

T Level Technical Qualification in Digital: Digital Production, Design and Development

Specimen assessment materials (SAMs)

Employer Set Project

First teaching September 2020

T Level Technical Qualification in Digital: Digital Production, Design and Development

Specimen assessment material for first teaching
September 2020

Component: Employer Set Project

This booklet contains material for the completion of the set task under supervised conditions.

This booklet is specific to each series and this material must only be issued to students who have been entered to undertake the task in the relevant series.

This booklet should be kept securely until the start of the xxxxxxxx supervised assessment period.

Level

3

Total Marks

N/A

Controlled
hours

N/A

Pre-task: Familiarisation with the industry context

Paper Reference PXXXXXA

Instructions to students

The Part A Set Task Brief will be issued one week before the start of Task 1 to allow you to familiarise yourself with the industry context of the business.

You should complete your familiarisation during the window of [Day_Month_Year] to [Day_Week_Year].

During the pre-release window you should spend time becoming familiar with the ways in which digital tools and technologies are used within the identified sector.

You are advised to spend around 6 hours on this task but may choose to spend more time if you wish.

Your centre will schedule a minimum of 6 hours too allow you to complete your familiarisation.

You are permitted:

- access to the internet
- to work with others
- share and receive findings from the investigation you will be carrying out
- to complete your investigation both during and outside of supervised sessions
- make notes about your findings.

You will not be allowed to take your notes into the supervised assessment sessions.

Set Task Brief

You work for a software development company that has been commissioned to develop a digital solution to meet the organisations needs. Your manager has asked you to work as part of a group of developers to investigate the use of digital in the finance sector in preparation for the start of the project and report back to your colleagues.

RBSX Group Ltd is an organisation that provides financial advice services to customers in the UK. The organisation currently relies on its advisors travelling to meet its clients in person.

After a review of its current digital solutions, the organisation has decided that it needs to develop a new solution.

The aims of the new solution are to allow:

- clients and advisors to communicate more effectively whilst reducing the need for travel to meetings
- clients to better access advice and recommendations about a range of financial services and products
- the advisors to:
 - access tools for carrying out financial analysis
 - help organise services around client needs (data analysis)

The requirements of the product are:

- an easy to use interface (GUI) with appropriate accessibility features
- provide two-way communication between advisor and client.
- ability for clients and advisors interact with a 'live feed' of financial information

Activity

Working in teams of 4-6, you must familiarise yourself with the way in which digital solutions are used in the financial advice sector.

To do this you may:

- use the information provided in the Set Task Information
- carry out independent investigation
- share and receive findings with others.

You may wish to consider:

- Data analysis and modelling
- Investments and savings
- Financial and currency markets
- Data and information Security
- Types of information given to clients by advisors

You may wish to make notes during this activity. You will not be allowed to take these notes into any of the Task Assessments.

Outcomes for submission

The purpose of this pre-release is to enable you to become familiar with the ways in which digital is used within the identified industry.

You are not required to submit any evidence for this pre-release.

You are permitted to make notes during the pre-release period but will not be allowed to take these into the assessment.

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Level

3

Total Marks

19

Controlled
hours

3

Task 1

Planning a project

Paper Reference

PXXXXXA

Instructions to students

You must complete **the activity** within the assessment.

The task must be undertaken at the time and on the date specified by Pearson

You will be given 3 hours for producing the outcomes for this Task.

Your centre will advise you of when any supervised breaks have been scheduled

The task must be completed under supervised conditions.

You are not permitted access to the internet during this Task.

You are permitted to use **offline** versions of relevant software to produce evidence for this task.

Your work and any material provided must be kept securely at all times.

DRAFT

Set Task Brief

You work for a software development company that has been contracted by RBSX Group Ltd to plan and develop their new digital solution.

Your manager has asked you to analyse the potential costs, benefits and risks associated with the project and then produce a plan for the development of the new digital solution.

Your manager intends to use your plan during the next monthly meeting with the client.

Using the Set Task Information provided your manager has asked you to produce:

- a Gantt chart to demonstrate how you would organize the development of the new digital solution.
- a plan for the resources selected and associated costs
- a rationale that explains your planning approach and justifies the decisions you made.

[19 Marks]

Outcomes for submission

Save your Gantt chart as a PDF and an Excel compatible spreadsheet file MS Project compatible file (as appropriate) in your folder for submission.

Save your Resource and cost plan as a PDF and an Excel compatible spreadsheet or MS Project compatible file (as appropriate) file in your folder for submission

Save your rationale as a PDF file in your folder for submission.

Use this naming convention:

Task2GanttChart_[Registration number #]_[surname]_[first letter of first name]

Task2ResourceCostPlan_[Registration number #]_[surname]_[first letter of first name]

Task2Rationale_[Registration number #]_[surname]_[first letter of first name]

Task 1 Resource Booklet

RBSX Group Ltd is an organisation that provides financial advice services to customers in the UK. The organisation currently relies on its advisors travelling to meet its clients in person.

After a review of its current digital solutions, the organisation has decided that it needs to develop a new digital solution.

