Investigate Stage – Student Guidance

1. Researching {investigating} the Brief

Your Task: Is to **investigate** the problem and **explore** the issues.

- an understanding of one **function of forests**
- an example of {problem} environmental **risks** that affects forests
- a consequence of **changing conditions** over time {issue}
- a reason **why modelling** is a suitable way to explore forest risk
- use of 2–3 relevant **research sources** to support your understanding

Note: Your response should be general and linked to the brief, **not** to a **specific project idea**.

Marker Check {Replace with Tick ONLY if Completed} ☑

☐ Mentions **function of forests**
☐ Mentions an environmental **risk** that affects forests
☐ Describes a consequence of **changing conditions** over time
☐ Explains why **modelling** is suitable to explore **forest risk**
☐ Uses 2–3 relevant research sources (see bibliography)

2. Existing Solutions

Your Task Your research should describe **3** existing systems. Each system should clearly describe:

- the **purpose** of the system
- the type of **data** it uses
- the type of **model** used (e.g. risk modelling, forecasting, rules-based)
- one **limitation** of the system or its modelling approach

Note: Each system **must** include **all four** elements to be credited..

Marker Check {Replace with Tick ONLY if Completed} ☑

☐ **Purpose** is clearly described
☐ **Data** used is identified
☐ Type of **modelling** is stated
☐ One **modelling-related limitation** is explained
☐ Three systems included in total

3. How Research Informed My Project

Your Task Your should explain how your **research influenced** your project **decisions**.

CRITICAL: This is **NOT** where you describe what you will build. "I will use..." statements for Plan & Design.

This section ONLY explains: "Because [research showed X], I decided [Y]"

- **why** you **chose** this **environmental** risk/issue
- **data types** or **variables** chosen **and why**
- **What process** you will **simulate** over time and **why**
- **modelling approach** chosen and **why** {e.g., Rules Based / Predictive / Risk Scoring / Statistical …}

Note: Use clear **link** between **research** and **decisions**, e.g. 'Because my research showed…, I decided to…'.

Sample:

Because **my research showed** existing systems [3] only monitor temperature and smoke after fires start, **I decided** to track predictive variables instead. The Bureau of Meteorology [1] **identified** rainfall, soil moisture, and wind as key fire risk factors, so **I chose** to monitor these variables to enable earlier warnings than current solutions provide.

Marker Check (tick / cross) ☑

☐ Explain **why** you chose this **environmental risk/issue**
☐ **What variables/data** types you will use and **why**
☐ **What process** you will **simulate** over time and why
☐ What **modelling approach** was chosen and **why** {Rules Based – Statistical - }
- Use language like 'Because my research showed…, I decided to…'.

4. Final Idea

Your Task Write **TWO** sentences outlining your final project idea. **Do not** describe **sensors, code etc.**

- One sentence stating your final project idea
- One sentence stating one limitation of your approach

Note: Do not include technical build detail {included in Plan}

Marker Check (tick / cross) ☑

☐ **Final** project **idea** clearly stated in one sentence
☐ **One** clear **limitation** stated in one sentence

Plan & Design Stage – Student Guidance

Ask yourself: If someone else were given only your Design Objectives and Project Options, would they be able to build the system correctly from start to finish?

1. Design Objectives

Your Task: You should write clear **Design Objectives** for your system. Your objectives should:

- be written as **'I will…' or 'The system will…'** statements
- describe **specific** actions {red LED alert / 75%} specific to **your own risk model**
  - e.g., The system will trigger a red LED alert when fire risk exceeds 75%

Note: **Generic** objectives will not be accepted.

Note: Your objectives are **guided by brief**.

Marker Check {Replace with Tick ONLY if Completed} ☑

☐ Objectives are written as **'I will…' or 'The system will…'** statements

☐ Objectives describe **clear system actions** that are **specific** to **your** system.

2. Project Options

Your Task: Describe **at least two different** ways of building your chosen project.

Options that describe different topics rather than **different build approaches** is not be acceptable

- **data collection approach** (e.g. single sensor vs multiple sensors)
- **data logging method** (e.g. continuous logging vs threshold-based/event logging)
- **modelling approach** (e.g. rules-based model vs decision-tree style logic)
- **risk scoring method** (e.g. points-based scoring vs weighted scoring)
- **feedback / output method** (e.g. digital vs analogue output)
- **where data is processed** (on the embedded device vs in Python)

For **each option**, explain:

- how the option would work (project-specific)
- one advantage
- one limitation

Note: Options must describe **different build approaches**, not different project topics.

Marker Check {Replace with Tick ONLY if Completed} ☑

☐ **Two project-specific build options** are described

☐ Each option explains **how it** would **work**

☐ Each option includes one **advantage**

☐ Each option includes one **limitation**

3. Justification of Design Choice

Your Task: State **which project option you chose** and clearly justify your decision. Your response should:

- Clearly state which **option** you **chose**
- Explain why the chosen option better **meets** the **Design Objectives**
- Explain why it **improves modelling** or **simulation** over time
- Identify **one practical benefit** of the chosen option (e.g. clarity, reliability, manageable data)

Note: Your justification must be based on **your own project**, not general statements.

