**ISEM 3006 Data Management in Business**

**Semester 1 2020/21**

**Exercise 1 Answer (ALL)**

**On Relational Algebra**

1. List the disc ID and movie number for those discs with cost higher than 120 and are held by the branch with branch number equal to 88.

RESTRICT Cost > 120 AND BranchNo = 88 ON Disc 🡪 DiscCost120orMore88

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DiscID | MovieNo | DatePurchased | Cost | BranchNo |
| 1001 | 1 | 2015-09-15 | 200 | 88 |
| 3001 | 3 | 2016-11-10 | 150 | 88 |

PROJECT DiscID, MovieNo FROM DiscCost120orMore88 🡪 Result

|  |  |
| --- | --- |
| DiscID | MovieNo |
| 1001 | 1 |
| 3001 | 3 |

1. List the movie number and the movie title of the discs that are held by the branch with address ’20 Renfrew Road’.

Disc EQUIJOIN Branch ON Disc.BranchNo = Branch.BranchNo 🡪 BranchHeldDisc

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| discid | movieno | datepurchased | cost | disc.branchno | branch.branchno | branchaddress | branchphone |
| 1001 | 1 | 2015-09-15 | 200 | 88 | 88 | 111, Happy Village | 3422-6789 |
| 1002 | 1 | 2015-09-25 | 200 | 99 | 99 | 20, Renfrew Road | 3455-9987 |
| 2001 | 2 | 2016-07-04 | 300 | 99 | 99 | 20, Renfrew Road | 3455-9987 |
| 3001 | 3 | 2016-11-10 | 150 | 88 | 88 | 111, Happy Village | 3422-6789 |
| 3002 | 3 | 2017-02-22 | 120 | 99 | 99 | 20, Renfrew Road | 3455-9987 |
| 4001 | 4 | 2016-05-09 | 300 | 99 | 99 | 20, Renfrew Road | 3455-9987 |
| 3003 | 3 | 2017-05-05 | 120 | 44 | 44 | 88, Lucky Drive | 3466-8899 |
| 1003 | 1 | 2018-02-27 | 100 | 88 | 88 | 111, Happy Village | 3422-6789 |
| 1004 | 1 | 2018-03-15 | 85 | 99 | 99 | 20, Renfrew Road | 3455-9987 |

BranchHeldDisc EQUIJOIN Movie Disc.MovieNo = Movie.MovieNo 🡪 BranchHeldDiscMovie

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| discid | Disc.  movieno | datepurchased | cost | disc.  branchno | branch.  branchno | branchaddress | branchphone | Movie.  movieno | movietitle | releasedate | charge | category |
| 1001 | 1 | 2015-09-15 | 200 | 88 | 88 | 111, Happy Village | 3422-6789 | 1 | Batman Ultimate | 2015-09-01 | 20 | Action |
| 1002 | 1 | 2015-09-25 | 200 | 99 | 99 | 20, Renfrew Road | 3455-9987 | 1 | Batman Ultimate | 2015-09-01 | 20 | Action |
| 2001 | 2 | 2016-07-04 | 300 | 99 | 99 | 20, Renfrew Road | 3455-9987 | 2 | Happy Life | 2016-07-03 | 10 | Thriller |
| 3001 | 3 | 2016-11-10 | 150 | 88 | 88 | 111, Happy Village | 3422-6789 | 3 | A Christmas Story | 2016-11-05 | 5 | Drama |
| 3002 | 3 | 2017-02-22 | 120 | 99 | 99 | 20, Renfrew Road | 3455-9987 | 3 | A Christmas Story | 2016-11-05 | 5 | Drama |
| 4001 | 4 | 2016-05-09 | 300 | 99 | 99 | 20, Renfrew Road | 3455-9987 | 4 | Pyramid Raider | 2013-11-15 | 10 | Action |
| 3003 | 3 | 2017-05-05 | 120 | 44 | 44 | 88, Lucky Drive | 3466-8899 | 3 | A Christmas Story | 2016-11-05 | 5 | Drama |
| 1003 | 1 | 2018-02-27 | 100 | 88 | 88 | 111, Happy Village | 3422-6789 | 1 | Batman Ultimate | 2015-09-01 | 20 | Action |
| 1004 | 1 | 2018-03-15 | 85 | 99 | 99 | 20, Renfrew Road | 3455-9987 | 1 | Batman Ultimate | 2015-09-01 | 20 | Action |

