UNIT 3 *Graphs* Teaching Notes

Historical Background and Introduction

The key concept here is that of drawing graphs to represent formulae (or functions) and hence depends on the formation of cartesian axes. These were first introduced by the French philosopher, *René Descartes* (1596-1650), from which the name 'cartesian' is derived (see internet address

http://www-groups-dcs.st-and.ac.uk:80/~history/

for details of his life and work).

The link between algebra and geometry (often called analytic geometry) seems quite natural now, but it is surprising to note how recently it came into being. The subject appeared in the 17th Century with *Pierre Fermat* and *René Descartes* as its principal developers. In fact, *Descartes* gained the glory as he quickly published his work, whereas *Fermat* delayed publication.

Prior to this time, geometry had been studied for many centuries, so that the properties of particular curves (e.g. circle, parabola, elipse etc.) had been well understood. Algebraic notation and analysis, particularly related to the solving of equations had also been progressing. What *Fermat* and *Descartes* did was to take an algebraic equation and plot corresponding points (and hence its graph) on a rectangular grid so combining geometry and algebra together.

Descartes published his main treatise in 1637, but he made it tough going for the readers - even the great Newton had dificulty in following the arguments! In fact *Descartes* wrote to the reader

> "I shall not stop to explain this in more detail, because I should deprive you of the pleasure of mastering it yourself"

and he continued

> "I have omitted a number of things that might have made it clearer, but I did this intentionally, and would not have it otherwise".

(Note this is not the MEP teaching philosophy!)

Fortunately, others at the time were able to revise the ideas and put them in an intelligible form and later a revised edtion of his work made its mark.

Nowadays it seems entirely natural to draw graphs of functions given in algebraic terms - indeed it is one of the key components of both GCSE and A Level maths courses. So we owe much to the advances made by both *Descartes* and *Fermat.*

In this unit, we first introduce coordinates in the positive quadrant and scatter graphs are introduced as a useful application. To extend the axes fully, negative numbers are introduced and the final section is centred on another application of graphs, namely that of conversion between units (or currencies).

Routes		**Standard**	**Academic**	**Express**
3.1	Scatter Graphs	✓	✓	–
3.2	Plotting Points	✓	✓	–
3.3	Negative Numbers	✓	✓	–
3.4	Coordinates	✓	✓	✓
3.5	Plotting Polygons	(✓)	✓	✓
3.6	Conversion Graphs	×	(✓)	✓

Language	**Standard**	**Academic**	**Express**
• scatter graph	✓	✓	–
• coordinate axis, coordinates	✓	✓	✓
• negative numbers	✓	✓	–
• polygon (through to decagon)	(✓)	✓	✓
• conversion graph	✕	(✓)	✓

(✓) *denotes extension work for these pupils*

Challenging Questions

The following questions are more challenging than others in the same section:

	Section	*Question No.*	*Page*
Practice Book Y7A	3.1	1 (h)	30
		2 (i)	32
" "	3.3	6	41
" "	3.5	8	51
		9	51