Marker Check {Replace with Tick ONLY if Completed} ☑

- ☐ Clearly state which **option** you **chose**
- ☐ Explain why the chosen option better **meets** the **Design Objectives**
- ☐ Explain why it **improves modelling** or **simulation** over time
- ☐ Identify **one practical benefit** of the chosen option (e.g. clarity, reliability, manageable data)

4. Stakeholders and End Users

Your Task: Identify the stakeholders and end users of your system. You should explain:

- **who** the **stakeholders** are
- **what** stakeholders need and **why**
- **who** the **end user** is
- what the **end-user** needs from the system and **why**

Note: Stakeholders benefit indirectly. End users directly operate the system.

Marker Check {Replace with Tick ONLY if Completed} ☑

- ☐ **Stakeholders** are **identified**
- ☐ **Stakeholder** needs are **explained**
- ☐ **End-user** is **identified**
- ☐ **End-user** needs are **explained**

5. Technologies That Will Be Used

Your Task: Describe the technologies used in your system. You should include:

- **embedded system** technologies
- **software** technologies
- **data** storage method
- **modelling** approach

Note: You must explain **why** each technology is suitable.

Marker Check {Replace with Tick ONLY if Completed} ☑

☐ **Embedded** system technologies are identified
☐ **Software** technologies are identified
☐ **Data** storage method is described
☐ **Modelling** approach is identified
☐ Suitability of **key** technologies explained in a brief sentence

6. System Architecture

Your Task: Create a **high-level** diagram or flowchart that shows how all the components of your system connect and work together. Your diagram should include:

- The **three main components** (embedded system, data storage, Python model)
- The **flow of data** between them
- Key **inputs** and **outputs** at each stage
- The **start** and **finish**.

Note: This needs to be a clearly labelled hand-drawn or digital flowchart. It must reflect your **actual** system, not a generic one.

Marker Check {Replace with Tick ONLY if Completed} ☑

☐ Three **main components** are shown
☐ Data **flow between** components is shown with arrows
☐ Key **inputs** and **outputs** are labelled
☐ The **start** and **finish**.

Optional: **Then two separate detailed flowcharts**

Flowchart 1: The **micro:bit** {Start, button, sensors, outputs, loop, Finish}

Flowchart 2: The **Python Model** {Start, read CSV, scoring rules, risk output, feedback loop, Finish}

or

A Flowchart that shows some component in **detail** of the **Overall System Architecture Flowchart**.

Create Stage – Student Guidance

1. Milestone Logs

A **milestone** represents a **significant stage** in **building** your **system**.

Your Task: Describe **at least 5** key milestones of the development process. Each milestone should:

- **describe** what was **completed** (**technical** detail)
- **show** how the **project progressed** from one stage to the next

Note: This is **NOT** a week-by-week diary. Focus on key stages of development in your project.

Marker Check {Replace with Tick ONLY if Completed} ☑

☐ Each milestone **describes** what was completed (includes **technical detail**)

☐ Milestones show how the **project progressed** from one stage to the next

2. Testing

Brief: You should describe the testing that took place **throughout** the development process.

Testing shows that you checked your system worked correctly as you built it.

Types of Tests: **Unit Tests:** Unit testing is where **individual** modules of an application are tested
Integration Test: Testing that **TWO or more components** are **working** correctly **together**.
System Test: Testing aimed at testing the **complete integrated system**.

Types of DATA Used in Testing:

1. **Standard Case Data** ..... {Normal Expected Data}
2. **Edge Case Data** .. {unusual or extreme - but still valid e.g., -5 for age}
3. **Stress Case Data** ..... {Large amounts}
4. **Invalid Case Data** ..... {Symbols where should be integers}
5. **Boundary Case Data** ..... {If valid num. <100, test 99, 100, 101}

Your Task: Describe the testing that took place **throughout development**. You should:

a. **At least TWO types of testing** i.e., Unit - Integration - System
b. **Screenshots** of **what you are testing** AND **the code that does the testing**
c. Is the code in each screen shot: i. Commented Sufficiently {within the code}
ii. Screenshot labelled with caption {beneath}
d. Explain **exactly what** is being **tested** and what behaviour or result **expected**.
e. Does the student **comment** on the results of the test.
f. For each, you must include a **Test Table**:

Test No.	Description	Test Data	Expected Result	Actual Result	Pass/Fail
1	Get the Mean	1_StandardTest.csv	116.75	116.75	Pass

Marker Check {Replace with Tick ONLY if Completed} ☑

☐ **At least two types of tests** included {Unit – Integration - System}
☐ Screenshots show **what** was tested and the **testing code**
☐ Is the code in each screen shot: i. Commented Sufficiently {within the code}
ii. Screenshot labelled with caption {beneath}
☐ Each test explains **what** is being tested and **expected behaviour**
☐ Results of tests are **commented** on
☐ **Testing Table:** Test data, expected result, and actual result are included for each test

Warning: You may NOT DIRECTLY use my Sample Testing Code. You MUST develop your own authentic Tests. You SHOULD test aspects of your MODEL.