The aims of the new digital solution are to allow:

- clients and advisors to communicate more effectively whilst reducing the need for travel to meetings
- clients to better access advice and recommendations about a range of financial services and products
- the advisors to:
 - access tools for carrying out financial analysis
 - help organise services around client needs (data analysis)

The requirements of the product are:

- an easy to use interface (GUI) with appropriate accessibility features
- to provide two-way communication between advisor and client.
- To have the ability for clients and advisors interact with a 'live feed' of financial information

Planning information

RBSX Group Ltd has forecast that developing the new digital solution will lead to a forecast increase in average annual revenue of 8.75% in the first year with a further increase of at least 15.5% in the second and third year.

RBSX Group Ltd has provided you with a set of financial information to assist you in producing your plan.

Financial information provided by RBSX Group Ltd	
Description of the revenue/costs	Amount (£)
Current average annual revenue	1 580 900
Current average annual total costs	985 340
Forecast costs for the development of the new digital solution	Amount (£)
Software development company base fee	50 000
Cost of training and development of internal staff	4 000
Cost of equipment upgrades (laptops, work stations, etc)	5 000
Cost of software licensing	4 000
Cost of new server	Option 1 - hosted cloud-based server - 230 (per month, ongoing) Option 2 - Physical server 3 500 (single payment)
Cost of infrastructure (networking) upgrades	3 200
Project Leaders pay (you)	200 per day
Forecast ongoing annual costs	Amount (£)
Additional network technician	22 000
Maintenance costs (server, equipment, infrastructure)	2 250

All of your company's software developers are currently working on other projects. Therefore, the senior managers have recruited new members of staff for this project.

Your project development team will consist of:

- One senior software engineers
 - Sarah O'Toole
- Two Junior software engineer
 - Ahad Shafiq
 - Terry Duran
- One database engineer
 - Gina Diaz
- One Network engineer
 - Marius Bronski

Profiles for the new staff

Name	Sarah O'Toole
Job title	Senior Software engineer
Core Skills	● System and user requirements analysis ● Writing and testing code ● Refining and rewriting code ● Integrating existing software products ● Testing and maintaining systems by monitoring and correcting software defects ● Python and C#
Previous experience	● Significant experience of delivering solutions for large multinational corporations ● Developed cloud deployed solutions in the financial sector ● Worked on large scale, highly transactional, distributed systems ● Team leader on a number of different high-risk projects
Cost	Cost £105 per hour

Name	Ahad Shafiq
Job title	Junior Software Engineer
Core Skills	• Researching, designing and developing new software programs • Developing existing programs by analysing and identifying areas for modification • C# .NET and JavaScript • The ability to explain complicated processes in non-technical language
Previous experience	• Newly graduated university - no previous work experience
Cost	• £25 per hour

Name	Terry Duran
Job title	Junior Software Engineer
Core Skills	• An excellent working knowledge of hardware, software and programming languages • Specialises in C# .NET and JavaScript • Good knowledge of Python 3, Java and C++ • The ability to develop and interpret technical plans • Excellent communication skills, both written and verbal • The ability to explain complicated processes in non-technical language • An awareness and respect for confidentiality and data protection issues
Previous experience	• Experience of delivering cloud deployed solutions for small retail businesses • Significant experience in the computer game development sector
Cost	£45 per hour

Name	Gina Diaz
Job title	Database Engineer
Core Skills	• Specialises in PHP, Python 3 and SQL • System and user requirements analysis • In-depth of understanding system security • Development of both back-end data systems and front-end accessibility for end-users • Significant experience of developing logical data model designs • Installation and testing of database management systems (DBMS) and associated hardware and software • Good team working skills
Previous experience	• Experience of delivering local and cloud deployed database systems in the retail industry
Cost	£47.50 per hour

Name	Marius Bronski
Job title	Network Engineer
Core Skills	• Excellent problem-solving and troubleshooting network problems to maximize network performance • Specialises in planning, implementing, and monitoring computer networks • Experienced in: • administering firewalls and maintaining IT security systems • router configuration • upgrading data servers and network equipment • A comprehensive knowledge of network protocols and services such as TCP/IP, DNS, and DHCP
Previous experience	• Experience of installing networks and other infrastructure in the retail and entertainment industries
Cost	£73 per hour

Your manager has produced an outline of the key tasks that need to be completed during the project. The table shows the key tasks and the estimated number of work hours it will take to complete each task.

Task	Estimated number of work hours
Upgrade infrastructure	21
Install physical server	7
Develop Module 1 - Back-end database	147
Develop Module 2 - User interface	70
Develop Module 3 - Information feed	126
Develop Module 4 - Investments and savings	115
Develop Module 5 - Data analytics	112
Develop Module 6 - Communications	105
Deploy Modules	7 (per module)
Unit testing	21 (per module)
Integration testing	14 (per module)
Regression testing for major fault	14 (per fault found)
Regression testing for minor fault	7 (per fault found)
User/acceptance testing	35
Create a Test plan	14
User Training	21

It is assumed that:

- At least 3 minor faults will be found with each module
- No more than 3 major faults will be found throughout the whole project
- Each member of staff would work 7 hours a day, 5 days a week,
- There will be no staff absences during the project development.

RBSX Group Ltd have requested that the project is completed in 17 weeks.

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Level

3

Total Marks

21

Controlled
hours

3

Task 2

**Identifying and fixing defects in
an existing code**

Paper Reference

PXXXXXA

Instructions for students

You must complete **ALL** activities within the assessment.

