Unit Title: Maths and Logic Fundamentals for the Games, Animation and VFX Industries

Unit Level:	**Three**
Guided Learning Hours:	**60**
Ofqual Unit Reference Number:	**H/507/3218**
Unit Review Date:	**31/07/2017**
Unit Sector:	**9.3 Media and Communication**

Unit Overview

The aim of this unit is to ensure learners have the basic skills required in order to understand and successfully apply mathematical concepts used throughout the fields of game development, animation and visual effects. Learners will develop the skills they need to absorb complicated concepts through the use of experimentation and play.

The unit will assist learners in developing an understanding of mathematical techniques with the aid of a programming approach. It is designed with exploration and experimentation at its core. The idea of this unit is not simply to explain and test learners recall, but instead to encourage them to understand the concepts, their application and the ramifications of changing the input values.

Good maths is a prerequisite for many of technical skills required to work in the games development, animation and visual effects industries. These skills are also highly transferable to other industries. Computer programs used to assist the creation of games, animation and visual effects, use different number systems to store and manipulate data, for example Hexadecimal is often used to represent colour using three numbers to represent red, green and blue.

Learning Outcomes

The learner will:

MLF 1 Understand numbers and number systems

MLF 2 Be able to employ basic mathematical problem solving skills

MLF 3 Understand basic mathematical concepts which are useful for problem solving and simulation

MLF 4 Be able to use probability, statistics and random numbers

Indicative Content

- Discrete and continuous mathematics: Number Systems, Families of Numbers, Natural, Integers, Rational and Irrational Numbers, Squares, Primes, Divisors, Remainders, Pi, e and Perfect Numbers.
- Arithmetic: Counting and Subtracting, Multiplication and Division. Using Binary, Decimal and Hexadecimal.
- Conversion operations: convert between Binary, Decimal and Hexadecimal.
- Write code that implements basic mathematical problems with the help of algebra and arithmetic: Is it prime, Euclid's algorithm.
- Vectors: Adding, Subtracting, Magnitude, Multiply by Scalar, 2D, 3D.

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- Trigonometry ratios and Wave Functions: Sine, Cosine and Tangent, Triangles, Circles, Angles and Distance.
- Matrices: Adding, Negative, Subtraction, Multiplication with constant, Multiplication with a Matrix, Division and Transpose.
- Scalar Product: Finding the angle between directions.
- Vector products: Find right from up and forward.
- Probability: Tossing coins, throwing dice, probability line.
- Averages: Mean, Mode, Median and Range.
- Standard deviation: Comparing datasets.
- Random: perception, pseudorandom, Noise and Perlin.

Assessment

This unit is assessed using the following assessment method:

- Maths Examination

See the assessment section of the qualification specification, Assessment Pack and sample assessments for full details on the assessment.

Delivery

This unit supplies knowledge that underpins many of the other units in this qualification. It is therefore recommended that it is undertaken early in the course. The unit helps learners to understand key mathematical concepts that are required in order to visually and physically simulate realities. It will also undertake to introduce a new way of learning, which learners may not have been exposed to previously, where there are few wrong answers and the emphasis is on experimentation. Where possible this module could be taught alongside the Programming Fundamentals unit and activities can feed into more detailed programming techniques.

Successful teaching of this unit will be achieved with a combination of tutor led learning sessions and individual exploration of the concepts through playing with input values and viewing the resulting output. Sessions should be practical and concepts should be presented visually with a fast feedback loop. Centres should ensure that this unit can be taught using interactive representations of the subjects, preferably with the use of computer programs where the input can be changed and the output is visual.

The course could be delivered in the order of the learning outcomes but there is a large amount of flexibility here due to the high overlap between subjects. Therefore tutors can be flexible with the order of subjects in order to assist with knowledge required for other units and where possible these subjects can feed directly into other unit activities.

This unit should be taught in a practical manner and wherever possible concepts should be introduced alongside practical uses that relate back to the games development, animation or visual effects industries.

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The subjects introduced throughout this unit should be reinforced through other units in the course and maths skills should continue to be assessed throughout the course.
Delivery of the programming element of this unit can be done using whatever C based programming language with which the tutor is most familiar.

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