RESTRICT BranchAddress = '20 Renfrew Road' ON BranchHeldDiscMovie 🡪 DiscMoiveHeldByRenfrew

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| discid | Disc.  movieno | datepurchased | cost | disc.  branchno | branch.  branchno | branchaddress | branchphone | Movie.  movieno | movietitle | releasedate | charge | category |
| 1002 | 1 | 2015-09-25 | 200 | 99 | 99 | 20, Renfrew Road | 3455-9987 | 1 | Batman Ultimate | 2015-09-01 | 20 | Action |
| 2001 | 2 | 2016-07-04 | 300 | 99 | 99 | 20, Renfrew Road | 3455-9987 | 2 | Happy Life | 2016-07-03 | 10 | Thriller |
| 3002 | 3 | 2017-02-22 | 120 | 99 | 99 | 20, Renfrew Road | 3455-9987 | 3 | A Christmas Story | 2016-11-05 | 5 | Drama |
| 4001 | 4 | 2016-05-09 | 300 | 99 | 99 | 20, Renfrew Road | 3455-9987 | 4 | Pyramid Raider | 2013-11-15 | 10 | Action |
| 1004 | 1 | 2018-03-15 | 85 | 99 | 99 | 20, Renfrew Road | 3455-9987 | 1 | Batman Ultimate | 2015-09-01 | 20 | Action |

PROJECT Moive.MovieNo, MovieTitle FROM DiscMoiveHeldByRenfrew 🡪 Result

|  |  |
| --- | --- |
| Movie.  movieno | movietitle |
| 1 | Batman Ultimate |
| 2 | Happy Life |
| 3 | A Christmas Story |
| 4 | Pyramid Raider |

1. List the branch number and branch address of the branches that do not hold any disc.

Branch LEFT OUTER JOIN Disc ON Branch.BranchNo = Disc.BranchNo 🡪 AllBranchDisc

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| branch.  branchno | branchaddress | branchphone | discid | movieno | datepurchased | cost | disc.  branchno |
| 88 | 111, Happy Village | 3422-6789 | 1001 | 1 | 2015-09-15 | 200 | 88 |
| 99 | 20, Renfrew Road | 3455-9987 | 1002 | 1 | 2015-09-25 | 200 | 99 |
| 99 | 20, Renfrew Road | 3455-9987 | 2001 | 2 | 2016-07-04 | 300 | 99 |
| 88 | 111, Happy Village | 3422-6789 | 3001 | 3 | 2016-11-10 | 150 | 88 |
| 99 | 20, Renfrew Road | 3455-9987 | 3002 | 3 | 2017-02-22 | 120 | 99 |
| 99 | 20, Renfrew Road | 3455-9987 | 4001 | 4 | 2016-05-09 | 300 | 99 |
| 44 | 88, Lucky Drive | 3466-8899 | 3003 | 3 | 2017-05-05 | 120 | 44 |
| 88 | 111, Happy Village | 3422-6789 | 1003 | 1 | 2018-02-27 | 100 | 88 |
| 99 | 20, Renfrew Road | 3455-9987 | 1004 | 1 | 2018-03-15 | 85 | 99 |
| 55 | 53 Good Mall | 5566-1234 |  |  |  |  |  |

RESTRICT DiscID IS NULL ON AllBranchDisc 1 🡪 BranchHoldNoDisc

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| branch.  branchno | branchaddress | branchphone | discid | movieno | datepurchased | cost | disc.  branchno |
| 55 | 53 Good Mall | 5566-1234 |  |  |  |  |  |

PROJECT Branch.BranchNo, BranchAddress FROM BranchHoldNoDisc 🡪 Result

(You have to PROJECT Branch.BranchNo instead of Disc.BranchNo, since Disc.BranchNo's value is NULL.)

|  |  |
| --- | --- |
| branch.  branchno | branchaddress |
| 55 | 53 Good Mall |