3. Problems Encountered during Implementation

Your Task: Describe at least **one significant problem** you encountered during the **implementation stage** and explain how you overcame it.

Note: This problem **'may'** have arisen during **Testing**. However, **most** problems occur **before testing**.

Critical: You **CANNOT** use duplicate code or examples from that used in **Testing Section**

Approach: You could:

- start with another test **showing** a problem.

or

- just describe any particular problem encountered {most likely way to do it}

Requirements:

- Clear **identification** of the problem with **technical detail**
- **Screenshots** {with captions} of **problem** showing code **before** fix (with commenting)
- **Explanation** of the **solution**
- Screenshots {with captions} showing code **after** fix {with **commented** code i.e., **evidence**}

Note: Complex problems (logic errors, data handling, integration) are stronger than simple problems (syntax, file paths) – meaning that you have more 'substantial' material to show off to an examiner.

Marker Check {Replace with Tick ONLY if Completed} ☑

☐ **Problem clearly identified** with technical detail

☐ **Screenshots** {with captions} show **commented** code **before fix**

☐ **Solution explained**

☐ **Screenshots** {with captions} show **solution** {with **commented** code i.e., **evidence**}

4. Description of Model you have Programmed

Your Task: Provide detailed technical description of your Python Model: Must Include:

- Purpose i.e., **risk addressed**
- Step-by-step process {**inputs** - **calculation** - **outputs**}
- Data **sources** used
- How **calculations/estimates** are made
- Outputs **explained**
- Code screenshots {with captions} with commenting

Note: Brief descriptions earn lower marks. Use technical terminology, specific values, and detailed logic flow.

Marker Check {Replace with Tick ONLY if Completed} ☑

☐ Purpose i.e., **risk addressed**

☐ Process explained **step-by-step** {**inputs** - **calculation** - **outputs**}

☐ Inputs/data sources **identified**

☐ Calculation or processing logic **described with technical detail**

☐ Outputs **explained**

☐ **Code screenshots or flowchart** with clear commenting/labels

Section 5: Evaluation Stage

1. Evaluation in Relation to the Brief

Your Task 1: Evaluate how well your final artefact met the requirements of the project brief. You should:

- State overall which requirements were **successfully** met.
- Identify one requirement that was **particularly successful** and explain **why?**
- Identify one requirement that was less successful or **challenging** and explain why

Note: Don't evaluate each requirement individually. Give an overall statement, then focus on **one success** and one **challenge**.

Marker Check {Replace with Tick ONLY if Completed} ☑

☐ Overall statement of **which requirements were met**

☐ Identifies one **successful** requirement with explanation

☐ Identifies one **challenging** requirement with explanation

2. Evaluation in Relation to End User Needs

Your Task: Evaluate how well your artefact met the needs of the **end users** and **stakeholders** you identified in the Plan & Design stage. You should:

Referring to your **end user** & **stakeholders** (from Plan & Design)

- Explain which **end-user / stakeholder needs** were **met** successfully {**Check** end-user **needs** in your plan.}
- Explain which **end-user / stakeholder needs** were **not fully met** or could be improved

Note: Make clear connections back to **Section** on **Stakeholders** and **End Users** from **Plan & Design**.

Marker Check {Replace with Tick ONLY if Completed} ☑

Referring to your **end user** & **stakeholders** (from Plan & Design)

☐ Explains which **end user / stakeholders** needs were **met successfully**

☐ Explains which **end user / stakeholders** needs were **not fully met** or could be improved

3. Improvements and Future Iterations

Your Task: Suggest at least **one** improvement or iteration for your artefact. Each improvement should:

- Clearly describe the **proposed improvement**
- Explain **why** this would be an improvement (e.g., more accurate, more useful, more reliable)
- Explain **how** the improvement would **work** or be implemented
- **Justify** the improvement **in relation to brief requirements** or end-user needs

Note: Strong improvements show technical understanding and link back to project objectives. Avoid vague statements like "make it better" or "add more sensors."

Marker Check {Replace with Tick ONLY if Completed} ☑

☐ Improvement **is clearly described**
☐ Explains **why** this would be an improvement
☐ Explains **how** the improvement would **work** or be implemented
☐ Justifies improvement in **relation to brief requirements** or end-user needs

Warning!Do NOT making ANY reference to shortage of time.

Section 1: Meeting the Brief

1. Video

Note: Although not required in your Report Website, I HIGHLY Recommend that your Report opens with a 'Meeting the Brief' section.

You **may** wish to include a brief written description, with images, demonstrating how your artefact meets each of the requirements. You will **not** be penalised marks for not including any text **if your video is sufficient** in describing how you meet each of the requirements.

Hint! You should NOT adlib the video. Your content must:

- include whatever required in each '**requirement**' {checklist}
- contain only **technical** content
- your **voice content** should **match** what you **display** on screen
- **clearly** delivered and is **audible** to an examiner
- Clear marker when transition from one requirement to another e.g., Have a little message come on the screen displaying next requirement: Advanced Requirement 2

Therefore: Write out what you are going to say. Then use that content on a page of your website called: 'Meeting the Brief'