The task must be undertaken at the time and date specified by Pearson

You will be given 3 hours for producing the outcomes for this Task.

Your Centre will advise you of when supervised breaks have been scheduled

You are not permitted access to the internet during this Task.

You are permitted to use **offline** versions of relevant software to produce evidence for this task.

Files provided for use during this activity:

- Task 2_Test_Strategy_Template.doc
- Task2_NonWorkingCode.txt

Your work and any material provided must be kept securely at all times.

Set Task Brief

You are a member of the programming team that is developing a program to meet the requirements in the Task 2 Resource Booklet.

Your manager has asked you to look at some code that a Junior Software Developer has produced but is not yet functional. The code that is not yet functioning is provided to you in the **Task2_NonWorkingCode.txt** file

The code should meet the requirements in the Task 2 Resource Booklet.

Activity

You will need to use:

- the information provided in the Task 2 Resource Booklet
- the non-functioning code provided in the Task2_NonWorkingCode.txt file.

You must:

- produce and apply a test plan to identify the defects that are preventing the program code in the **Task2_NonWorkingCode.txt** file from functioning.
- apply a solution to fix the defects in the program code provided
- document the process that you followed to fix the code.

When applying a solution to fix the defects you must:

- ensure the code meets the requirements in the Set Task Information
- use Python 3 programming language
- follow accepted programming conventions
- test your solution to ensure that it functions as expected.

Two files are provided for use during this activity:

- Task 2_Test_Log_Template.doc
- Task2_NonWorkingCode.txt

[21 Marks]

Outcomes for submission

Save your code as PDFs and as a .txt files in your folder for submission.

Use this naming convention:

Task2code_[doc #]_[Registration number]_[surname]_[first letter of first name]

Save your testing document as a PDF file in your folder for submission.

Use this naming convention:

Task2_Test_Log_[Registration number #]_[surname]_[first letter of first name]

Task 2 Resource Booklet

RBSX Group Ltd has provided you with this set of information to develop your program.

Requirements

You need to create a program that will allow the user to enter this information:

- client/investor details:
 - name
 - address
 - phone number
- amount to be invested (per month)
- the type of investment they want.

The program should then provide the user with a personalised investment quote that shows:

- customer details
- the maximum and minimum they can expect the investment to be worth after:
 - 1 year
 - 5 year
 - 10 years
- total profit in each time frame
- total fees paid in each time frame
- total taxes paid in each time frame.

Values should be formatted as currency (GBP) to 2 decimal places.

The program should be able to handle user errors.

Types of investment

Investment types offered	Information
Option 1 - Savings plans	Maximum investment per year: £20 000 Predicted returns per year: • 1.2% to 2.4% Estimated Tax: • 0% RBSX Group Fees per month: • 0.25%
Option 2 - Managed stock investments	Maximum investment per year: Unlimited Predicted returns per year: • 4% to 23% Estimated Tax: • 10% on profits above £12 000 • 20% on profits above £40 000 RBSX Group Fees per month: • 1.3%

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Level

3

Total Marks

17

Controlled
hours

3

Task 3

Designing a solution

Paper Reference

PXXXXXA

Instructions for students

You must complete the activity within the assessment.

The task must be undertaken at the time and on the date specified by Pearson

You will be given 3 hours for producing the outcomes for this Task.

Your Centre will advise you of when any supervised breaks have been scheduled

The task must be completed under supervised conditions.

You are not permitted access to the internet during this Task.

You are provided with the file *Task_3_data.csv* for use during this task

Your work and any material provided must be kept securely at all times.

You must complete ALL activities within the assessment.

You are not allowed access to the internet during this task.

Your work and any material provided must be kept securely at all times.

DRAFT

Set Task Brief

Part of the new digital solution requires your company to develop a data service that will turn raw data into meaningful information. The information will be used by financial advisors to make data-driven decisions.

Your manager has decided to open the problem up to all developers to see if they can design a suitable solution.

Your manager has provided you with a set of user requirements that he has agreed with the client.

User requirements agreed with the client

- The solution must allow users to input an amount in one currency and convert this to another currency (based on most up to date figures).
- The solution must also:
 - be easy to use
 - display information in a meaningful way
 - make use of appropriate textual, numerical and graphical output in a way that would be relevant to the end user.

Activity

You must produce algorithm designs to show how you would implement the system and user requirements provided in the Set Task Information.

The algorithm designs should be of sufficient detail to:

- effectively communicate the intended solution
- allow the client to make informed decisions
- allow a third party to use the design documents to create the proposed solution.

You should use either pseudocode or flow charts to communicate your algorithms.

The file *Task3_data.csv* contains the data that will be used by the solution. You should use this file to help you design your solution.

[17 marks]

Outcomes for submission

Save your completed design documents as PDF files in your folder for submission. Use this naming convention:

Task3[document name]_[Registration number #]_[surname]_[first letter of first name]

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Level

3

Total Marks

34

Controlled
hours

4

Task 4a

Developing a solution

Paper Reference

PXXXXXA

Instructions for students

You must complete ALL activities within the assessment.

The task must be undertaken at the time and on the date specified by Pearson

You will be given 4 hours for producing the outcomes for this Task.

Your Centre will advise you of when any supervised breaks have been scheduled

The task must be completed under supervised conditions.

You are not permitted access to the internet during this Task.

