Questions:

1. Answer the following questions:

   a. Just by observing the tables below, what would you choose as the primary key of each table?

      - <u>Salesreps</u>: EMPL_NUM
      - <u>Offices</u>: OFFICE
      - <u>Customers</u>: CUST_NUM
      - <u>Orders</u>: ORDER_NUM
      - <u>Products</u>: MFR_ID & PRODUCT_ID (Composite Primary Key)

   b. Based on the explanation of the attributes given on pages 2 – 5, write down all the foreign keys. For example, if you think that Rep_Office is a foreign key in the Salesreps table, you should write:
      "Rep_Office is a foreign key in the Salesreps table because it refers to the primary key (office attribute) of the offices table."
      Do the same for every foreign key that you find in the entire database.

   - **<u>Salesreps</u>**:
      - **Rep_Office** is a foreign key in the **Salesreps** table because it refers to the primary key (*office* attribute) of the *offices* table.
      - **Manager** is a foreign key in the **Salesreps** table because it recursively refers to the primary key (*empl_num* attribute) of the same table (*salesrep* table).
   - **<u>Offices</u>**:
      - **Mgr** is a foreign key in the **Offices** table because it refers to the primary key (*empl_num* attribute) of the *salesrep* table.
   - **<u>Customers</u>**:
      - **Cust_Rep** is a foreign key in the **Customers** table because it refers to the primary key (*empl_num* attribute) of the *salesrep* table.
   - **<u>Orders</u>**:
      - **Cust** is a foreign key in the **Orders** table because it refers to the primary key (*cust_num* attribute) of the *customers* table.
      - **Rep** is a foreign key in the **Orders** table because it refers to the primary key (*empl_num* attribute) of the *salesrep* table.
      - **Mfr & Product** is a composite foreign key in the **Orders** table because it refers to the composite primary key (*Mfr_id & Product_id* attribute) of the *products* table.
   - **<u>Products</u>**: None

2. **-1** It is true that in the office table, "Office" by itself is a primary key. Suppose we do not want "office ID" to be the primary key or be part of a "Composite Primary key," and we prefer "City" to the primary key or part of the Primary Key. What assumption(s) must you make to make "City" the primary key or part of the primary key? Note that you can add column(s) that may not exist to the table. **Hint: Some cities like "San Marcos" may exist in multiple states.**

If we want to use the city as our primary key, we must ensure those attributes are unique. However, many city names in the United States are quite common and used often, like Austin, San Marcos, Columbus, Greenville, Springfield, etc. Therefore, we could not use the city name as our primary key.

If we wanted to use the name of a city as a part of the primary key, we would need to be able to ensure that we are referring to the correct city and that there is only one office per city. We could add a column for State, but we would also need to add a column for Zipcode because some states might have multiple cities with the same name. Additionally, places like New York City are quite large for a city, so it is good also to have the Zipcode. And finally, for multiple offices in one city, we could use the office's street address. So the extra columns would be: (Office_Address | City | Zipcode).

3. What is the difference between primary key and candidate key?

The primary key is a column or combination of two or more columns that uniquely identifies each row of a table. A candidate key could have been chosen as the primary key for the table but was not chosen. Therefore the difference between primary key and candidate key is just simply based on which one is chosen.

➔ How many primary key(s) a table can have? A table can only have **one** primary key.

➔ How many Foreign keys can a table have? A table can have **many** foreign keys.

➔ How many candidate keys a table can have? A table can have **multiple** candidate keys.

4. Suppose you have a city table with the following attributes: (Assume that we are only considering cities and states in the US.)

➢ || State | City Name | Zip code | Population | Region ||

○ Is there any problem with choosing Population as a primary key? Explain.

Yes, there is a problem with choosing "Population" as the primary key because a good primary key does not change often and is unique. Populations fluctuate, and two cities could potentially have the same population.

○ Is there any problem with choosing a Zip code as a primary key? Explain.

Yes, there is a problem with choosing just the zip code as a primary key because a zip code might overlap multiple cities. Like 91601 is used in both Burbank and North Hollywood. Zip codes are pointers to an area, not a specific city. There is also the issue of a city having multiple zip codes, San Diego has 81 zip codes.

Salesreps Table:

EMPL_NUM	NAME	AGE	REP_OFFICE	TITLE	HIRE_DATE	MANAGER	QUOTA	SALES
105	Bill Adams	37	13	Sales Rep	12-FEB-88	104	$350,000	$367,911
109	Mary Jones	31	11	Sales Rep	12-OCT-89	106	$300,000	$392,725
102	Sue Smith	48	21	Sales Rep	10-DEC-86	108	$350,000	$474,050
106	Sam Clark	52	11	VP Sales	14-JUN-88		$275,000	$299,912
104	Bob Smith	33	12	Sales Mgr	19-MAY-87	106	$200,000	$142,594
101	Dan Roberts	45	12	Sales Rep	20-OCT-86	104	$300,000	$305,673
110	Tom Snyder	41		Sales Rep	13-JAN-90	101		$75,985
108	Larry Fitch	62	21	Sales Mgr	12-OCT-89	106	$350,000	$361,865
103	Paul Cruz	29	12	Sales Rep	01-MAR-87	104	$275,000	$286,775
107	Nacy Angelli	49	22	Sales Rep	14-NOV-88	108	$300,000	$186,042