1. List the branch number and the address of the branches which hold at least one disc.

Branch EQUIJOIN Disc ON Branch.BranchNo = Disc.BranchNo 🡪 BranchHoldingDisc

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| branch.  branchno | branchaddress | branchphone | discid | movieno | datepurchased | cost | disc.  branchno |
| 88 | 111, Happy Village | 3422-6789 | 1001 | 1 | 2015-09-15 | 200 | 88 |
| 99 | 20, Renfrew Road | 3455-9987 | 1002 | 1 | 2015-09-25 | 200 | 99 |
| 99 | 20, Renfrew Road | 3455-9987 | 2001 | 2 | 2016-07-04 | 300 | 99 |
| 88 | 111, Happy Village | 3422-6789 | 3001 | 3 | 2016-11-10 | 150 | 88 |
| 99 | 20, Renfrew Road | 3455-9987 | 3002 | 3 | 2017-02-22 | 120 | 99 |
| 99 | 20, Renfrew Road | 3455-9987 | 4001 | 4 | 2016-05-09 | 300 | 99 |
| 44 | 88, Lucky Drive | 3466-8899 | 3003 | 3 | 2017-05-05 | 120 | 44 |
| 88 | 111, Happy Village | 3422-6789 | 1003 | 1 | 2018-02-27 | 100 | 88 |
| 99 | 20, Renfrew Road | 3455-9987 | 1004 | 1 | 2018-03-15 | 85 | 99 |

PROJECT Branch.BranchNo, BranchAddress FROM BranchHoldingDisc 🡪 Result

|  |  |
| --- | --- |
| branch.  branchno | branchaddress |
| 88 | 111, Happy Village |
| 99 | 20, Renfrew Road |
| 44 | 88, Lucky Drive |

1. List the branch number of the branches which hold discs of 'Drama' movie BUT NOT discs of 'Action' movie.

Disc EQUIJOIN Movie ON Disc.MovieNo = Movie.MovieNo 🡪 DiscMovieDetail

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DiscID | Disc. MovieNo | DatePurchased | Cost | BranchNo | Movie. MovieNo | MovieTitle | ReleaseDate | Charge | Category |
| 1001 | 1 | 2015-09-15 | 200 | 88 | 1 | Batman Ultimate | 2015-09-01 | 20 | Action |
| 1002 | 1 | 2015-09-25 | 200 | 99 | 1 | Batman Ultimate | 2015-09-01 | 20 | Action |
| 2001 | 2 | 2016-07-04 | 300 | 99 | 2 | Happy Life | 2016-07-03 | 10 | Thriller |
| 3001 | 3 | 2016-11-10 | 150 | 88 | 3 | A Christmas Story | 2016-11-05 | 5 | Drama |
| 3002 | 3 | 2017-02-22 | 120 | 99 | 3 | A Christmas Story | 2016-11-05 | 5 | Drama |
| 4001 | 4 | 2016-05-09 | 300 | 99 | 4 | Pyramid Raider | 2013-11-15 | 10 | Action |
| 3003 | 3 | 2017-05-05 | 120 | 44 | 3 | A Christmas Story | 2016-11-05 | 5 | Drama |
| 1003 | 1 | 2018-02-27 | 100 | 88 | 1 | Batman Ultimate | 2015-09-01 | 20 | Action |
| 1004 | 1 | 2018-03-15 | 85 | 99 | 1 | Batman Ultimate | 2015-09-01 | 20 | Action |

RESTRICT Category = 'Drama' ON DiscMovieDetail 🡪 DramaDisc

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DiscID | Disc. MovieNo | DatePurchased | Cost | BranchNo | Movie. MovieNo | MovieTitle | ReleaseDate | Charge | Category |
| 3001 | 3 | 2016-11-10 | 150 | 88 | 3 | A Christmas Story | 2016-11-05 | 5 | Drama |
| 3002 | 3 | 2017-02-22 | 120 | 99 | 3 | A Christmas Story | 2016-11-05 | 5 | Drama |
| 3003 | 3 | 2017-05-05 | 120 | 44 | 3 | A Christmas Story | 2016-11-05 | 5 | Drama |

PROJECT BranchNo FROM DramaDisc 🡪 BranchWithDrama

|  |
| --- |
| BranchNo |
| 88 |
| 99 |
| 44 |

RESTRICT Category = 'Action' ON DiscMovieDetail 🡪 ActionDisc

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DiscID | Disc. MovieNo | DatePurchased | Cost | BranchNo | Movie. MovieNo | MovieTitle | ReleaseDate | Charge | Category |
| 1001 | 1 | 2015-09-15 | 200 | 88 | 1 | Batman Ultimate | 2015-09-01 | 20 | Action |
| 1002 | 1 | 2015-09-25 | 200 | 99 | 1 | Batman Ultimate | 2015-09-01 | 20 | Action |
| 4001 | 4 | 2016-05-09 | 300 | 99 | 4 | Pyramid Raider | 2013-11-15 | 10 | Action |
| 1003 | 1 | 2018-02-27 | 100 | 88 | 1 | Batman Ultimate | 2015-09-01 | 20 | Action |
| 1004 | 1 | 2018-03-15 | 85 | 99 | 1 | Batman Ultimate | 2015-09-01 | 20 | Action |