You are provided with the file *Task_4_data.csv* for use during this task

Your work and any material provided must be kept securely at all times.

DRAFT

Set Task Brief

The design ideas for the currency conversion part of the solution that you worked on in Task 3 have been reviewed by your manager. A senior developer has coded the solution and your manager has presented it to RBSX Group Ltd.

Since then RBSX Group Ltd have requested some additional functionality to be added to further develop the solution.

RBSX Group Ltd have provided the new system requirements, these are:

- the existing code provided allows users to input an amount in one currency and convert this to another currency based on the most up to date figures provided.
- the solution must also identify trends and patterns over time for:
 - the value of the pound (GBP) to the US dollar (USD)
 - the value of the US Dollar (USD) to the pound (GBP).
- the solution must be secure.

RBSX Group Ltd have also provided user requirements for the solution. These are:

- be easy to use
- display information in a meaningful way
- make use of appropriate textual, numerical and graphical output in a way that would be relevant to the end user.

Activity

The file *Task_4_data.csv* contains the data that will be used by the solution.

Develop the programming code for the data service so that it meets the new system and user requirements provided in the Set Task Brief.

During development of the solution make sure that you:

- consider the security requirements and use secure coding principles and practices to mitigate against potential threats and vulnerabilities
- ensure that your code is maintainable, readable and functional
- follow accepted programming conventions.

During this task you do **not** need to formally document your testing.

[34 marks]

Outcomes for submission

Save your code as PDFs and as a .txt files in your folder for submission. Use this naming convention:

- Task4acode [doc#]_[Registration number]_[surname]_[first letter of first name]

Save a working version of your solution in your folder for submission. You may use an appropriate folder structure and naming convention to save the working version of the solution.

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Level

3

Total Marks

9

Controlled
hours

1.5

Task 4b

Reflective evaluation

Paper Reference

PXXXXXA

Instructions for Students

You must complete the activity within the assessment.

The task must be undertaken at the time and on the date specified by Pearson

You will be given 1.5 hours for producing the outcomes for this Task.

The task must be completed under supervised conditions.

You are not permitted access to the internet during this Task.

Your Centre will provide you with '**read only**' copy of the evidence you produced in Task 4a to assist you with your evaluation.

You are not allowed to make changes to evidence produced in previous tasks.

Your work and any material provided must be kept securely at all times.

DRAFT

Set Task Brief

The project is now complete and is in the process of being handed over to RBSX Group Ltd.

Your company's policy insists that all employees reflect on their quality of their work at the end of every project.

Your manager has asked you to review the quality of your work. Your manager has provided with the requirements to help you.

The new system requirements are:

- the existing code provided allows users to input an amount in one currency and convert this to another currency based on the most up to date figures provided.
- The solution must also identify trends and patterns over time for:
 - the value of the pound (GBP) to the US dollar (USD)
 - the value of the US Dollar (USD) to the pound (GBP).

The user requirements are the solution should:

- be easy to use
- display information in a meaningful way
- make use of appropriate textual, numerical and graphical output in a way that would be relevant to the end user.

Activities

Produce an evaluation of the solution you produced in **Task 4a**.

Your evaluation should justify:

- how well the solution you produced meets:
 - system requirements
 - user requirements.
- how the solution could be further developed.

You have been provided with a copy of the system and user requirements in the Set Task Information to help you with your evaluation.

Your evaluation should be supported by specific examples from your work.

[9 marks]

Outcomes for submission

Save your report as a PDF file in your folder for submission. Use this naming convention:

Task4b_Review_[Registration number #]_[surname]_[first letter of first name]

Task 2- Test Log

Description of test	Test data to be used (if required)	Expected outcome	Actual outcome	Comments and intended actions

Add more rows and tables as required

Employer Set Project - Sample Assessment Mark Scheme

General Marking Guidance

- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Learners must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved. Examiners should also be prepared to award zero marks if the learner's response is not rewardable according to the mark scheme.
- Where judgement is required, a mark scheme will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the mark scheme to a learner's response, a senior examiner should be consulted.
- Crossed out work should be marked **unless** the learner has replaced it with an alternative response.
- Accept incorrect/phonetic spelling (as long as the term is recognisable) unless instructed otherwise.

Levels-Based Mark Scheme Guidance

Levels-based mark schemes (LBMS) have been designed to assess students' work holistically. They consist of two parts:

1) Indicative content

Indicative content reflects content-related points that a student might make but is not an exhaustive list. Nor is it a model answer. Students may make some or none of the points included in the indicative content as its purpose is as a guide for the relevance and expectation of the responses. Students must be credited for any appropriate response.

2) Levels-based descriptors

Each level is made up of a number of traits which when combined together articulate the quality of response that a student needs to demonstrate. The traits progress across the levels to demonstrate the different expectations of each level. When using a levels-based mark scheme, the 'best fit' approach should be used.

Applying the levels-based descriptors

Examiners should take a 'best fit' approach to determining the mark.

- Examiners should first make a holistic judgement on which level most closely matches the student's response. Students will be placed in the level that best describes their answer. Answers can display characteristics from more than one level, and where this happens markers must use any additional guidance (e.g. weighting of traits) and their professional judgement to decide which level is most appropriate.
- The mark awarded within the level will be decided based on the quality of the answer and will be modified according to how securely all traits are displayed at that level:
 - Marks will be awarded at the top of that level if the student has evidenced each of the descriptor traits securely.
 - Where the response does not securely meet all traits, the marks should be awarded based on how closely the descriptor has been met.

