Dr Ed Powley

Introduction

"No matter the language, learning to program will take a very long time, and is often very frustrating. I'm sorry. There is no solution. Just practice. Regular practice.

"That's why I always call programming a craft. You spend your life honing your craft, not a weekend.

"You WILL get stuck. You WILL get very frustrated. You WILL want to quit. You WILL think this is all pointless and dumb. You WILL look at the things others are doing and think 'How the hell am I going to do this?'

"Programming can make you feel empowered. Programming can make you feel excited. Programming can be a major source of inspiration.

"But it has to come from you. YOU are the driving force here. I and others can only point you in a direction."

— Ólafur Waage

In this assignment, you are required to complete a number of tasks to accompany your studies of the principles of computing. This assignment is divided into a series of bite-sized **worksheets**. The worksheets require you to **design**, **annotate**, and **write** a series of computer programs according to instructions, as well as to **apply** mathematical techniques to **solve** problems.

In order for programmers to communicate with each other regarding the technical aspects of a game development project, they must have good computational thinking skills, a strong foundational knowledge of computing principles, applied knowledge of program design notations and annotations, and a working knowledge of particular programming constructs (often as a result of writing their own versions). Such knowledge and skills take time and a sustained effort to develop.

> For this **referral/deferral** assignment, you may **either**:
> 1. Complete a series of **nine worksheets**; this carries a maximum mark of 100% with each worksheet marked on a criterion-referenced basis; **or**
> 2. Complete an **online quiz**; this carries a maximum mark of 48%.

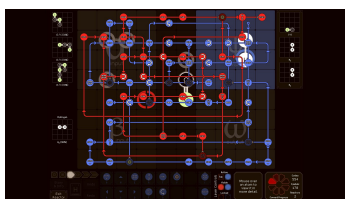Either way, this assignment addresses the following learning objectives:

1. **Apply** basic computational thinking to puzzle solving;
2. **Use** number representation systems including binary and hexadecimal;
3. **Express** simple algorithms using notations such as flowcharts and pseudocode;
4. **Reason** using the operations of Boolean logic;
5. **Utilise** theoretical concepts such as computational complexity;
6. **Write** programs using algorithm strategies based on recursion;
7. **Implement** programs making use of advanced data structures;
8. **Calculate** geometric quantities using vectors;
9. **Understand** how computer processors execute low-level machine code.

Assignment Setup

This assignment consists of a **single summative submission**. You will receive **formal feedback** three weeks after the submission deadline.

Option 1: Worksheets

SpaceChem is a puzzle game in which players must apply computational thinking to build circuits which assemble chemical molecules.

The individual worksheets can be found on LearningSpace. Each worksheet contains detailed submission instructions. You will generally be required to either **fork** a repository on GitHub and submit a **pull request** containing your solution, or to complete an online quiz on LearningSpace. For the purposes of
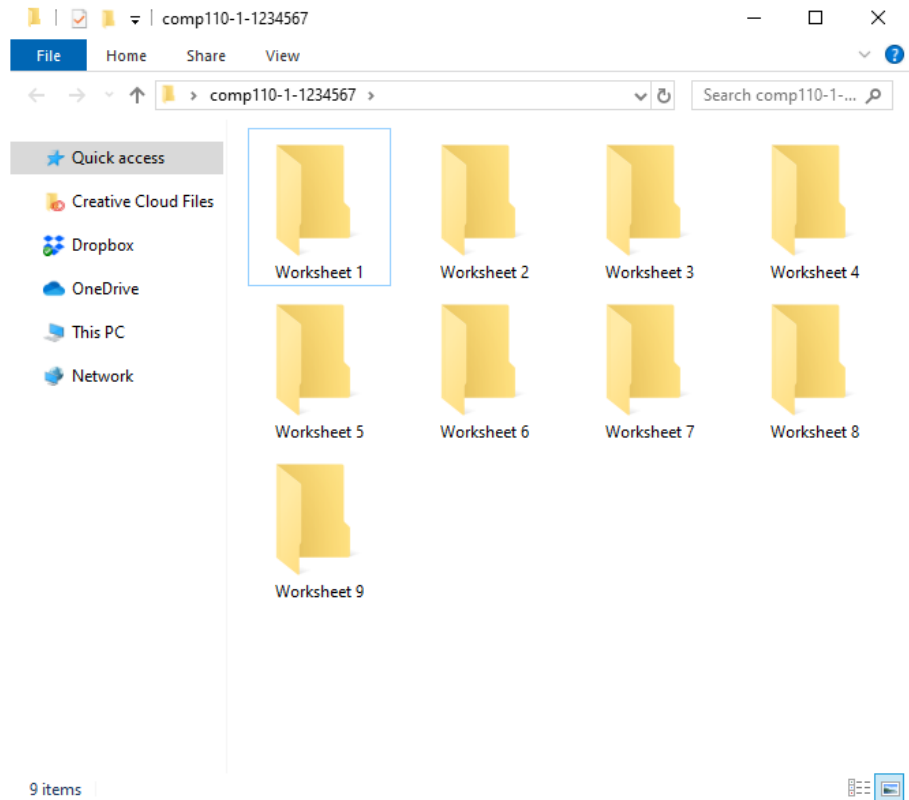
Figure 1: Recommended folder structure for your final summative submission.

this referral/deferral assignment, submitting via GitHub pull request is optional, however is recommended in order to take advantage of TravisCI where applicable and to request feedback from the tutor.

