Linear functions

Overview of unit

CORNERSTONE MATHS

Investigation	Key Mathematical Ideas	Key Technology Experiences
Introduction Welcome to SandCircle Mobile Games (30 minutes)	→ Context of the unit is established: The mechanics and business of mobile phone game design are described, such as how to design components of a game and compute salary and savings. → Motion can be represented on a graph of time versus distance. → Idealised motion on a distance-time graph appears as a straight line (constant rate).	No technology needed.
Investigation 1 Yari, the Yellow School Bus (45 minutes)	→ Motion can be represented on a graph of time versus distance. → Idealised motion on a distance-time graph appears as a straight line (constant rate).	Play and pause a video.
Investigation 2 Our First Mobile Phone Game (40 minutes)	→ Motion can be represented on a graph of time versus distance. → Idealised motion on a distance-time graph appears as a straight line (constant rate).	Play and pause a simulation.
Investigation 3 Controlling Characters with Graphs (70 minutes)	→ Graphs are mathematical representations of relationships such as motion. → Graphs of motion show characters' start position, speed (relative) and places and times where characters meet. → For graphs of motion (that is, time versus distance), the steeper the line, the faster the motion. → Speed can be determined from different parts of a graph and simulation.	Play and pause a simulation. • Edit the graph to change the speed. • Edit the graph to change the final position.

Investigation	Key Mathematical Ideas	Key Technology Experiences
Investigation 4 Controlling Characters with Equations (120 minutes)	→ Equations are a form of mathematical representation. Graphs and tables are other forms. → Equations can be written based on tables or graphs. → You can "translate" between graphs, tables and equations. → Time, distance and speed are represented differently in these three representations. → For equations of the form $y = mx$, in motion contexts, m is the speed of a moving object.	Play and pause a simulation. • Edit the graph to change the speed. • Edit the graph to change the final position. • Edit the graph to change the start position. [*The table and equation windows are available to view.*]
Investigation 5 One to Another (40 minutes)	→ You can "translate" between graphs, tables and algebraic expressions.	No technology needed.
Investigation 6 Better Games (90 minutes)	→ Introduction to non-proportional linear functions (not passing through the origin). → Pupils explore two ways to derive the equations of non-proportional linear functions: using differences of position and time in a table; using the y -intercept and speed/gradient of a graph. → For equations of the form $y = mx + c$, in motion contexts, c is typically the starting point and m is the speed of a moving object.	Play and pause a simulation. • Edit the graph to change the speed. • Edit the graph to change the final position. • Edit the graph to change the start position. • Edit the equation to change the speed and start position.
Investigation 7 Wendella's Journey: Moving at Different Speeds (80 minutes)	→ In a position-time graph, multi-segment graphs can represent characters moving at different speeds. → Graphs tell a story. Stories can be represented in the form of graphs. In this activity, pupils will learn to write stories from graphs and make graphs for stories. → "Flat" or horizontal lines represent standing still.	Play and pause a simulation. • Edit the graph to change the velocity.

Investigation	Key Mathematical Ideas	Key Technology Experiences
Investigation 8 Money Matters (55 minutes)	→ Multi-segment graphs show varying speeds in motion contexts. → Multi-segment graphs can also be used in non-motion contexts to show rate of accumulation, for example. → Graphs tell a story. Stories can be represented in the form of graphs. In this activity, pupils will learn to write stories from graphs and make graphs for stories. → "Flat" lines represent standing still. → Lines "slanting downward" represent moving backwards.	Play and pause a simulation.
Investigation 9 Mathematically Speaking: Graphs to Know (10 minutes)	→ Graphs of rates of change are used in various contexts. → Quick graph sketching helps pupils to see general patterns.	No technology needed.
Investigation 10 Crab Velocity (65 minutes)	→ In position-time graphs, negative rates indicate backwards motion. → Position can also be negative, with 0 indicating some defined point such as a start line or water level.	Play and pause a simulation.

Investigation	Key Mathematical Ideas	Key Technology Experiences
Investigation 11 Wolf and Red Riding Hood (80 minutes)	→ Finding the velocity of a character given some conditions. → No matter how the characters move, if their motion graphs have the same endpoint, they meet at the same place at the same time. → The average rate (speed or velocity) of a character travelling at different rates for different times is the single speed at which she can make the same trip in the same amount of time. → A graph can be used to find the average rate (velocity) of a character moving at different rates (velocities): Draw a line from beginning point to ending point of the character's graph, and then determine its rate.	Play and pause a simulation.
Investigation 12 Problem Solving (25 minutes)	→ Apply ideas learned in the unit in similar and different settings.	No technology needed.
Investigation 13 Problems from the SandCircle Lunchroom (30 minutes)	→ Apply ideas learned in the unit in similar and different settings.	No technology needed.
Investigation 14 SandCircle Mobile Games: Going Full Time (15 minutes)	→ Pupils reflect on the unit as a whole, reflect on the mathematics, and note what they learned. → You may want to give feedback to pupils in the form of a letter from the potential employer, stating: "You have been/not been successful in this application because..."	No technology needed.