Task 1 - Planning a project

Indicative content and marker guidance				
Gantt Chart: • A large project so would expect to see tasks broken down in to smaller chunks (potentially and Agile approach) • There should be sensible use of concurrent and serial tasks for example: ◦ Installing server and upgrading infrastructure could be happening while software modules are being developed ◦ Integration testing would be expected after specific modules have been unit tested ◦ Testing time for each module would be split up to allow testing along with other modules. The rationale will show the reasoning for the chosen project development approach demonstrated in the Gantt chart points the learners may consider, although some of these will vary depending on the choices learners make in terms of organisation. These include but are not limited to: • Staff (skills, industry expertise, experience) ◦ Only one member of staff has experience in the financial industry although many have experience in the retail industry so may be familiar with risks and challenges of dealing with financial systems ◦ One member of staff is very inexperienced which may be risky on such a large, and potentially risky project. More senior/experienced staff may need to take on extra work and/or provide support ◦ There is no member of staff that has specific skills in designing user interfaces • Resources ◦ Learners should rationalize the choice of allocation of tasks to different members of staff ◦ A justification of which server option they choose should be presented • Time scales and costs ◦ Learners should identify if the project deadline is realistic/achievable or not and provide support for any reason why the project time line is inappropriate. ◦ More contingency time may needed on jobs performed by Ahad, due to his inexperience ◦ Learners should discuss the cost of their solution with reference to how these costs were arrived at if the projected costs and increase in revenue make the project feasible ◦ If the online sever option is chosen then the installation of the physical server task wouldn't need to be included in the plan • Risks ◦ All members of staff are new and therefore unproven in the company ◦ 17 Weeks is a tight timescale for such a project and may not be feasible even slight slippage could cause the project to go over deadline ◦ It is unrealistic to assume that there will be no staff absence in a 17-week period. It would be wise to build contingency time in to the project as a whole and/or the tasks assigned to each member of the team ◦ Discussion of the relevant risks between physical and hosted server options and why each was selected or rejected				
Assessm ent focus	Band 0	Band 1	Band 2	Band 3
	0	1-2	3-4	5-6
Gantt chart	No rewardable material	Project tasks are somewhat organised in logical and efficient manner making some use of an appropriate SDLC model to provide some accurate prediction of the project's timescales Resources have sometimes been assigned to project tasks effectively but there are some major and/or significant errors or omissions	Project tasks are organised in a mostly logical and efficient manner making use of an appropriate SDLC model to provide mostly accurate predictions of the project's timescales Resources have mostly been assigned to the project tasks effectively, but there are some minor errors or omissions.	Project tasks are organised in a thoroughly logical and efficient manner using an appropriate SDLC model to provide thoroughly accurate predictions of the project's timescales Resources have consistently been assigned to the project tasks effectively.

	0	1	2-3	4
Resource and cost plan		Some correct resources and accurate costs have been added to the plan resulting in an estimate of limited accuracy.	Mostly correct resources and accurate costs have been added to the plan resulting in an estimate that is largely accurate.	Fully correct resources and accurate costs have been added to the plan resulting in an accurate estimate.
	0	1-3	4-6	7-9
Rationale	No rewardable material	Rationale for project planning decisions demonstrate some effective consideration of: • cost, risks and benefits • order and timing of tasks • selection and allocation of resources • dependencies and prerequisites.	Rationale for project planning decisions demonstrate mostly effective consideration of: • cost, risks and benefits • order and timing of tasks • selection and allocation of resources • dependencies and prerequisites.	Rationale for project planning decisions demonstrate a thorough and perceptive consideration of: • cost, risk and benefits • order and timing of tasks • selection and allocation of resources • dependencies and prerequisites.

