Tackling A Level Projects in

Computer Science

AQA 7517

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Contents

Chapter 1
Starting a new project

Objectives

- Choose a project title
- Choose a stakeholder
- Create a project outline
- Understand levels of technical skills
- Also, understand:
  - How to be realistic in your project scope
  - Languages that are and are not appropriate to use
  - The design methodologies that could be used
  - Different options for IDEs
  - How your work is authenticated

Introduction

Choosing a suitable A Level project is quite a challenge. Projects contribute to 20% of your final grade and therefore choosing the right project for you is important. In particular, for AQA, you must consider how much opportunity the project you choose gives for demonstrating your technical skills.

This guide will take you through the steps to create a successful project. It will not give you the answers, but instead show you tips and tools to help keep you on track, and evidence your project efficiently. Using this guide and the specification should give you confidence in being able to produce the best project you can.

Projects are not about quantity, but quality. Exam Boards have specific **mark schemes**. You need to show you meet each of the mark scheme points. Clear and precise documentation makes it easier for both you, your teacher and the moderator to identify where you have met **mark criteria**.

TIP	Ensure that you fully understand the mark scheme before starting your project.

The important focus should be on programming in a high-level text-based programming language. Your project must allow you to demonstrate your programming abilities, not just design a graphically appealing website, or use a database that is built with a graphical user interface such as Microsoft® Access®.

WARNING Your project problem and solution must allow enough scope to access the more advanced technical techniques (see more on this in the following section). You should discuss this carefully with your teacher.

Problems and investigations

Whilst it is up to you what you decide to do as a project, you can ask for help from your teacher when making your decision.

The first choice you have to make is whether you would like to create a solution to a problem or carry out an investigation. The vast majority of students doing AQA projects tackle problems rather than investigations.

Problems

Most students will find a problem that exists for a group of users or one end-user. Their project then requires analysing and developing a computational solution to the problem.

TIP You will need input from an end-user or other interested people when doing your project.

Investigations

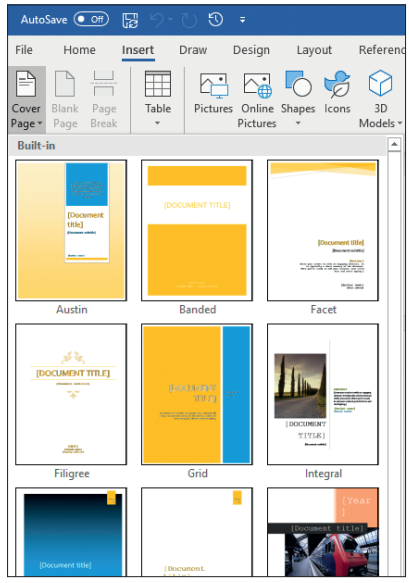
Instead of a problem, AQA allows you to undertake an investigation of an area of interest that requires a significant amount of programming.

In order to carry out an investigation, you must have a supervisor who has some understanding of the area that will be investigated.

TIP You must have a supervisor in order to carry out an investigation. Your supervisor should not be the teacher who will mark your project.

Examples of investigation projects include:

- AI or machine learning algorithms
- Data set analysis and visualisation – e.g. from live data feeds or large data sets
- Neural networks
- 3D graphics rendering



Selection of Microsoft® Word templates

TASK	Create a title page for your documentation.

