**2-23 Word Problems**

1. Yes, a customer can have zero to many plans, according to the ERD.
2. Yes, a customer can exist with zero to many plans, as stated in part a, and according to the ERD.
3. No, a plan requires at least one customer to exist, according to the ERD.
4. According to the ERD, a handset must have a type, but a handset type does not need a corresponding handset. This may allot for handset types that are not carried by the company currently, or out of stock perhaps. However, there isn’t any indication to me that the plan has a limit on the type of handsets. I would say **no,** as my answer. In a real world scenario, I’d say certain plans are associated with certain types of phones, e.g. a high data use phone (iPhone) will require a data plan of some sort. This relationship doesn’t make itself clear to me here.
5. Weird question. A handset can exist without a plan. Theoretically, data can be maintained on that handset. A plan cannot exist without a handset.
6. No, optional or one and one only.
7. No, in this model, a handset has one and only one operating system. NO BOOTCAMP UP IN THIS ERD.
8. Yes, because the inclusion of manufacturers in handset types is optional. Therefore, it is reasonable to assume the company can keep track of manufacturers regardless of it having particular handset types.
9. Yes, even though a handset can have only one operating system, each operating system may exist on optional many handset types.
10. A customer belongs to optional many plans, meaning they might have no plans at all, but still be tracked as a customer, or they are associated with one or more plans. Each plan, however, is responsible for one, and only one, customer at a time.
11. The family member relationship is of a unary degree. In addition it has the following cardinalities:
    1. A customer can have family members, or one, but that relationship is optional.
    2. A family member is associated optionally, but one and only one customer, should the option be used.
12. Because any plan must include a handset, and because a plan must include a customer, it is possible for a handset to be associated with a specific customer through the use of a key.
13. A handset must have a handset type to exist, and a handset type must have an OS to exist, therefore a handset’s OS must be identified somewhere.