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| **UNIT 9: Real-life and algebraic linear graphs** |

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**SPECIFICATION REFERENCES**

N13 use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate

A7 where appropriate, interpret simple expressions as functions with inputs and outputs

A8 work with coordinates in all four quadrants

A9 plot graphs of equations that correspond to straight-line graphs in the coordinate plane; …

A10 identify and interpret gradients and intercepts of linear functions graphically and algebraically

A12 Recognise, sketch and interpret graphs of linear functions …

A14 plot and interpret … graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration

A17 solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation); find approximate solutions using a graph

R1 change freely between related standard units (e.g. time, length, area, volume/capacity, mass) and compound units (e.g. speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts

R11 use compound units such as speed, … unit pricing, …

R14 interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion

G11 solve geometrical problems on coordinate axes

G14 use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money, etc.)

**PRIOR KNOWLEDGE**

Students should be able to plot coordinates and read scales

Students should be able to substitute into a formula.

**KEYWORDS**

Linear, graph, distance, time, coordinate, quadrant, real-life graph, gradient, intercept, function, solution, parallel

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| **9a. Real-life graphs**(N13, A7, A8, A9, A10, A14, R1, R11, R14, G11, G14) | **Teaching time**7-9 hours |

**OBJECTIVES**

By the end of the sub-unit, students should be able to:

* Use input/output diagrams;
* Draw, label and scale axes;
* Use axes and coordinates to specify points in all four quadrants in 2D;
* Identify points with given coordinates and coordinates of a given point in all four quadrants;
* Find the coordinates of points identified by geometrical information in 2D (all four quadrants);
* Find the coordinates of the midpoint of a line segment; Read values from straight-line graphs for real-life situations;
* Draw straight line graphs for real-life situations, including ready reckoner graphs, conversion graphs, fuel bills graphs, fixed charge and cost per unit;
* Draw distance–time graphs and velocity–time graphs;
* Work out time intervals for graph scales;
* Interpret distance–time graphs, and calculate: the speed of individual sections, total distance and total time;
* Interpret information presented in a range of linear and non-linear graphs;
* Interpret graphs with negative values on axes;
* Find the gradient of a straight line from real-life graphs;
* Interpret gradient as the rate of change in distance–time and speed–time graphs, graphs of containers filling and emptying, and unit price graphs.

**POSSIBLE SUCCESS CRITERIA**

Interpret a description of a journey into a distance–time or speed–time graph.

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Students should be able to decide what the scales on any axis should be to be able to draw a correct graph.

Conversion graphs can be used to provide opportunities for students to justify which distance is further, or whether or not certain items can be purchase in different currencies.

**COMMON MISCONCEPTIONS**

With distance–time graphs, students struggle to understand that the perpendicular distance from the *x*-axis represents distance.

**NOTES**

Clear presentation of axes is important.

Ensure that you include questions that include axes with negative values to represent, for example, time before present time, temperature or depth below sea level.

Careful annotation should be encouraged: it is good practice to get the students to check that they understand the increments on the axes.

Use standard units of measurement to draw conversion graphs.

Use various measures in distance–time and velocity–time graphs, including miles, kilometres, seconds, and hours.