PROJECT BranchNo FROM ActionDisc 🡪 BranchWithAction

|  |
| --- |
| BranchNo |
| 88 |
| 99 |

BranchWithDrama EXCEPT BranchWithAction 🡪 Result5

|  |
| --- |
| BranchNo |
| 44 |

(As discussed in lecture, you cannot just perform a DramaDisc EXCEPT ActionDisc to get the result. It will result in a table the same as DramaDisc since no two rows in the two the table are the same.)

1. Similar to (5), list the branch number, address and phone number of the branches which hold discs of 'Drama' movie BUT NOT discs of 'Action' movie.

The first 6 steps are the same as in Question 5

Result5 EQUIJOIN Branch ON Result5.BranchNo = Branch.BranchNo 🡪 BranchWithDramaButNoActionDetail

|  |  |  |  |
| --- | --- | --- | --- |
| Result5.BranchNo | Branch.BranchNo | BranchAddress | BranchPhone |
| 44 | 44 | 88 Lucky Drive | 3466-8899 |

PROJECT Branch.BranchNo, BranchAddress, BranchPhone FROM BranchWithDramaButNoActionDetail 🡪 Result

|  |  |  |
| --- | --- | --- |
| Branch.BranchNo | BranchAddress | BranchPhone |
| 44 | 88 Lucky Drive | 3466-8899 |

1. List the customer number of the customers who have rented ALL movies. (Note: All Movies, not all Discs. One movie may have multiple discs.)

Rental EQUIJOIN RentalItem ON Rental.RentalID = RentalItem.RentalID 🡪 CustomerRentalItem

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Rental. RentalID | RentalDate | CustomerNo | RentalItem. RentalID | DiscID | RentalCharge | DueDate | ReturnDate |
| 1 | 2016-11-10 | 678 | 1 | 1002 | 40 | 2016-11-16 | 2016-11-13 |
| 2 | 2017-05-15 | 678 | 2 | 2001 | 10 | 2017-05-16 | 2017-05-20 |
| 2 | 2017-05-15 | 678 | 2 | 3002 | 10 | 2017-05-21 |  |
| 2 | 2017-05-15 | 678 | 2 | 4001 | 15 | 2017-05-21 | 2017-05-20 |
| 3 | 2018-09-13 | 777 | 3 | 1002 | 20 | 2018-09-20 |  |
| 3 | 2018-09-13 | 777 | 3 | 4001 | 10 | 2018-10-30 |  |

CustomerRentalItem EQUIJOIN Disc ON RentalItem.DiscID = Disc.DiscID 🡪 CustomerRentedDisc

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rental. RentalID | RentalDate | CustomerNo | RentalItem. RentalID | RentalItem. DiscID | RentalCharge | DueDate | ReturnDate | Disc. DiscID | MovieNo | DatePurchased | Cost | BranchNo |
| 1 | 2016-11-10 | 678 | 1 | 1002 | 40 | 2016-11-16 | 2016-11-13 | 1002 | 1 | 2015-09-25 | 200 | 99 |
| 2 | 2017-05-15 | 678 | 2 | 2001 | 10 | 2017-05-16 | 2017-05-20 | 2001 | 2 | 2016-07-04 | 300 | 99 |
| 2 | 2017-05-15 | 678 | 2 | 3002 | 10 | 2017-05-21 |  | 3002 | 3 | 2017-02-22 | 120 | 99 |
| 2 | 2017-05-15 | 678 | 2 | 4001 | 15 | 2017-05-21 | 2017-05-20 | 4001 | 4 | 2016-05-09 | 300 | 99 |
| 3 | 2018-09-13 | 777 | 3 | 1002 | 20 | 2018-09-20 |  | 1002 | 1 | 2015-09-25 | 200 | 99 |
| 3 | 2018-09-13 | 777 | 3 | 4001 | 10 | 2018-10-30 |  | 4001 | 4 | 2016-05-09 | 300 | 99 |

