of a supertype
- State the rules relating to entities and subtypes, and give examples of each
- Apply the rules of supertype and subtype by evaluating the accuracy of ER diagrams that represent them
- Apply the rules of supertype and subtype and include them in a diagram when appropriate

Purpose

- Supertypes and subtypes occur frequently in the real world:
  - food order types (eat in, to go)
  - grocery bag types (paper, plastic)
  - payment types (check, cash, credit)
- You can typically associate ‘choices’ of something with supertypes and subtypes.
- For example, what will be the method of payment – cash, check or credit card?
- Understanding real world examples helps us understand how and when to model them.

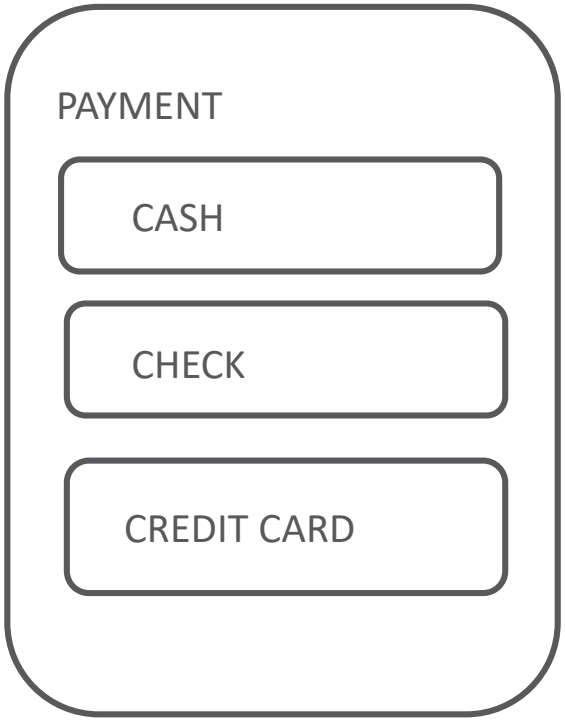
Evaluating Entities

- Often some instances of an entity have attributes and/or relationships that other instances do not have.
- Imagine a business which needs to track payments from customers.
- Customers can pay by cash, by check, or by credit card.



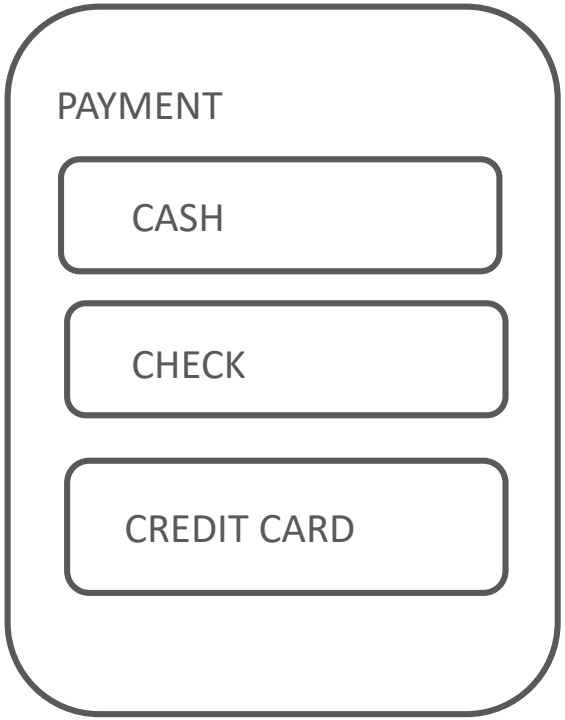
Evaluating Entities

- All payments have some common attributes: payment date, payment amount, and so on.
- But only credit cards would have a “card number” attribute.
- And for credit card and check payments, we may need to know which CUSTOMER made the payment, while this is not needed for cash payments.



