

1. Details of a new driver cannot be entered into the system unless a delivery is recorded for this driver.

How could a brand new driver's details be entered when they will not yet have made a delivery?

b. A range check could be applied to only allow entries where the date of birth would ensure the driver is greater than 18 (and less than 65).

A further constraint could be to ensure that a strict date type is used, such as enforcing a 4 digit year entry.

2. a. Paul Campbell could change his name or his license number when it is to be renewed. This would result in the unique identifier having to be changed, and any related records using the identifier would also have to be changed, which could be problematic.

If any other taxi driver has the same license number number and initials as Paul, then the identifier will not be unique.

3. a. A foreign key is an attribute which exists in an entity and exists as the primary key in another related entity.

b. Referential integrity is ensuring that no value of a foreign key can exist in a table unless the value is already in existence in the related table where the attribute is the primary key.

4. a. 1 : M

b. 1 : 1

5. Normalising from 2NF to 3NF removes non-key dependencies to a new entity along with a copy of the attribute the dependency is based on
6. A boolean data type would be a field where the values would be strictly yes or no.
7. Cost refers to the **monetary** aspect required to obtain information.
Value refers to the level of **importance** information has to an organisation.
8. Pagination is the process of dividing information into discrete pages, and includes the setting of aspects such as page numbering, page breaks and widow and orphan control.
9. An Executive Information System is used to allow senior managers to summarise data for reports by drilling down to data in lower level systems, thus allowing decisions to be made.
10. A distributed database is one in which different tables are stored in physically different locations, yet organised such that any machine on the network can access all the required data.
11. Critical Path Analysis and Resource Allocation.

12. A macro could be created by choosing to record keystrokes and then assigning them to a named macro. The macro could then be used by invoking a key press, which would be assigned during the macro creation.

13. Yes, under the terms of the Freedom of Information Act such information should be released for public bodies, of which schools and councils are examples of.

UNF

Customer (Customer name

Hires Address

Account contact

Contact telephone number

Car Registration

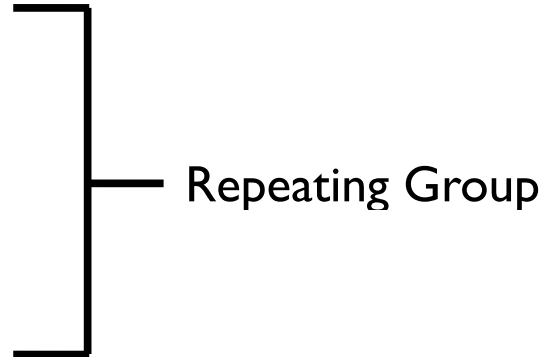
Date

Drop-off Location

Model

Hire Cost

No. Of Seats)



INF

Customer (Customer name
Address
Account contact
Contact telephone number

Hire (Car Registration
Date
Drop-off Location
Model
Hire Cost
No. Of Seats
Customer name)*

For key (and identification of partial dependencies)

Cars are hired per day - a particular registration can only appear once per day

| Car registration | Date | Drop off Location | Model | Hire Cost | No of seats | Customer Name |
|------------------|------------|-------------------------|--------------------|-----------|-------------|--------------------|
| PK12 DYU | 05/01/2011 | 3 Drumoak Place, Forfar | Lamborghini Spyder | £1200.00 | 2 | Main Entertainment |
| SO59 DCZ | 07/01/2011 | Glasgow Airport | Porshe Cayman | £980.00 | 2 | Main Entertainment |
| PK12 DYU | 02/02/2011 | Edinburgh Airport | Lamborghini Spyder | £1200.00 | 2 | Main Entertainment |
| TY11 HSJ | 02/02/2011 | Glasgow Airport | Koenigsegg CCX | £1500.00 | 2 | PLM Associates |
| SO59 DCZ | ? | ? | Koenigsegg CCX | £1500.00 | 2 | ? |

2NF

Customer (Customer name
Address
Account contact
Contact telephone number)

Hire (Car Registration *
Date
Drop-off Location
Customer name *)

Car (Car Registration
Model
Hire Cost
No. Of Seats)

For key (and identification of partial dependencies)

| Car registration | Date | Drop off Location | Model | Hire Cost | No of seats | Customer Name |
|------------------|------------|-------------------------|--------------------|-----------|-------------|--------------------|
| PK12 DYU | 05/01/2011 | 3 Drumoak Place, Forfar | Lamborghini Spyder | £1200.00 | 2 | Main Entertainment |
| SO59 DCZ | 07/01/2011 | Glasgow Airport | Porsche Cayman | £980.00 | 2 | Main Entertainment |
| PK12 DYU | 02/02/2011 | Edinburgh Airport | Lamborghini Spyder | £1200.00 | 2 | Main Entertainment |
| TY11 HSJ | 02/02/2011 | Glasgow Airport | Koenigsegg CCX | £1500.00 | 2 | PLM Associates |
| SO59 DCZ | ? | ? | Koenigsegg CCX | £1500.00 | 2 | ? |