Using styles

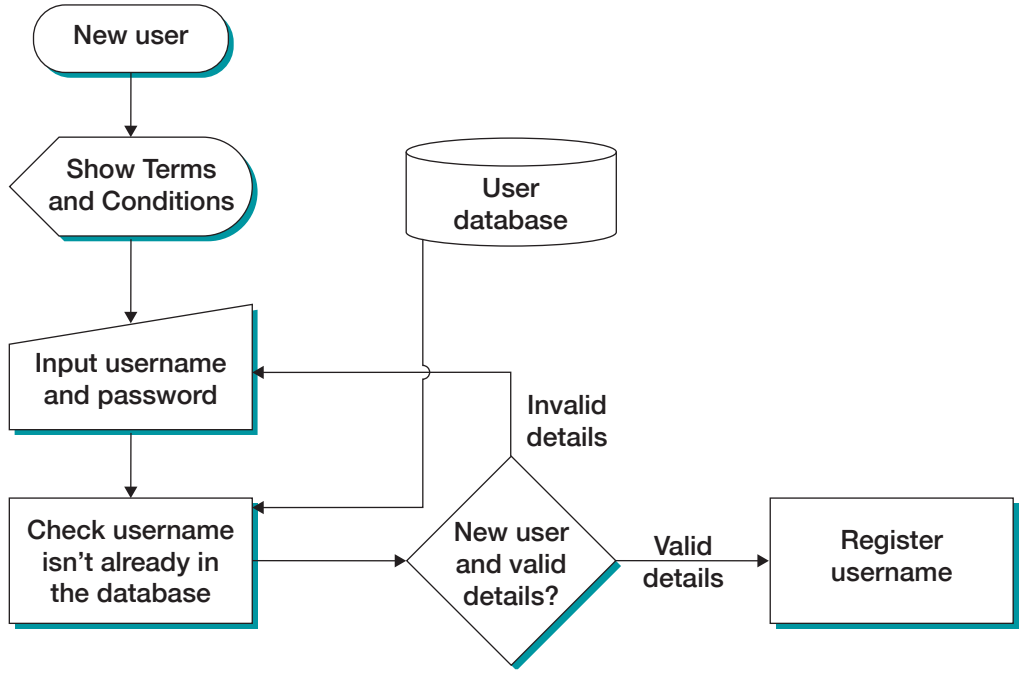
Styles are pre-set ways of formatting text. You should create and save any styles that are needed before adding any content to your document.

Using styles is important as they will be used later to create a table of contents for your work that will dynamically change as you add or delete pages. This will save you a lot of time.

Style options within a word processor

The most common ones you will need are Normal, Heading 1 and Heading 2. Again, there are no extra marks for creating styles. Use the default ones that your word processor or template provide.

The following example shows part of a system flowchart for registration with an online booking system.



An example of a section of a system flowchart

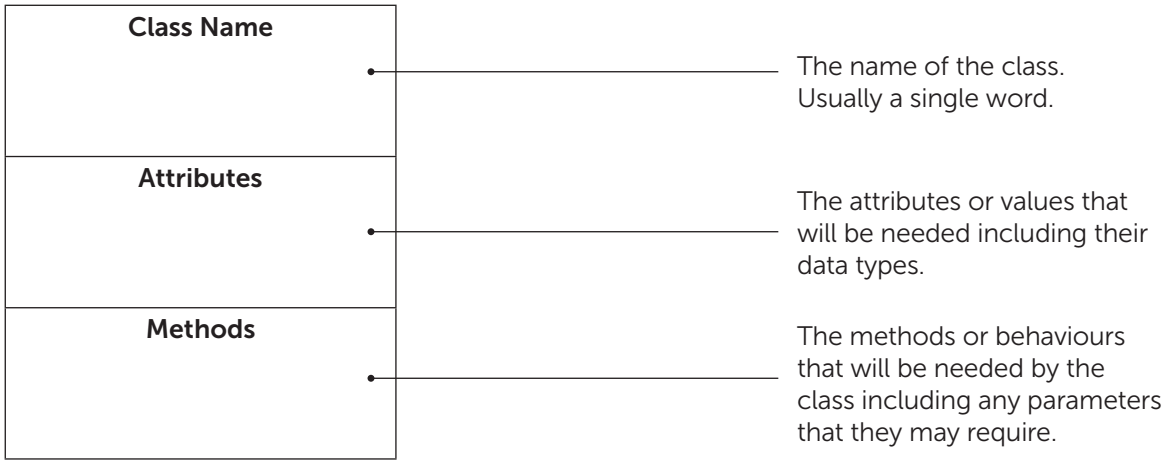
TASK If appropriate for your project, create a system flowchart that gives an overview of how the key processes in your system work.