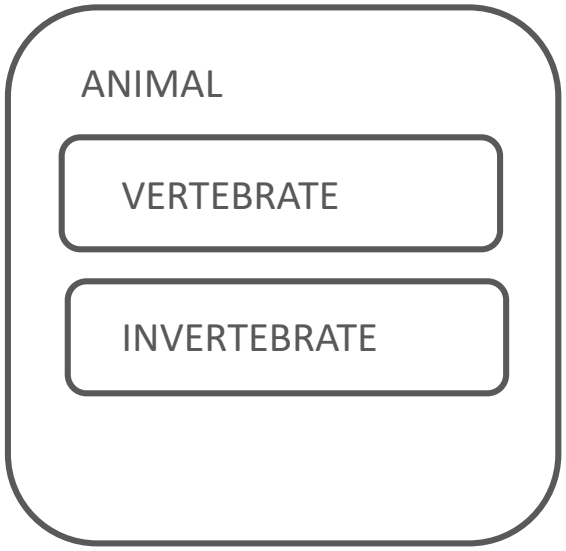
Evaluating Entities

- Should we create a single PAYMENT entity or three separate entities CASH, CHECK, and CREDIT CARD?
- And what happens if in the future we introduce a fourth method of payment?



Subdivide an Entity

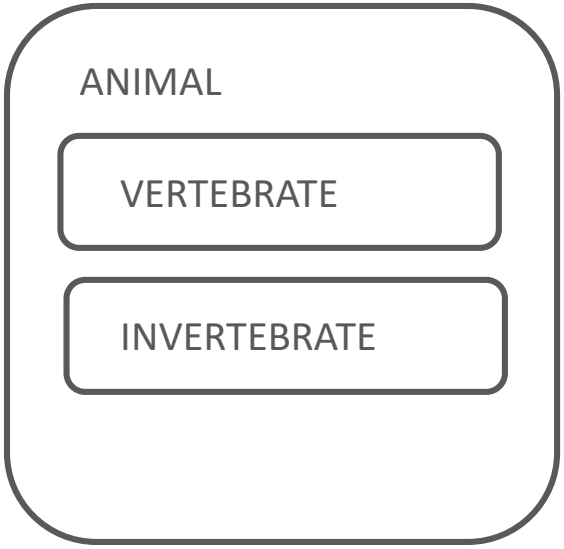
- Sometimes it makes sense to subdivide an entity into subtypes.
- This may be the case when a group of instances has special properties, such as attributes or relationships that exist only for that group.
- In this case, the entity is called a “supertype” and each group is called a “subtype”.



ANIMAL SUPERTYPE

Subtype Characteristics

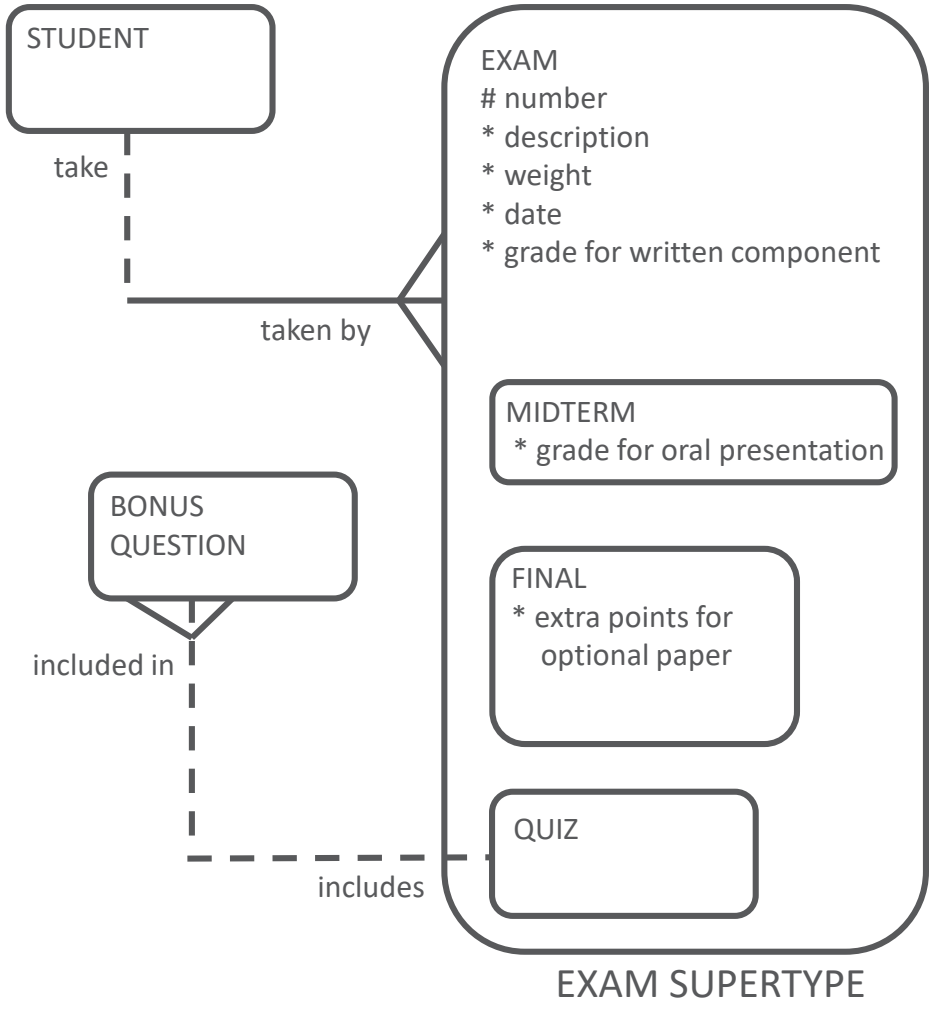
- A subtype:
  - Inherits all attributes of the supertype
  - Inherits all relationships of the supertype
  - Usually has its own attributes or relationships
  - Is drawn within the supertype
  - Never exists alone
  - May have subtypes of its own