Offices Table:

OFFICE	CITY	REGION	MGR	TARGET	SALES
22	Denver	Western	108	$300,000	$186,042
11	New York	Eastern	106	$575,000	$692,637
12	Chicago	Eastern	104	$800,000	$735,042
13	Atlanta	Eastern	105	$350,000	$367,911
21	Los Angeles	Western	108	$725,000	$835,915

Orders Table:

ORDER_NUM	ORDER_DAT	CUST	REP	MFR	PRODU	QTY	AMOUNT
112961	17-Dec-89	2117	106	REI	2A44L	7	$31,500
113012	11-Jan-90	2111	105	ACI	41003	35	$3,745
112989	03-Jan-90	2101	106	FEA	114	6	$1,458
113051	10-Feb-90	2118	108	QSA	K47	4	$1,420
112968	12-Oct-89	2102	101	ACI	41004	34	$3,978
113036	30-Jan-90	2107	110	ACI	4100Z	9	$22,500
113045	02-Feb-90	2112	108	REI	2A44R	10	$45,000
112963	17-Dec-89	2103	105	ACI	41004	28	$3,276
113013	14-Jan-90	2118	108	BIC	41003	1	$652
113058	23-Feb-90	2108	109	FEA	112	10	$1,480
112997	08-Jan-90	2124	107	BIC	41003	1	$652
112983	27-Dec-89	2103	105	ACI	41004	6	$702
113024	20-Jan-90	2114	108	QSA	XK47	20	$7,100
113062	24-Feb-90	2124	107	FEA	114	10	$2,430
112979	12-Oct-89	2114	102	ACI	4100Z	6	$15,000
113027	22-Jan-90	2103	105	ACI	41002	54	$4,104
113007	08-Jan-90	2112	108	IMM	773C	3	$2,925
113069	02-Mar-90	2109	107	IMM	775C	22	$31,350
113034	29-Jan-90	2107	110	REI	2A45C	8	$632
112992	04-Nov-89	2118	108	ACI	41002	10	$760
112975	12-Oct-89	2111	103	REI	2A44G	6	$2,100
113055	15-Feb-90	2108	101	ACI	4100X	6	$150
113048	10-Feb-90	2120	102	IMM	779C	2	$3,750
112993	04-Jan-89	2106	102	REI	2A45C	24	$1,896
113065	27-Feb-90	2106	102	QSA	XK47	6	$2,130
113003	25-Jan-90	2108	109	IMM	779C	3	$5,625
113049	10-Feb-90	2118	108	QSA	XK47	2	$776
112987	31-Dec-89	2103	105	ACI	4100Y	11	$27,500
113057	18-Feb-90	2111	103	ACI	4100X	24	$600
113042	02-Feb-90	2113	101	REI	2A44R	5	$22,500

Customers Table:

CUST_NUM	COMPANY	CUST_REP	CREDIT_LIMIT
2111	JCP Inc.	103	$50,000
2102	First Corp.	101	$65,000
2103	Acme Mfg.	105	$108,000
2123	Carter and Sons	102	$40,000
2107	Ace International	110	$35,000
2115	Smithson Corp.	101	$20,000
2101	Jones Mfg.	106	$65,000
2112	Zetacorp	108	$108,000
2121	QMA Assoc.	103	$45,000
2114	Orion Corp.	102	$43,200
2124	Peter Brothers	107	$40,000
2108	Holm and Landis	109	$55,000
2117	J.P. Sinclair	106	$35,000
2122	Three-Way Lines	105	$30,000
2120	Rico Enterprises	102	$50,000
2106	Fred Lewis Corp.	102	$65,000
2119	Solomon Inc.	109	$25,000
2118	Midwest Systems	108	$60,000
2113	Ian and Schmidt	104	$20,000
2109	Chen Associates	103	$25,000
2105	AAA Investments	101	$45,000

Products Table:

MFR	PRODU	DESCRIPTION	PRICE	QTY_ON_HAND
REI	2A45C	RATCHET LINK	$79	210
ACI	4100Y	WIDGET REMOVER	$2,750	25
QSA	XK47	REDUCER	$355	38
BIC	41672	PLATE	$180	0
IMM	779C	900-LB BRACE	$1,875	9
ACI	41003	SIZE 3 WIDGET	$107	207
ACI	41004	SIZE 4 WIDGET	$117	139
BIC	41003	HANDLE	$652	3
IMM	887P	BRACE PIN	$250	24
QSA	XK48	REDUCER	$134	203
REI	2A44L	LEFT HINGE	$4,500	12
FEA	112	HOUSING	$148	115
IMM	887F	BRACE HOLDER	$54	223
BIC	41089	RETAINER	$225	78
ACI	41001	SIZE 1 WIDGET	$55	277
IMM	775C	500-LB BRACE	$1,425	5
ACI	4100Z	WIDGET INSTALLER	$2,500	28
QSA	XK48A	REDUCER	$177	37
ACI	41002	SIZE 2 WIDGET	$76	167
REI	2A44R	RIGHT HINGE	$4,500	12
IMM	773C	300-LB BRACE	$975	28
ACI	4100X	WIDGET ADJUSTER	$25	37
FEA	114	MOTOR MOUNT	$243	15
IMM	887X	BRACE RETAINER	$475	32
REI	2A44G	HINGE PIN	$350	14