Data Flow Diagrams

Data Flow Diagrams (DFDs) show the inputs, outputs and how data moves within your system.

Datastores are the databases or files within the system. In the analysis, the users of the system will have been identified along with the actions which they will carry out.

Here is an example of a very simple Data Flow Diagram for a student registering on to a course in a school:

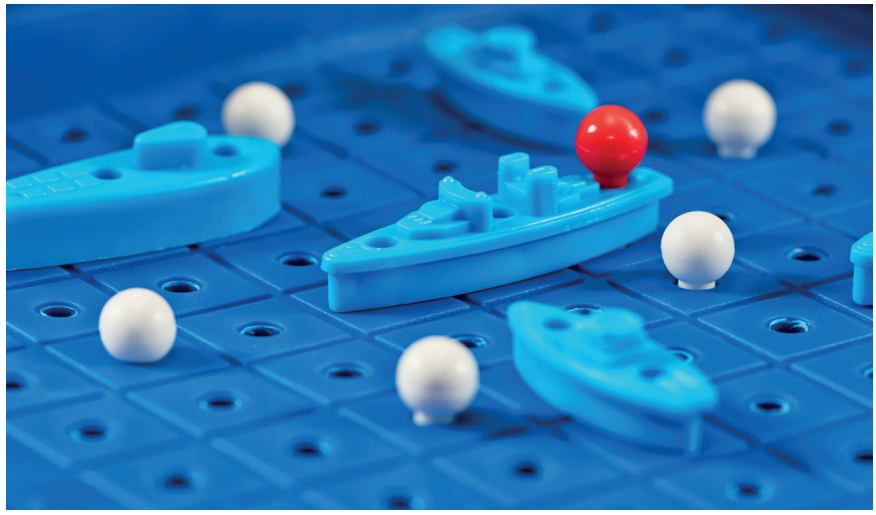


The layout of a class

TIP It is highly advisable that you have solved some simple programming problems in an OOP style before you attempt to write your own class diagrams.

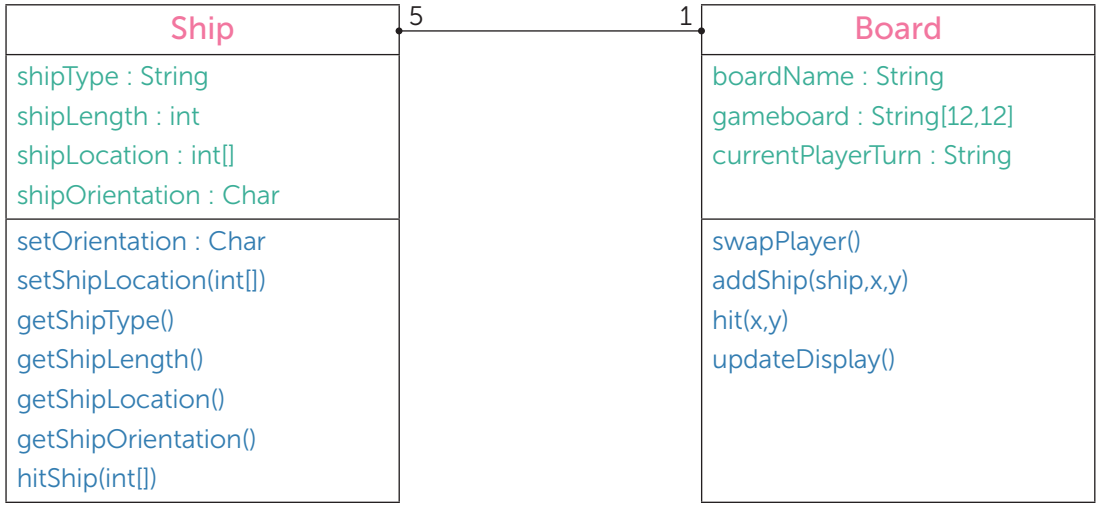
Worked example of class diagrams

This worked example will consider a battleships style game and assume that the initial analysis of the problem has already been carried out.