PROJECT CustomerNo, MovieNo FROM CustomerRentedDisc 🡪 CustomerRentedMovie

|  |  |
| --- | --- |
| CustomerNo | MovieNo |
| 678 | 1 |
| 678 | 2 |
| 678 | 3 |
| 678 | 4 |
| 777 | 1 |
| 777 | 4 |

PROJECT MoiveNo FROM Movie 🡪 AllMovieNo

|  |
| --- |
| MovieNo |
| 1 |
| 2 |
| 3 |
| 4 |

CustomerRentedMovie DIVIDED BY AllMovieNo 🡪 CustomerRentedAllMovie

|  |
| --- |
| CustomerNo |
| 678 |

1. List the customer number of the customers who have rented ALL 'Action' movies.

Rental EQUIJOIN RentalItem ON Rental.RentalID = RentalItem.RentalID 🡪 CustomerRentalItem

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Rental. RentalID | RentalDate | CustomerNo | RentalItem. RentalID | DiscID | RentalCharge | DueDate | ReturnDate |
| 1 | 2016-11-10 | 678 | 1 | 1002 | 40 | 2016-11-16 | 2016-11-13 |
| 2 | 2017-05-15 | 678 | 2 | 2001 | 10 | 2017-05-16 | 2017-05-20 |
| 2 | 2017-05-15 | 678 | 2 | 3002 | 10 | 2017-05-21 |  |
| 2 | 2017-05-15 | 678 | 2 | 4001 | 15 | 2017-05-21 | 2017-05-20 |
| 3 | 2018-09-13 | 777 | 3 | 1002 | 20 | 2018-09-20 |  |
| 3 | 2018-09-13 | 777 | 3 | 4001 | 10 | 2018-10-30 |  |

CustomerRentalItem EQUIJOIN Disc ON RentalItem.DiscID = Disc.DiscID 🡪 CustomerRentedDisc

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rental. RentalID | RentalDate | CustomerNo | RentalItem. RentalID | RentalItem. DiscID | RentalCharge | DueDate | ReturnDate | Disc. DiscID | MovieNo | DatePurchased | Cost | BranchNo |
| 1 | 2016-11-10 | 678 | 1 | 1002 | 40 | 2016-11-16 | 2016-11-13 | 1002 | 1 | 2015-09-25 | 200 | 99 |
| 2 | 2017-05-15 | 678 | 2 | 2001 | 10 | 2017-05-16 | 2017-05-20 | 2001 | 2 | 2016-07-04 | 300 | 99 |
| 2 | 2017-05-15 | 678 | 2 | 3002 | 10 | 2017-05-21 |  | 3002 | 3 | 2017-02-22 | 120 | 99 |
| 2 | 2017-05-15 | 678 | 2 | 4001 | 15 | 2017-05-21 | 2017-05-20 | 4001 | 4 | 2016-05-09 | 300 | 99 |
| 3 | 2018-09-13 | 777 | 3 | 1002 | 20 | 2018-09-20 |  | 1002 | 1 | 2015-09-25 | 200 | 99 |
| 3 | 2018-09-13 | 777 | 3 | 4001 | 10 | 2018-10-30 |  | 4001 | 4 | 2016-05-09 | 300 | 99 |

PROJECT CustomerNo, MovieNo FROM CustomerRentedDisc 🡪 CustomerRentedMovie

|  |  |
| --- | --- |
| CustomerNo | MovieNo |
| 678 | 1 |
| 678 | 2 |
| 678 | 3 |
| 678 | 4 |
| 777 | 1 |
| 777 | 4 |

RESTRICT Category = 'Action' ON Movie 🡪 ActionMovieDetail

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MovieNo | MovieTitle | ReleaseDate | Charge | Category |
| 1 | Batman Ultimate | 2015-09-01 | 20 | Action |
| 4 | Pyramid Raider | 2013-11-15 | 10 | Action |

PROJECT MovieNo FROM ActionMovieDetail 🡪 ActionMovieNo

|  |
| --- |
| MovieNo |
| 1 |
| 4 |

CustomerRentedMovie DIVIDED BY ActionMovieNo 🡪 Result

|  |
| --- |
| CustomerNo |
| 678 |
| 777 |