Task 2 - Identifying and fixing defects in an existing code

Indicative content and marker guidance				
Core errors in given code. (line numbers apply to the example working code and are for guidance only expect variation based on alterations made by the learner):				
- Line 9 and 10 indentation error. Should be aligned with lines 7 and 8 - Line 20 – variable opening.investSum() takes a user input but is not converted to a useable numerical data format - Line 42 – incorrect name for called function stockMain() should be stocksMain() - Line 70 & 71 – values for counter of index 'i' return the wrong year's results should be: <pre>70 if i == 0 or i == 4 or i == 9: 71 print('At the end of year', str(i+1))</pre> (or similar logic) - Values are not displayed to 2.dp – should use round() or trunc(). (possible use in lines 73, 75, 77, 96, 98, 100, 136, 138, 140,142, 171,173, 175, 177 - Line 114 & 149 using the wrong value for the fees so will be outputting incorrect results (value is 0.13 but should be 0.013 - Lines 122 to 127 and 157 to 162 – the logic for the if statement is slightly wrong should be > for the if and elif not >= - Line 164 & 165 – using wrong variable. Using stocksMin.total instead of stocksMax.total - Functions savingsPrint() and stocksPrint() do not output the users address when giving the quote (lines 188 and 200 in example code)				
The learner may have also addressed handling user error which could include addition of code to the function opening() which may include:				
- Length limitation to name or phone variables - An 'isdigit() or similar check for the phone number				
The test plan/log should also contain inclusion of tests that show that areas of the program that appear to be coded correctly (e.g. calculations, error handling etc.) have been tested to ensure outputs are correct and the program is robust.				
A limited understanding of program requirements would be typified by only identifying and fixing the functional errors that would be highlighted by the IDE, but would not identify and fix logical errors.				
The number of errors identified is not a hurdle between Band 2 and 3, the discriminator is the quality and appropriateness of the tests selected.				
Assessment focus	Band 0	Band 1	Band 2	Band 3
	0	1-2	3--5	6-8
Use of testing to identify defects	No rewardable material	Tests selected show a basic understanding of the identified program requirements. Test log includes some appropriate test data. Testing has identified some error in the code provided.	Tests selected show a good understanding of the identified program requirements. Test log includes a good a range of normal, erroneous and extreme data. Testing has identified most errors in the code provided.	Tests selected show a thorough and detailed understanding of the identified program requirements. Test log includes a comprehensive range of normal, erroneous and extreme data. Testing has comprehensively identified the errors in the code provided.
		1	2-3	4
Understanding of the testing process		Test log shows a basic understanding of how errors/problems were identified and how they were rectified.	Test log shows a good understanding of how errors/problems were identified and how they were rectified.	Test log shows a thorough and detailed understanding of how errors/problems were identified and how they were rectified.

		1-3	4-6	7-9
The solution		Code has some functionality, but significant errors still persist. Changes made apply some precise logic and programming structures which would result in some correct outcomes.	Code is mostly functional, but some minor errors still persist. Changes made apply mostly precise logic and programming structures which would result in mostly correct outcomes.	Code is fully functional. Changes to code apply fully precise logic and programming structures throughout which would result in consistently correct outcomes

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Task 3 – Designing a solution

Indicative content and marker guidance

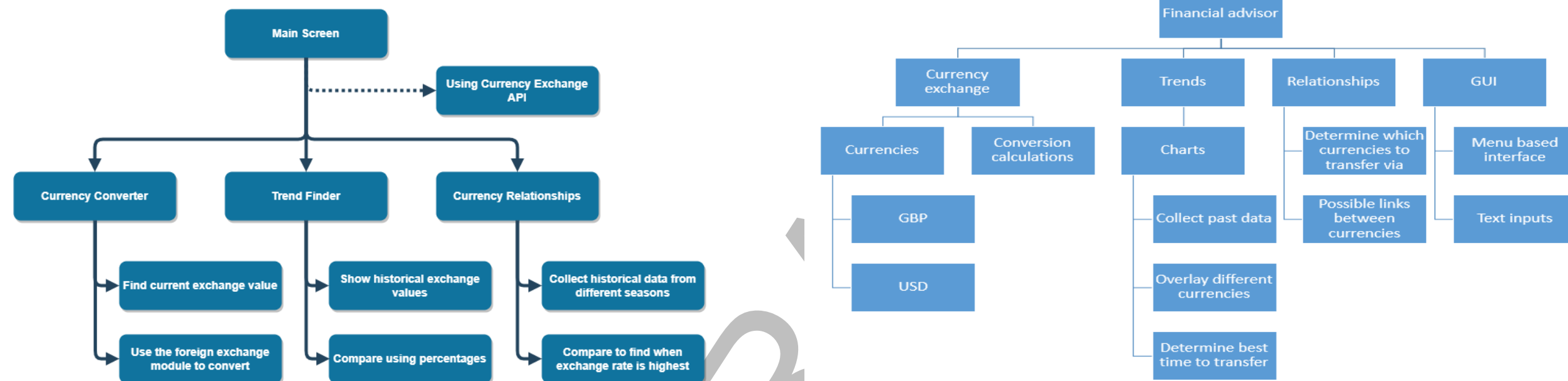
Algorithms demonstrates decomposition of the problem into simpler and more understood primitives, formulating an abstraction model.

The process should involve transforming one abstraction into a more detailed abstraction using refinement.

The new abstraction can be referred to as a refinement of the original one. A good abstraction leads **to reusable components** and any **problems that maybe encountered**.

Use of visualization by way of illustrating the system may be used.

Good decomposition will show all the necessary subsystems that make up the main problem.



The characteristics of a good algorithm are:

- the steps are clearly defined
- each step are uniquely defined and should depend on the input and the result of the preceding steps
- the algorithm stops after a finite number of instructions are executed, two key constructs iterate and decide
- receives input, how much and what data is required in this case currency amount and rate of exchange
- produces output type of output e.g. print out, return value or return list, what results are required, what happens if no results can be computed maybe error
- Links to API or CSV to import most up-to-date currency exchange
- Sensible names
- Use of key words
- Indentation
- Flow charts are allowed with correct use of symbols
- Correct structure, notation and syntax

Examples:

Function currency_converter():
currencies = ["GBP", "USD", "EUR"]
OUTPUT "Which currency would you like to convert from?"
TRY:
 currency_from = input "[GBP/USD/EUR] From: "
 currencies.remove(currency_from)
EXCEPT:
 OUTPUT "Not an option"
 currency_converter()
OUTPUT "Which currency would you like to convert to?"
currency_to = input currencies[0], currencies[1], "To: "
rates = [FOREIGN EXCHANGE MODULE]
con = rates.get_rate(currency_from, currency_to)
OUTPUT currency_from, "to", currency_to, "=", con.2SF

