You can preview this quiz, but if this were a real attempt, you would be blocked because:

This quiz is not currently available

Question **1** Not yet answeredMarked out of 25

(a) Consider a database consisting of `TradesPortfolio` and `Customers` tables shown below.

TradesPortfolio | Customers

TradeID	Strike	LowerBarrier	UpperBarrier	ExpiryDate	DeliveryDate	Notional	CustomerRef
1	112.5		114.5	02/06/2023	15/06/2023	120000000	ASN16
2	108.6	107.5		23/05/2023	25/05/2023	-25000000	BB631
3	112	109	115.6	02/06/2023	04/06/2023	-75000000	BS354
4	111.5			07/06/2023	10/06/2023	35000000	BB631
5	115.5	108	115	14/06/2023	18/06/2023	500000000	AAB39

TradesPortfolio | **Customers**

CustomerID	LegalName	Domicile	CollateralID	MarginLevel
AAB39	Citigroup	US	IX45	1
ASN16	Santander	Spain	KM12	2
BB631	JP Morgan	US	IY55	2
BS354	RBS	UK	JY394	2
NK212	Deutsche Bank	Germany	KL34	1

Display in table form the results of each of the following SQL queries (you might use the characters **|**, **!**, **-** or **_** to help display the table in the text response):

(i) [4 marks]

```
SELECT
   TradeID, Strike
FROM
   TradesPortfolio
WHERE
   Strike > 112;
```

(ii) [5 marks]

```
SELECT
   TradeID, Ccur(ABS(Notional)*MarginLevel/10000) AS Commission
FROM
   TradesPortfolio, Customers
WHERE
   TradesPortfolio.CustomerRef = Customers.CustomerID
AND
   LegalName = 'JP Morgan';
```

(b) [5 marks] For the TradesPortfolio table above, it has been discovered that a typo has been made, and in fact, LowerBarrier and UpperBarrier field values for TradeID 3 should be empty. Provide an SQL instruction that would update this information.

(c) [6 marks] Provide SQL instruction to create TradesPortfolio table above. Make sure to identify any primary and foreign keys used, and choose appropriate data types.

(d) [5 marks] Explain what referential integrity is and how it is enforced. Give an example of a database anomaly that could arise for the two tables above if referential integrity was not enforced.

Question **2** Not yet answeredMarked out of 25

(a)

(i) [5 marks] Suppose we have a vector named v of length 10 created in R. Give an R instruction that creates a new vector named w that holds the last 3 elements of the vector v.

(ii) [5 marks] If x <- exp(c(-3, -4, 0, 5)), what is the result of the instruction

x < 0

?

(b) [5 marks] The following R code tries to display 3 samples of Geometric Brownian motion, but it contains errors. Find these errors and explain how they can be fixed.

```
#Geometric Brownian Motion
Drift <- 0.45
Volatility <- 0.15
InitialValue <- 100
dt <- 1/365
LogSpotIncrements1 = rnorm(365, drift*dt,Volatility*sqrt(dt))
LogSpotIncrements2 = rnorm(365, drift*dt,Volatility*sqrt(dt))
LogSpotIncrements3 = rnorm(365, drift*dt,Volatility*sqrt(dt))
s1 <-InitialValue *exp(cumsum(LogSpotIncrements1))
s2 <-InitialValue *exp(cumsum(LogSpotIncrements2))
s3 <-InitialValue *exp(cumsum(LogSpotIncrements3))
plot(s1, s2, s3,  type = "l")
```

(c) [5 marks] Suppose we run the following R instructions to calculate the volatility of GBPJPY (Assume all the required libraries have been loaded)

GBPJPY <- get.hist.quote("GBPJPY=X")

GBPJPY <- GBPJPY[!is.na(GBPJPY$Close)]

sd(GBPJPY$Close)*sqrt(252)

The result is 502 = 50200% which appears to be wrong, as FX volatilities are typically around 10-20%. What have we done wrong and how can we fix it?

(d) [5 marks] Suppose we have a dataframe "Trades" with 5 columns and 20 records. The first column is called "TradeType". What R instruction could you execute to select the 5th, 10th and last row of the first column of this dataframe and save the results in a new dataframe called "TradeTypesSelectedRecords" ?

Question **3** Not yet answeredMarked out of 25

(a) [4 marks] Suppose X >0. Give a Python instruction to calculate the (natural) logarithm of X and store this value in a variable called LogX. Make sure to state any libraries that you may need to use.

(b) [5 marks] Explain what the terms "class" and "object" mean. Provide a Python instruction to determine the class of a dataframe named `AmazonSharePrice`.

(c) [5 marks] The following Python code attempts to compute log-returns of the `Close` column and put them into a new column called `LogReturns` for the dataframe, and then plot a graph of log-returns, but it contains some errors. Spot these errors and explain how to fix them.

```
numpy import
GoldmanShares['LogReturns'] = numpy.log(GoldmanShares)['Close']).diff()
GoldmanShares.plot(LogReturns)
```

(d)

(i) [5 marks] Assume you have a dataframe called TradeBook, which contains a column called Notional holding numerical values. What Python instruction would you use to create a new column in the dataframe called "Commission" that holds values that are 10% of the values in the Notional column?

(ii) [6 marks] Now suppose that TradeBook also has a text column called TradeType. What Python instruction would you use to overwrite the values of Commission column and set them to 0 where TradeType is equal to "Swaption"?

Question **4** Not yet answeredMarked out of 25

(a) [4 marks] Write down the function that is used to invoke the standard normal cumulative distribution function in Excel. In what well-known formula is it used extensively in regards to option pricing?

(b) [4 marks] Explain the difference between a VBA function and subroutine. Give one example of each (without writing any VBA code, just describe the input and output and what each one does).

(c) [7 marks] Explain carefully how VLOOKUP function works. Make sure to state all the arguments VLOOKUP function takes and explain their meaning. Give a practical example of use of VLOOKUP.

(d) [10 marks] Write a VBA subroutine that will calculate the forward price to maturity, F, which is defined by the formula F = S ·exp((r-q)T) where S is the spot price, r is the interest rate, q is the dividend yield, and T is the time to maturity in years. The VBA subroutine should read these values from cells named `Spot`, `InterestRate`, `DividendYield`, `YearsToMaturity` and output its result into a cell named Forward. Make sure to add comments to your code.

◀ Late-summer reassessment 2021/22 (hidden)

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