1. Identify the classes and attributes of the following sets of objects.

   a.

 | Ben Jones | Susan Lee | Joe Davison |
   |---|---|---|
   | Sales | Accounts | Catering |
   | 4 Hill Road, Anytown, B State | 17 High Street, Anytown, B State | 42, Forest Road, Anytown, B State |
   | 6/11/1977 | 4/10/1977 | 2/3/1963 |

   b.

Toyota	Proton	Honda
Altis	Saga	Accord
1.6 litre	1.3 litre	2.0
Red	Blue	Silver
2013	2010	2008
WWW 1234	BHL 5678	JPN 8324

2. Draw a class diagram for the following classes. Indicate all the associations between the classes in your diagram.

   - A customer owns zero, one or several ticket(s)
   - A ticket is owned by exactly one customer.
   - Each ticket consists of 1 to 4 coupons.
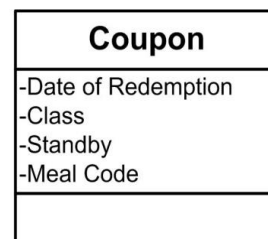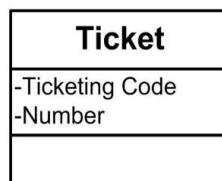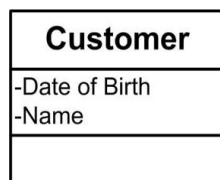
3. Generalization and Inheritance: Design the class diagram for following classes using Generalization relation.
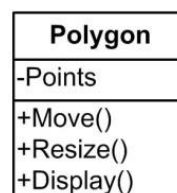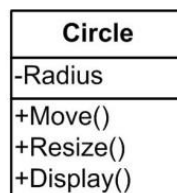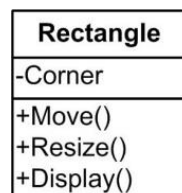
4. From each of the following paragraphs, prepare a list of nouns that may be useful as classes. Then go through your list and reject any nouns that will

not make useful classes; give a reason for each rejection. List the nouns that you retain as classes.

   a. ABC is a small family firm that hires out cars. A car is bought in new or nearly new from a dealer and is given an initial check. It is then available for hire. Between each separate hiring, the car is given a service and a clean for the next customer. When a car reaches a certain mileage, it is sold.

   b. A credit card company with 6.5 million cardholders arrangements with 500,000 retailers who accept the cards. The retailers include hotels, shops, travel agencies, garages and restaurants. When a card holder wishes to buy something, he or she presents the card to the retailer. If the sale is for more than RM5000, the retailer then telephones the credit card company to check that the customer has sufficient credit. If the sale is authorized, the transaction is carried out using a 2-part voucher, which record details of the customer, the retailer and the transaction. Details of the transaction are also included on the monthly statement which is sent to the cardholder.

5. Draw a class diagram to link the following classes using aggregation, inheritance and multiplicity where appropriate:

   Zoo, Animal, Bird, Mammal, Reptile, Cage, Keeper

6. **Read the case study and answer questions 7(a) and (b).**

   A small dairy company wants to automate orders and payment on their milk rounds. Each milkman sets off on his round with the products that he is going to deliver and his list of customer requirements. As he comes to each house on his list, he checks to see what products are required. Customers have standing orders. If a customer wants to alter the order temporarily, this is classed as an exception (e.g. "1 extra pint today", "6 yogurts on Thursday"). From time to time, the dairy offers certain products at a special rate; orders for these products are known as promotion orders. All orders, Standing, Exception and Promotion, consist of individual order lines for each product ordered. On Fridays the milkman comes round to collect money. Most customers pay cash weekly, although some pay monthly by cheque.

a) Draw a class diagram to represent this information. Where appropriate, your diagram should include association, aggregation, inheritance and multiplicity.
b) List sample attributes and operations for the class Order, Order Line, Standing Order, and Exception Order.