//where 0, 1, 2 corresponds to a currency
INT currentCurrency = GET INPUT
INT preferredCurrency = GET INPUT
FLOAT amount = GET INPUT

ARRAY [3 ARRAY[3 INT]] exchangeRates = GET
exchange rate multipliers

FLOAT newAmount = amount * exchangeRates
[in correct input currencies]
OUTPUT newAmount

Function relationships (currency, currencies, years)
for cur in currencies
 if cur != currency then
 results = findRates(currency, cur, years)
 if mean(results) < conver(currency, cur, 1) then
 output "It is worth converting to " + cur
 else
 output "It is not worth converting to " + cur
 end if
 end if
end for
end function

Assessment focus	Band 0	Band 1	Band 2	Band 3
	0	1-2	3-5	6-8
Decomposition of the problem	No rewardable material	Basic or superficial decomposition of the identified problems that superficially cover the required: - inputs - processes - outputs.	Mostly detailed decomposition of the identified problems that sufficiently cover the required: - inputs - processes - outputs.	Thorough and detailed decomposition of the identified problems that comprehensively cover the required: - inputs - processes - outputs.
		1-2	3-4	5-6
Application of logical thinking and conventions		Algorithms would produce some correct outcomes as a result of: - some precise logic - some appropriate structure and sequence which is likely to be inefficient. Some use of accepted conventions.	Algorithms would produce mostly correct outcomes as a result of: - mostly precise logic - appropriate structure and sequence but which may lack efficiency. Mostly appropriate use of accepted conventions though some minor inconsistencies may still exist.	Algorithms would produce correct outcomes as a result of: - precise logic - appropriate and efficient structure and sequence. Appropriate and consistent use of accepted conventions.
		1	2	3
Communication of the design		Superficial communication of the design uses technical language which is only sometimes appropriate for the audience.	Adequate communication of the design uses technical language which is mostly appropriate for the audience.	Effective communication of the design uses technical language which is appropriate for the audience.

Task 4a - Developing the solution

Indicative content and marker guidance

The solution

- Provides developed coded solution relating to the breakdown of the problem from the previous stage and explaining what they did and justifying why.
- The solution will be well structured and modular in nature – clearly see subsections this may be separated modules or the use of Procedures, Functions or classes
- Code will be annotated to aid future maintenance of the system
- All variables and structures will be appropriately named.
- Various outcomes which maybe basic in terms of very linear structure to more logically and efficient approach. The use of function, procedures and Classes
- Code should be robust and evidence provide screen shot and by outcome

Examples

```
from forex_python.converter import CurrencyRates
from termcolor import colored
import datetime
from os import system, name
def clear():
    if name == 'nt':
        _ = system('cls')
    else:
        _ = system('clear')
clear()
def main_screen():
    clear()
    screen = colored("""Financial Advisor
1. Currency Converter
2. Trend Finder
3. Currency Relationships
4. Exit\n
Select a Number: """, "blue")

    choice = input(screen)
    if choice == "1" or choice.lower() == "converter":
        converter()
    elif choice == "2" or choice.lower() == "trend":
        trend()
    elif choice == "3" or choice.lower() == "relationships":
        relationship()
    elif choice == "4" or choice.lower() == "exit":
        pass
    else:
        print(colored("Not an option", "red"))
        main_screen()
```

```
###Imports###

def outputResults(results, output):
    out = ""
    to = results[0]["to"]
    fr = results[0]["fr"]
    if output:
        for i in range(1, len(results)):
            dy = results[i]["day"]
            mn = results[i]["month"]
            yr = results[i]["year"]
            rate = results[i]["rate"]
            out += f"{dy}-{mn}-{yr}:\t"
            out += f"1 {fr} was {rate} {to}\n"
    out += f"There were {len(results)} results\n"
    for i in range(13):
        j = str(i)
        if i < 10:
            j = "0" + j
        out += mean(results, f"{j}")[0]
    return out
    elif y == "4":
        break
```

```
def relationshipsMenu():
    cur = input("Enter a currency (£/$/€): ")
    years = input("How many years would you like to go back (NOTE: the data only goes back to 1999): ")
    accuracy = int(input("Conversion rates will be taken every x days. x = "))
    for x in currencies:
        if cur != x:
            results = findRates(currencies[cur], currencies[x], years, accuracy, False)
            if mean(results, "00")[1] < mean(results, str(date.today())[5:7])[1]:
                print(f"It is worthwhile converting to {currencies[x]} this month\n\n\n")
            else:
                print(f"It is not worthwhile converting to {currencies[x]} this month\n\n\n")
```

```
def trend():
    print("Which currency would you like to check the trend of?")
    currency_from = input("[GBP/EUR] From: ")
    old_date = datetime.datetime(2012, 1, 1, 0, 0, 0, 000000)
    rates = CurrencyRates()
    old_rate = rates.get_rates(currency_from, old_date).get("USD")
    new_rate = rates.get_rate(currency_from, "USD")
    per_increase = (new_rate - old_rate) / old_rate * 100
    print("Percentage increase between 2012 and 2019 for GBP due to the USD
is {:.2f}%\n".format(per_increase))
    main_screen()
```

```
def mean(results, month):
    sigma = 0
    n = 0
    for i in range(1, len(results)):
        if month == "00" or month == results[i]["month"]:
            sigma += results[i]["rate"]
            n += 1
    avg = sigma/n
    to = results[0]["to"]
    fr = results[0]["fr"]
    return [f"{months[month]}:\n1 {fr} is {avg} {to}, on average\n", avg]
```

```
class convertor():
    def __init__(self):
        self.rates = CR()

    def get_conversion_rate(self, currency1, currency2):
        return self.rates.get_rate(currency1, currency2)

    def def_get_conversion_rate(self, currency1, currency2, amount):
        rate = self.get_conversion_rate(currency1, currency2)
        return rate * amount

    def draw_plot(self, x, y):
        plt.plot(x, y)
        plt.show()

    def get_trend(self, currency):
        past_rates = []
        past_day = []
        days = 0
        for i in range(5):
            for x in range(4):
                days += 90
                date = datetime.datetime(2019 - i, 12 - (x * 3), 2)
                past_rates.append(days)
                days += 5
            avg_rate = sum((past_rates[0] - past_rates[len(past_rates) - 1]) / past_rates[0]) * 100
            self.draw_plot(past_rates, past_day)
            avg_rate = sum(past_rates, past_day)
            self.draw_plot(past_rates, past_day)
            return avg_rate, str(trend)[:6]

new = convertor()
print(new.get_conversion_rate('USD', 'GBP'))
print(new.convert_amount('USD', 'GBP', 125))
print(new.get_trend('GBP'))
```