Association links and multiplicity

A `Board` class can be added which will store where ships are placed and control what happens when they are hit. 1 board has exactly 5 ships, so these numbers can be written by the **association link**. Note that in the real game, two boards would be needed, one for each player.



The number of instances that are created from each class is known as **multiplicity**.

0..1	No instances or one instance
1	Exactly one instance
0..*	Zero or more instances
1..*	One or more instances
*	Any number of instances
4..6	4 to 6 instances
3	Exactly 3 instances

Possible multiplicity instances

Further classes would need to be built for other objects in the game such as the players.

TASK If your project will make use of object-oriented programming techniques then create a class diagram to describe the system.

Note that the AQA specification expects a broader understanding of OOP than that given above. If your project is heavily using OOP then when creating any designs you should consider which of the following key aspects are relevant to your project.

Alternatively, your solution or investigation may be saving files. For instance, if mapping data for cities were being saved with a certain file format and filename format, then you would need to explain this.

TASK If your project relies on more files, then show how the file structure will be organised.

HCI (Human-Computer Interaction) / Screen designs

Designs should be given for any point where the user interacts with the computer. Typically this will be a screen design, and almost all projects require some on-screen interaction.

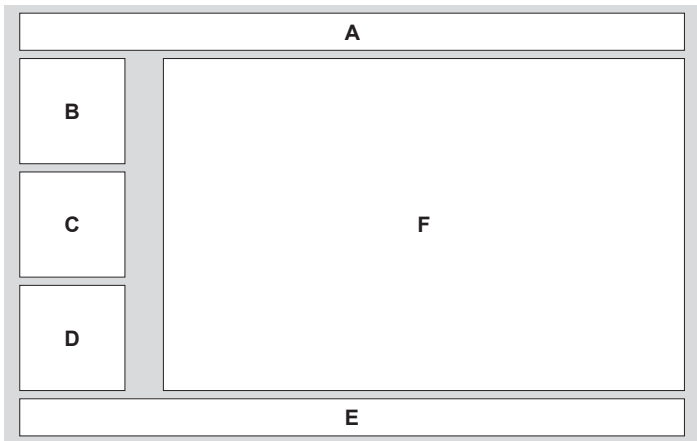
When designing a Graphical User Interface (GUI), you should consider the placement of all GUI objects. For example, in a game, this may be the menu system and placement of objects such as health bars and scores. For other systems, it may be where users enter data, view results and have menu bars placed.

The GUI is an important part of a project and should be accurately sketched out.

TIP You should have researched features of GUIs for similar software to that which you are designing in the Analysis section. Make sure your designs reference any applicable research that was carried out earlier.

Wireframes are a good way of designing your GUI. These are line drawings. They will help to show key features and layout clearly. Specific aspects can be numbered and explained in more detail.

If you have key themes or **house styles** that must be used in the requirements specification, then refer to these here.



A: Page header
B, **C**, **D**: Advertising
E: Page Footer
F: Page Content

Styles
Header:
- Arial Bold 14pt, Blue

Page text:
- Arial 12pt, Dark grey

Page Header:
- Arial Bold 14pt, Black

Sample GUI layout for web page

Completeness of solution

You will get marks for the completeness of your solution compared to the objectives that you set out to achieve.

If some of your objectives were very hard and beyond A level standard, you will not be marked down for failing to achieve these. However, if your objectives were too easy and you meet them all, then you won't necessarily get full marks even if you do complete them all. For this reason, you should focus on having objectives that are hard enough to access technical skills from Group A.

You should aim to meet all the objectives of your system. Appropriate testing of your code will help in providing evidence that you have met the objectives.

It is a good idea to make a copy of your objectives in a table form. Create a column next to each objective which can refer to the evidence that shows that it was met including, where appropriate, a page number. The evidence may be from test results (in the next section of the report), video evidence, user feedback or code listings.

TIP You can still get into the top mark band level if a few of your objectives aren't met. You need to consider whether your time is better spent fixing problems with your solution, or completing other parts of the report to a higher standard.