3NF

Customer (Customer name
Address
Account contact
Contact telephone number

Hire (Car Registration *
Date
Drop-off Location
Customer name *)

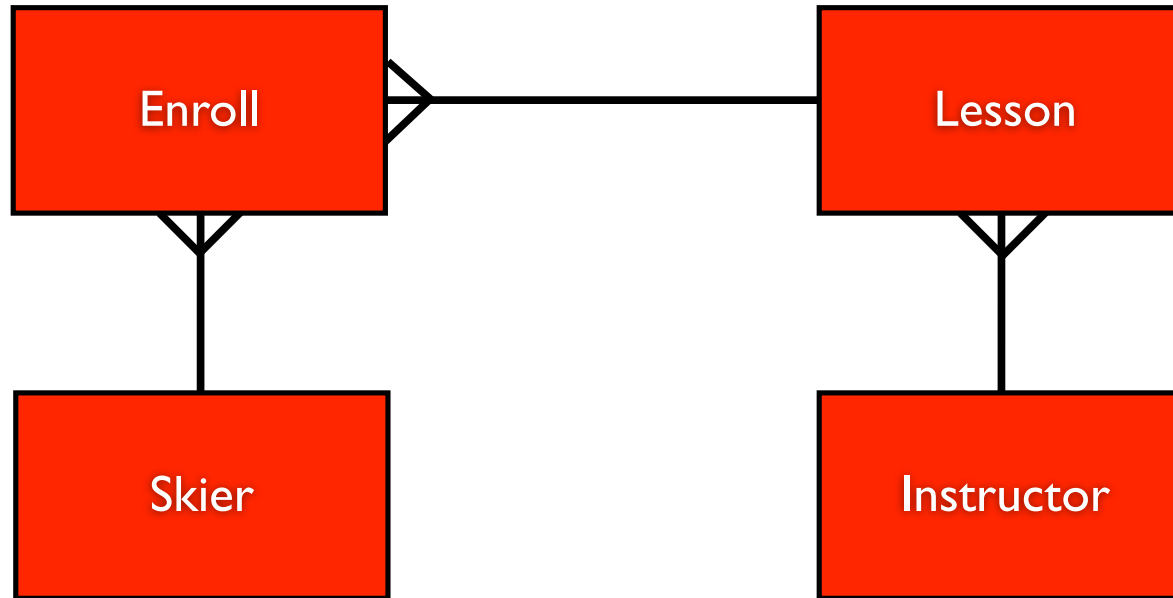
Car (Car Registration
Model *)

Model (Model
Hire Cost
No. Of Seats)

For identification of non-key dependencies

| Car registration | Model | Hire Cost | No of seats |
|------------------|--------------------|-----------|-------------|
| PK12 DYU | Lamborghini Spyder | £1200.00 | 2 |
| SO59 DCZ | Porsche Cayman | £980.00 | 2 |
| PK12 DYU | Lamborghini Spyder | £1200.00 | 2 |
| TY11 HSJ | Koenigsegg CCX | £1500.00 | 2 |
| ? | Lamborghini Spyder | £1200.00 | 2 |

15. a.



b. A - Lookup value from instructor table

B - Text

C - > 0 and < 30 (any appropriate range check - a range check can always be applied to a numeric field)

c. Entity integrity has not been forced. `Instructor_id` is the key and is empty in the first record shown. This breaks entity integrity in that the primary key should never be null (empty). Also, `instructor_id 9287` appears twice. This breaks the second aspect of entity integrity, which states that primary key values should be unique.

d. Object.

16. a. Supporting legacy systems allows the company to maintain support for older pieces of essential software which cannot perhaps be upgraded. This will save the company time and money in their upgrade process.

Technological change happens very rapidly, and future proofing allows the company to meet the challenges of tomorrow with the hardware of today. Ensuring that machines have the fastest processor, the maximum available memory etc. should allow future software developments to run on machines without the need to buy new hardware.

b. Emulation is a means of running old obsolete software on new hardware by making the new machine behave as if it is an older machine which supports the software. An example is having PCs run computer games created for old game platforms such as the Sega Mega drive.

c. In-house training is delivered by staff within an organisation, which can be tailored exactly to the needs of the company.

External courses involve staff going to a training centre for training delivered by an expert in the field. This can be very expensive, but the trainer is likely to be highly accomplished in the field.

d. Identification of network topology.

Network hardware - servers, switches, cabling etc.

Network software - network operating system, monitoring and auditing software.

Network management - setting of access rights, security, storage capacity, network location etc.

e. Ensure employees have regular breaks from computers and ensure that appropriate lighting is in place in offices.