ANIMAL SUPERTYPE

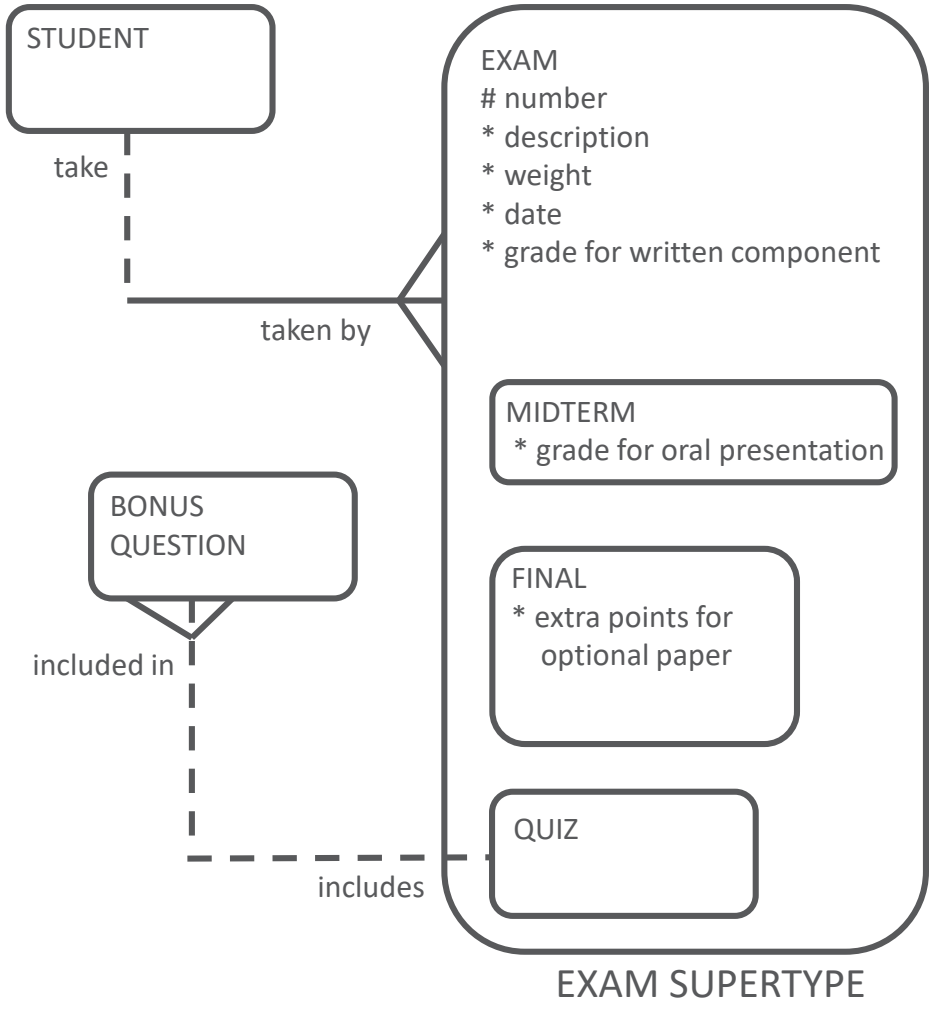
Supertype Example

- EXAM is a supertype of QUIZ, MIDTERM, and FINAL.
- The subtypes have several attributes in common.
- These common attributes are listed at the supertype level.



