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Object Oriented Programming (CMPS373)

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HW 2 – Question 2

1. Circle, Point – Aggregation; A circle consists of a point. At the same time, a point can make up several different circles.
2. Earth, Planet – Generalization; Earth is a planet, so it inherits all the traditional characteristics of a planet, such as having a core, surface, and atmosphere.
3. Computer, Workstation – Aggregation; This is a ‘has-a’ relationship because a workstation can have a computer. The lifetimes of the computer and workstation are independent because if we remove the computer from the workstation / the computer gets destroyed, it does not mean the workstation has to be destroyed as well. There are other useful tools we can find on a workstation besides a computer.
4. Rectangle, Square – Association; A rectangle and a square are related to one another in that they are both quadrilaterals (they have four sides).
5. Person, Shoes – Aggregation; This is a ‘has-a’ relationship because a person can have shoes on their feet. The lifetimes of the person and the shoes are independent of one another because if the shoes get destroyed, it does not mean the person has to die as well. He/she can keep walking around with no shoes on or replace the shoes in case something bad happens to them.
6. ATM, Bank Card – Association; An ATM can have several different bank cards inserted into it (making this a one-to-many relationship).
7. Car, Tire - Aggregation; This is a ‘has-a’ relationship because a car can have tires. The lifetimes of the car and tire are independent because if one of the tires goes flat, it does not mean the car stops working. The car will just not be able to get around as efficiently until the tire gets replaced.
8. File, Directory – Composition; This is a ‘has-a’ relationship because a directory can have files inside of it. The lifetimes of the file and directory are dependent because if a directory gets deleted, all the files inside of it get deleted as well.
9. College, Students – Association; A college can have multiple different students enrolled at it (this is a one-to-many relationship).
10. Professor, Students – Association; A professor can have multiple students enrolled in one of their courses (making this a one-to-many relationship).
11. Sports Team, Fans – Association; Some people can be fans of multiple different sports teams (making this a many-to-many relationship).
12. Computer Science Department, Computer Science Professor – Composition; This is a ‘has-a’ relationship because a department can have professors making it up. The lifetimes of the department and professors are dependent on one another because without professors who can teach computer science concepts, there can be no computer science department.
13. Cocktail, Martini – Generalization; A martini is a cocktail, so it inherits all the usual characteristics of a cocktail. Therefore, this relationship is a generalization.
14. Person, Heart – Composition; This is a ‘has-a’ relationship because a person has a heart. The lifetimes of the person and heart are dependent because if the heart stops working, the person will die (since the heart pumps blood through the person’s body).
15. Programming Language, Object-Oriented Programming Language – Generalization; An object-oriented programming language is a type of programming language. Therefore, it inherits all the traditional characteristics of a programming language, such as being able to define variables and functions.
16. Shark, Teeth – Aggregation; This is a ‘has-a’ relationship because a shark can have teeth. The lifetimes of the shark and its teeth are independent because if a shark loses its teeth, this does not mean the shark dies. They can still survive by breathing with the help of their gills.
17. Function, Derivative – Composition; This is a ‘has-a’ relationship because a function can have a derivative. The lifetimes of the function and derivative are dependent because if a function does not have a derivative at a given point, then the function cannot be differentiated at that point.
18. Watch, Time – Composition; This is a ‘has-a’ relationship because a watch has the current time. The lifetimes of the watch and time are dependent because if the time in real life changes, so does the time given on the watch.