Prepare a **single** `.zip` **file** containing your submissions **in separate folders**, and upload it to the appropriate submission area on LearningSpace. The folder structure within your zip file should resemble that shown in Figure 1.

Option 2: Online quiz

The **Referral Quiz** activity can be found on LearningSpace. Complete **all** questions. The maximum mark is 48%; a mark of at least 40% is required for a pass. You may attempt the quiz an unlimited number of times; your highest graded attempt will be taken.

Once you have completed the quiz, prepare a **single** `.pdf` **file** containing your quiz results. The easiest way to do this is to open the quiz review page in Chrome, and use the browser's Print command, and set the destination to "Save as PDF".

This final submission is subject to the usual university policies regarding late submission or non-submission, as detailed in the course handbook — even if you have completed the quiz on LearningSpace, failure to upload to the submission area by the institutional deadline will be counted as a non-submission.

Additional Guidance

Make a submission on time and you will get at least a 30% mark on that worksheet, even if your solution is incorrect or incomplete. This is just below the pass threshold of 40%, so even an incomplete solution submitted on time is often enough to pass. A solution meeting all of the correctness and/or functionality criteria on the worksheet is required to demonstrate basic proficiency,

with higher grades contingent on your solution being of a high quality. The individual worksheets give more guidance as to what constitutes "quality" for that particular exercise, but bear in mind that a major purpose of these worksheets is to assess your ability to communicate complex computational ideas in English, in notation and in program code. Thus pay particular attention to the precision and clarity of your written communication, and the readability and maintainability of your source code.

It is very important to keep up with the worksheets. Missing a deadline results in an automatic mark of 0% for that worksheet. The underlying skills being developed are also critically important to your progression as a programmer, so do not neglect the work. Do not underestimate the time it takes to complete tasks that may appear trivial when you first see them. Do not leave work until the last minute! With programming in particular, trying to "cram" the work just before the deadline is a sure path to failure. Aim for consistent, steady progress over the course of the semester.

A key skill of software development is the ability to read and follow instructions. Make sure to read the worksheet carefully to ensure that you are meeting all of the requirements — a surprising number of students needlessly lose marks by misreading the worksheet.

Nobody learns in a vacuum: you are allowed, and indeed encouraged, to discuss your work with your peers. However you must be very careful to avoid falling into **academic misconduct**, in particular **plagiarism**. If any part of your solution is **not your own individual work**, you must make this as clear as possible in your submission, for example in source code comments.

FAQ

- **What is the deadline for this assignment?**
  Each worksheet has its own formative deadline, specified on that worksheet and also communicated in class. Falmouth University policy states that summative deadlines must only be specified on the MyFalmouth system.
- **What should I do to seek help?**
  You can email your tutor for informal clarifications. For informal feedback, make a pull request on GitHub.
- **How will I receive feedback on my work?**
  You will be given verbal feedback on your work during the session in which it is marked. If you require more in-depth feedback or discussion, please book an appointment with your tutor.
- **Is this a mistake?**
  If you have discovered an issue with the brief itself, the source files are available at:
  `https://github.com/Falmouth-Games-Academy/bsc-assignment-briefs`.
  Please make a pull request and comment accordingly.

Additional Resources

- F. Dunn and I. Parberry (2011). 3D Math Primer for Graphics and Game Development. CRC Press.
- E. Lengyel (2011). Foundations of Game Engine Development, Volume 1: Mathematics. Terathon Software LLC.
- T. Jenkyns and B. Stephenson (2012). Fundamentals of Discrete Math for Computer Science: A Problem-Solving Primer. Springer.

See also individual worksheets.

Marking Rubric

Each individual worksheet is marked according to this rubric.

Criterion	Weight	Refer for Resubmission	Adequate	Competent	Very Good	Excellent	Outstanding
Basic competency threshold	30%	A reasonable attempt at the worksheet was not submitted by the formative deadline.	A reasonable attempt at the worksheet was submitted by the formative deadline. Adequate ability to generate ideas, problem solving, concepts, technical competency and proposals in response to set briefs and/or self-initiated activity. There is no evidence of academic misconduct.				
Other criteria	70%	Please see individual worksheets for marking criteria.					

Each worksheet is worth 11.1% of the total marks for this assignment.