Supertype Example

- The same applies to relationships.
- Subtypes inherit all attributes and relationships of the supertype entity.

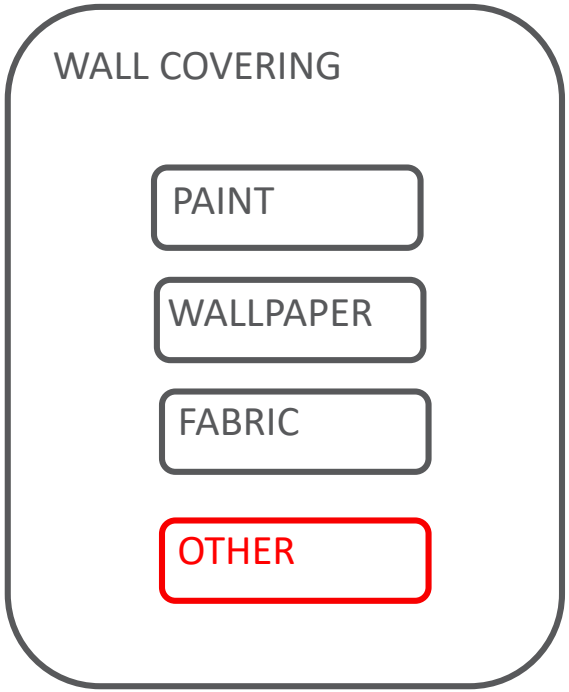


Always More Than One Subtype

- When an ER model is complete, subtypes never stand alone. In other words, if an entity has a subtype, a second subtype must also exist. This makes sense.
- A single subtype is exactly the same as the supertype.
- This idea leads to the two subtype rules:
  - Exhaustive: Every instance of the supertype is also an instance of one of the subtypes. All subtypes are listed without omission.
  - Mutually Exclusive: Each instance of a supertype is an instance of only one possible subtype.

Always More Than One Subtype

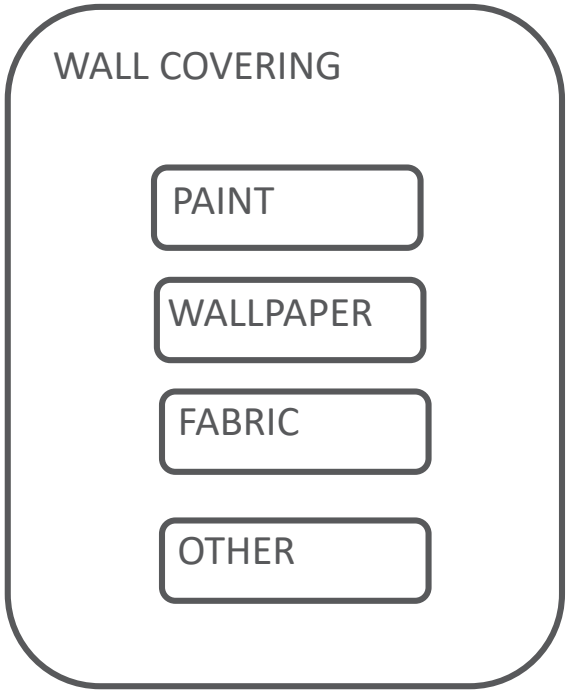
- At the conceptual modeling stage, it is good practice to include an OTHER subtype to make sure that your subtypes are exhaustive -- that you are handling every instance of the supertype.