User experiences:

- Usability tests focusing on task performance how well did it meet the user needs, fully , partially or not met
- Objective usability which measures task execution time and the number clicks or errors this could be menu selection not overly complicated. Any typo error message will appear rather than program exiting.
- Comments about how well the system works, is the information from the output valuable, for example did the program provide the correct currency rate and converted it correctly, trends could be identified etc.
- Use of visualization this can be dataset converted into graphs

Assessment focus	Band 0	Band 1	Band 2	Band 3	Band 4
	0	1-2	3-4	5-6	
Functionality	No rewardable material	The solution implements code with some functionality but some major errors still persist.	The solution implements mostly functional code but code may lack efficiency and some minor errors still persist.	The solution implements functional and efficient code throughout.	
		1	2	3	
Logic and programming structures		The code uses some precise logic and programming structures which would result in some correct outcomes.	The code uses mostly precise logic and programming structures which would result in sufficiently correct outcomes.	The code uses precise logic and programming structures throughout which would result in consistently correct outcomes.	
		1	2	3	
Robustness		The code handles some common user errors	The code handles most common user errors	The code thoroughly handles common, and most unexpected, user errors	
		1-2	3-4	5-6	
Security		The code mitigates against some common vulnerabilities as a result of some effective application of secure coding practices.	The code mitigates against most relevant vulnerabilities through mostly effective application of secure coding practices	The code thoroughly mitigates against relevant vulnerabilities through effective application of secure coding practices	
		1-2	3-4	5-6	7-8
Code organisation		The code is partially maintainable by a third party but would present significant difficulties through the use of: • inconsistent naming conventions • limited logical organisation • limited informative commenting	The code is partially maintainable by a third party but would present some minor difficulties through the use of: • some consistent naming conventions • some logical organisation • some informative commenting	The code is maintainable by a third party and would present only a few minor difficulties through the use of: • mostly consistent naming conventions • mostly logical organisation • mostly informative commenting	The code is easily maintainable by a third party through the use of: • consistent and appropriate naming conventions • fully logical organisation • highly informative commenting

User experience

1-2	3-4	5-6	7-8
Basic user experience is provided through limited effective use of: - input handling - user guidance and error messages - outputs	Adequate user experience is provided through somewhat effective use of: - input handling - user guidance and error messages - outputs	Good user experience is provided through mostly effective use of: - input handling - user guidance and error messages - outputs	Excellent user experience is provided through consistently effective use of: - input handling - user guidance and error messages - outputs

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Task 4b - Reflective evaluation

Indicative content and marker guidance

Indicative content will vary according to the approach learners have taken in task 4 and the effectiveness of the solution they created. Therefore, indicative content must be established during the preparation for standardisation by the Lead Examiner.

Generic features of effective evaluations are likely to include:

- the extent to which the solution meets the:
 - requirements of the set task brief
 - needs of the users.
- a justification of how the solution could be further developed/enhanced.
- specific examples from the solution to support points made
- contextualisation of any points made.

Assessment focus	Band 0	Band 1	Band 2	Band 3
	0	1-2	3-4	5-6
Programming outcomes	No rewardable material	Judgements reached are somewhat supported showing a superficial or basic understanding of how well the solution met the: - requirements of the set task brief - needs of the users.	Judgements reached are mostly well supported showing a good understanding of how well the solution met the: - requirements of the set task brief - needs of the users.	Judgements reached are comprehensively well supported showing a thorough and detailed understanding of how well the solution met the: - requirements of the set task brief - needs of the users.
		1	2	3
Comparison to designs		A superficial or simplistic rationale is provided for what future developments should be implemented.	A good rationale which is reasonably well supported is provided for what future developments should be implemented.	A convincing and well-supported rationale is provided for what future developments should be implemented.