7. **Read the case study and identify the main entity classes to model a class diagram. In your class diagram, define associations between the classes, specify multiplicity, and attributes that you find appropriate. Apply aggregation, composition and generalization concepts, if applicable.**

XYZ is the leading film exhibitor and distributor in Malaysia. It has 30 cinema branches all over Malaysia. XYZ provides an Online Movie Booking System to minimise operation cost and increase ticket sales. Each cinema consists of many rooms and each room has many seats. Room and seat information such as room number, room type, seat number and seat type are recorded in the system.

Cinema manager can schedule, reschedule and correct the timetable of each cinema. A movie timetable consists of schedule screening sessions for all the movies. Every movie will be scheduled to at least one screening session. A room will be selected to screen a movie on a particular session.

All customers can search movie timetable to obtain available ticket for a session in any cinema specified by the customer. Only the registered customer is allowed to make online booking. A new customer needs to register a new account by entering personal details. The system will create a customer account if one does not already exist. When the account is created, the registered customer can proceed to login to the system.

To make a booking, a customer is required select a movie session and number of tickets. Next the customer can select seat number(s). After selecting the seat number(s), he/she can proceed to make a payment for the booking using credit card or debit card. The payment is subject for an approval from the Bank Credit Unit. Once payment has gone through successfully, the system will issue a booking confirmation by sending a notification to the customer via email. If the payment is rejected, customer will receive a failure notification.

Sales office in each cinema will use the system to manage all the booking confirmation. Sales office will generate monthly sales report to show the analysis of ticket sales for each branch.

8. The following diagram below is a class diagram of an Order Management System.
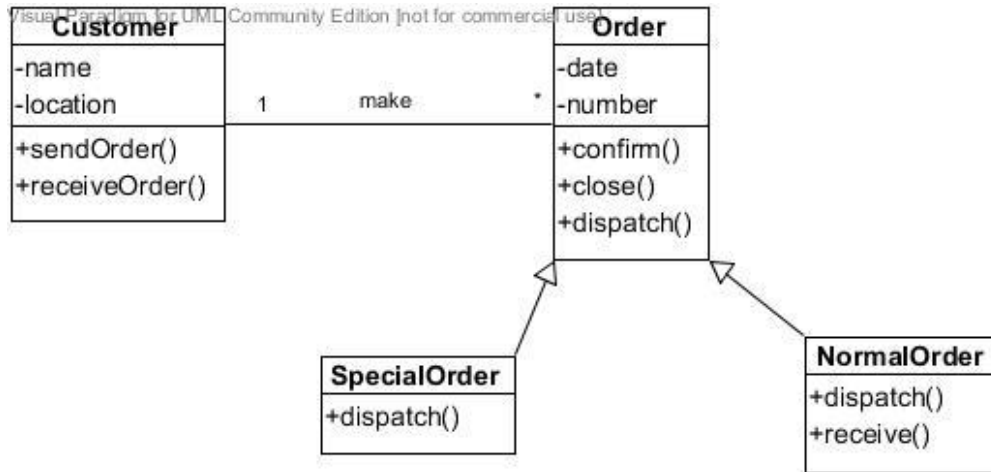
Draw an <u>object diagram</u>, which is an instance of the system at a particular time of purchase based on the following description:

The object diagram consists of the following objects:
- Customer
- Order
- SpecialOrder
- NormalOrder

Now the customer object (C) is associated with three order objects (O1, O2 and O3). These order objects are associated with special order and normal order objects (O1 has a special order, S1; O2 has a special order, S2 and O3 has a normal order, N1). The customer is having the three orders with different numbers (12, 32 and 40) for the particular time considered.

For orders the values are 12, 32, and 40 which implies that the objects are having these values for the particular moment (here the particular time when the purchase is made is considered as the moment) when the instance is captured. The same is for special order and normal order objects which are having number of orders as 20, 30 and 60.

9. Here is a situation which involves a family getting the father's tea. The father, who has a responsibility to satisfy his hunger, tells the mother to get his tea; in order to do this, the mother collaborates with her children, telling them to peel the potatoes, fry the sausages and put the kettle on for tea.

   Draw CRC cards for the father, mother, and children to illustrate the responsibilities and collaborations in this situation.