WALLCOVERING SUPERTYPE

Subtypes Always Exist

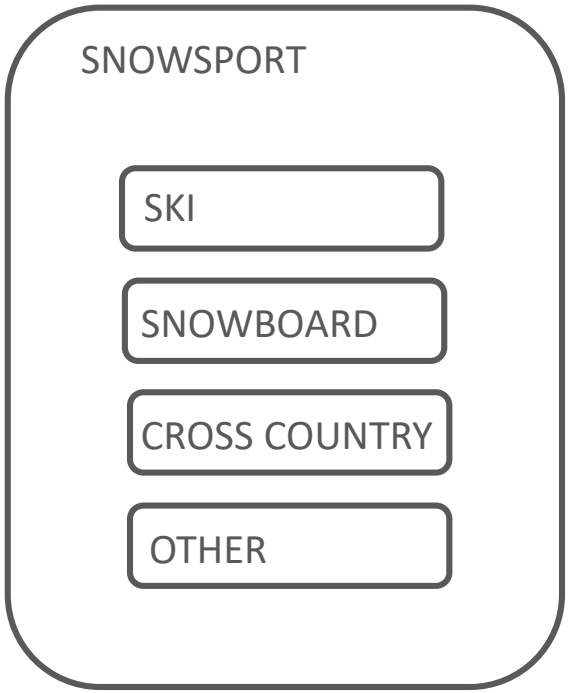
- Any entity can be subtyped by making up a rule that subdivides the instances into groups.
- But being able to subtype is not the issue—having a reason to subtype is the issue.
- When a need exists within the business to show similarities and differences between instances, then subtype.



WALLCOVERING SUPERTYPE

Correctly Identifying Subtypes

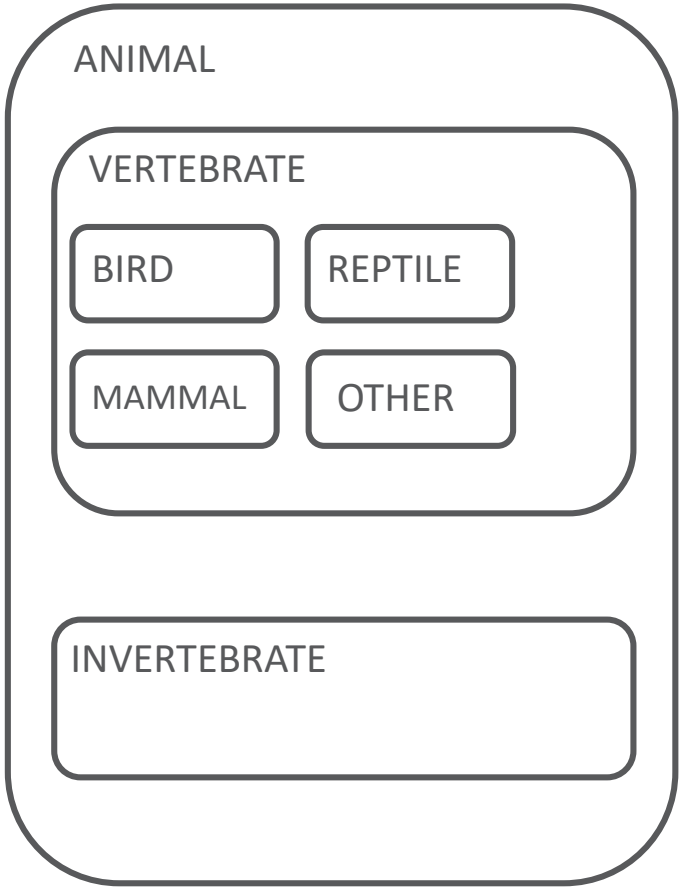
- When modeling supertypes and subtypes, you can use three questions to see if the subtype is correctly identified:
  - Is this subtype a kind of supertype?
  - Have I covered all possible cases? (exhaustive)
  - Does each instance fit into one and only one subtype? (mutually exclusive)



SNOWSPORT SUPERTYPE

Nested Subtypes

- You can nest subtypes.
- For ease of reading -- “readability” -- you would usually show subtypes with only two levels, but there is no rule that would stop you from going beyond two levels.



NESTED ANIMAL SUPERTYPE

Terminology

Key terms used in this lesson included:

- Exhaustive
- Mutually exclusive
- Subtype
- Supertype

Summary

In this lesson, you should have learned how to:

- Define and give an example of a subtype
- Define and give an example of a supertype
- State the rules relating to entities and subtypes, and give examples of each
- Apply the rules of supertype and subtype by evaluating the accuracy of ER diagrams that represent them
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