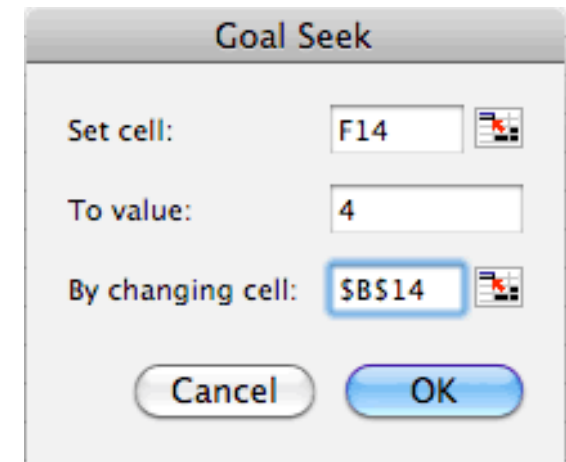
17. a. $F14 = \text{Count} (F2:F12)$

b. $F2 = \text{IF} (E2 > B14, E2 - B14, "")$

c. Choose the Goal Seek Function in cell F14.

Choose to set this target value to 4 by altering the value in cell B14.

Apply the goal seek.



18. a. Calendar - Used to arrangement appointments and meetings with friends etc.

Contacts - Details of friends names, addresses, emails etc. can be stored for quick access.

b. A persona is an online identity (possibly including an avatar) which represents a person on an online facility such as SocialNet.

c. The Data Protection Act means that SocialNet must adequately secure data held because it is of a personal nature. They should also ensure that personal data is correct, up to date and only shared with the knowledge and blessing of data subjects (SocialNet members).

22. a. (i). Downy tree (family = birch, height = 21, young_colour = reddish-brown, mature_colour = greyish-white, bark = horizontal grooves, leaves = single row of teeth)
 (ii).

| family | height | young_colour | mature_colour | bark | leaves | tree |
|--------|--------|---------------|---------------|--------------------|---------------------|--------|
| birch | 21 | reddish-brown | greyish-white | horizontal grooves | single row of teeth | downy |
| birch | 30 | reddish-brown | white | black patches | double row of teeth | silver |
| beech | 40 | grey | grey | fissured | lobed | oak |

(iii). IF family IS “birch”
 AND height IS “21”
 AND young-colour IS “reddish-brown”
 AND mature_colour IS “greyish-white”
 AND bark IS “ ”
 AND leaves ARE “ ”
 THEN tree IS “downy”

(iii). IF family IS “birch”
 AND height IS “30”
 AND young-colour IS “reddish-brown”
 AND mature_colour IS “white”
 AND bark IS “ ”
 AND leaves ARE “ ”
 THEN tree IS “downy”

(iii). IF family IS “beech”
 AND height IS “40”
 AND young-colour IS “grey”
 AND mature_colour IS “grey”
 AND bark IS “ ”
 AND leaves ARE “ ”
 THEN tree IS “oak”

22. b. In a RDBMS, the user would access the tree information by performing a **query** using one or more **fields**. This would then return a list of one or more **records** that match the criteria of the query.

In an expert system, the tree information is accessed by running a **consultation** session with the system. The user would then answer **questions** given in the **user interface** until such time as the system provides a piece of **advice** (or possibly more than one) that is in line with the user's answers.

c. (i). The programmer may have incorrectly coded the system.

The knowledge engineer may have misrepresented the information from the domain expert which would have resulted in the system being coded incorrectly.

(ii). At the **knowledge acquisition** stage the domain expert may have provided misleading information.

23. a. 1, 2, 3 and 5

b. 2

c. Conflict resolution strategies are required as at any stage during a consultation there may be more than one rule which can be fired (all the conditions of the rule are known as facts in working memory). Conflict resolution decided which of these rules should fire.

d. $W \wedge \neg E \rightarrow Y$

24. a. Prospector domain: Mineral geology

Category: Advice

Main Characteristics: Used fuzzy logic to handle uncertainty

Results very closely matched those provided by human expert

b. Information is structured data, given meaning and context. Knowledge is derived from information and produces new information - knowledge occurs when information is understood.

25. a. CF conclusion = CF rule x Min (CF conditions)

$$\text{CF} = 70\% \times \text{Min} (20\%, 40\%, 60\%)$$

$$\text{CF} = 70\% \times 20\%$$

$$\text{CF} = 14\%$$

b. CF (Spain) : 80% x Min (20%, 40%, 60%)

$$80\% \times 20\% = 16\%$$

CF (Mexico) : 90% x Min (90%, 70%, 60%)

$$90\% \times 60\% = 54\%$$

Advice is choose **Mexico**, because it has a higher certainty factor than any of the other rules that could fire.

c. (i). Having the slider makes it easy for a user to choose their level of belief in the answers to the questions that they provide. However, it does not display an exact value on the slider so may prove a little problematic in this respect.

Why justification is clearly highlighted for the user to use as and when required.

(Assume that an option for How justification will be displayed on production of advice).

User chooses answers from pre-defined options which means no errors are likely to occur through poorly spelt user input.

Perhaps too limited a number of choices for holiday-type displayed, but this is not an issue with the user interface.

25. c. (ii). Another component is the knowledge base, where the facts and rules are stored in the system.

The 3rd component is the inference engine, which applies the facts to the rules and determines the order in which questions are asked of the user. It also decides when advice can be generated.