Objectives	Achieved	Evidence
4. Parents need to be informed of the appointments that they have just made.	✓	Testing p.63
1.1. Once they have confirmed the appointment a page will be displayed which contains 1.1.1. The appointment times 1.1.2. The names of the teachers 1.1.3. The subject for each teacher	✓	Screenshot p.65
4.2 A print button will be on the confirmation page. When clicked this will print all the appointment details given in objective 4.1	✓	Video [1m32s]

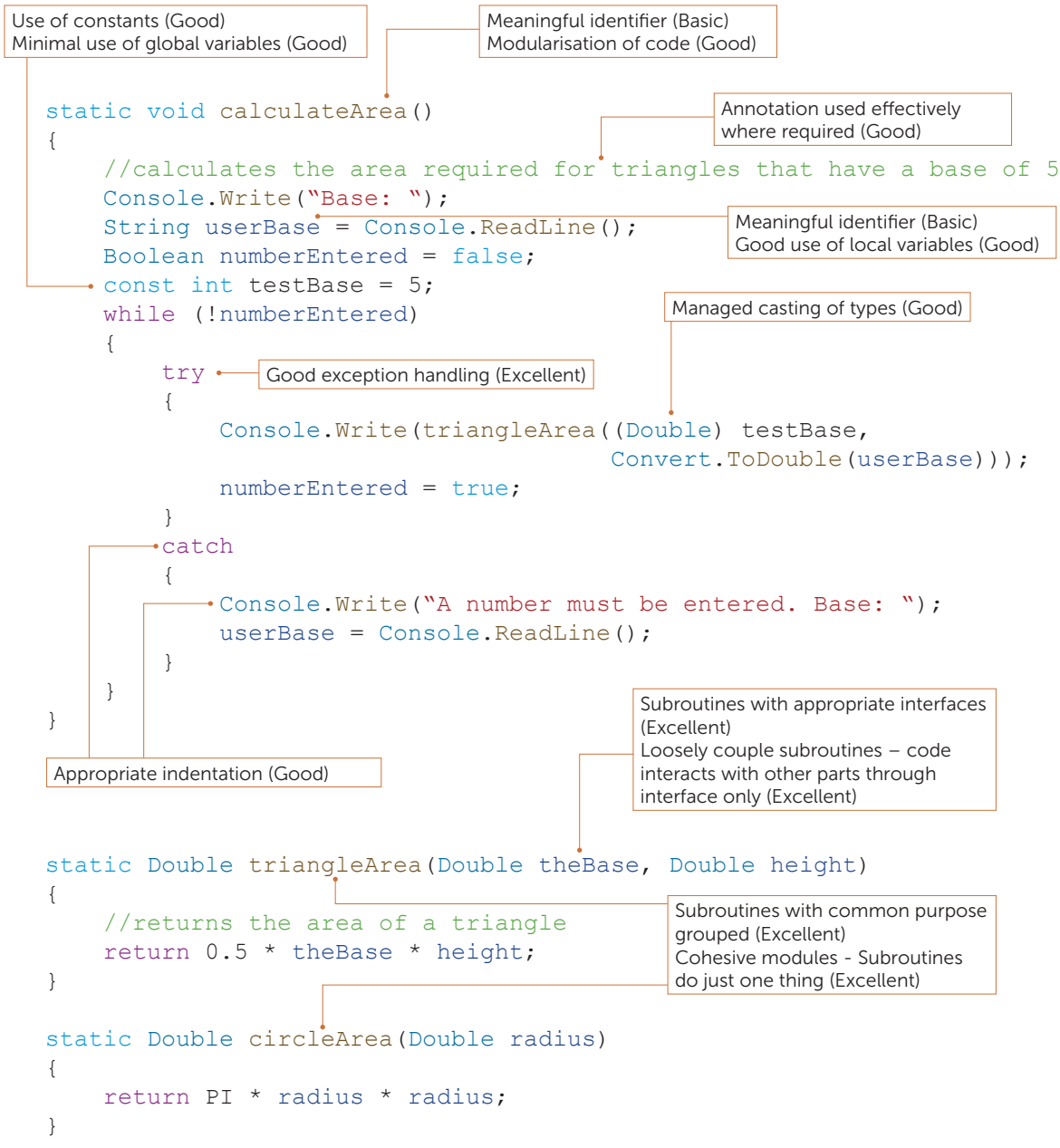
An example showing evidence for a section of objectives being achieved

TASK Create evidence to show the completeness of the solution.

Chapter 5

Technical solution

The following example shows a small section of code and how it can demonstrate many of the features of Basic, Good and Excellent coding styles.




```
static void calculateArea()
{
    //calculates the area required for triangles that have a base of 5
    Console.Write("Base: ");
    String userBase = Console.ReadLine();
    Boolean numberEntered = false;
    const int testBase = 5;
    while (!numberEntered)
    {
        try
        {
            Console.Write(triangleArea((Double) testBase,
                                       Convert.ToDouble(userBase)));
            numberEntered = true;
        }
        catch
        {
            Console.Write("A number must be entered. Base: ");
            userBase = Console.ReadLine();
        }
    }
}

static Double triangleArea(Double theBase, Double height)
{
    //returns the area of a triangle
    return 0.5 * theBase * height;
}

static Double circleArea(Double radius)
{
    return PI * radius * radius;
}
```

Chapter 8
Final checks

TIP	As your report needs to be printed, set yourself a deadline at least one working day ahead of the deadline your teacher gives you. This means that if there are technical difficulties with the printer you are using you have time to fix them.

Finally, check that each page number has printed and is in your report. If any evidence is missing then you may well lose marks. Be aware of any deadlines that your teacher has given and make sure you submit your work well before the deadline.

Deadline for submitting your report

Deadline for printing report: _____

Deadline for handing in report: _____

To do list
Have you done the following?

- [ ] **Checked your report against the To do lists in this book**
- [ ] **Checked your report against the mark scheme**
- [ ] **Made sure that key documentation and evidence is present**
- [ ] **Proof-read your work**
- [ ] **Checked that any copied materials have been correctly referenced**
- [ ] **Uploaded videos**
- [ ] **Created a list of all video evidence**
- [ ] **Completed a Candidate Record Form (CRF)**
- [ ] **Printed the report and attached it to the CRF with a treasury tag**
- [ ] **Handed in the report**

Index

Appendix

Useful shortcuts and key combinations

Editing shortcut key combinations

Ctrl + A	Select all
Ctrl + B	Apply or remove bold formatting
Ctrl + C	Copy
Ctrl + Shift + C	Copy formatting
Ctrl + F	Find
Ctrl + I	Apply or remove italic formatting
Ctrl + P	Print
Ctrl + S	Save
Ctrl + V	Paste
Ctrl + Shift + V	Paste formatting
Ctrl + X	Cut
Ctrl + Y	Redo or repeat last action
Ctrl + Z	Undo an action
Shift + F3	Toggle case
Alt + =	Insert equation
Shift + Enter	Create a soft line break
Ctrl + Enter	Insert a page break
Ctrl + [	Decrease font size
Ctrl +]	Increase font size

Navigation shortcuts

Ctrl + Home	Go to beginning of document
Ctrl + End	Go to end of document
Shift + F5	Go to last place text was edited

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Completing an A Level Computer Science project is a huge undertaking for any student regardless of their competence in programming.

The key to success is to plan and write a strong report, evidencing what has been carried out.

Tackling A Level Projects in Computer Science for AQA 7517 is the essential student guide for completing the project and, in particular, the report, with confidence and independence. It contains clear and concise instruction and examples of what needs to be included. From how to generate initial ideas and choose end users, to how to evidence your final product; this book covers it all.

This guide does not specifically teach programming and is therefore suitable for use with any language or project idea being undertaken.

With important tips and advice based on the authors' in-depth experience with Computer Science projects, this will help to keep a project's progress on track.

Finally, a guide that can help students to submit their final project with confidence before the deadline.

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'Long Surf Breaking'
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