VCE Mathematical Methods Unit 1

Line segment graphs and review of coordinate geometry

Introduction

This learning activity is designed to use a line segment graph as a context for review of coordinate geometry. Parts 1 to 5 are intended to be completed without the use of technology. Parts 6 and 7 include the use of technology.

Part 1

Consider the set of points and coordinates given below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Point | *A* | *B* | *C* | *D* | *E* | *F* |
| Coordinates | (0, 0) | (5, 3) | (7, 10) | (15, 10) | (17, 2) | (17, 0) |

Plot these points on a graph, and connect them to form the line segments *AB*, *BC*, *CD*, *DE* and *EF*.

Calculate the total area bounded by these line segments and the horizontal axis.

Part 2

For each line segment find:

1. the gradient
2. the coordinates of the midpoint
3. the length
4. the equation of the line that contains the line segment
5. the angle the line segment makes with respect to the horizontal, correct to the nearest degree

Part 3

Let *P* be the point with coordinates (1, 6)

1. find the equation of the line that passes through *P* and is parallel to the line segment *AB*
2. find the equation of the line that passes through *P* and is perpendicular to the line segment *AB*
3. draw both of these lines on the graph

Part 4

Let *Q* be the point with coordinates (11, 8)

1. find the equation of the line that passes through *Q* and is parallel to the line segment *CD*
2. find the equation of the line that passes through *Q* and is perpendicular to the line segment *CD*
3. draw both of these lines on the graph

Part 5

Find the coordinates of the point of intersection of the line passing through *BC* and the line with equation $ 3x+2y=24$.

Part 6

Use technology to define a piecewise (hybrid) function with pieces for each of the line segments
*AB*, *BC*, C*D* and *DE* and plot its graph.

Clearly indicate each of the points *A*, *B*, *C*, *D*, *E* and *F* on the graph and include the line segment *EF*.

Part 7

Verify the results from Parts 1 to 5 of the learning activity, and plot corresponding graphs on the same graph as in Part 6.

Areas of study

The following content from the areas of study is addressed through this task.

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| **Unit 1** |
| **Area of study** | **Content dot point** |
| Functions, relations and graphs | 1 |
| Algebra, number and structure | 1, 2, 8 |
| Calculus | - |
| Data analysis, probability and statistics | - |

Outcomes

The following outcomes, key knowledge and key skills are addressed through this task.

|  |
| --- |
| **Unit 1** |
| **Outcome** | **Key knowledge dot point** | **Key skills dot point** |
| 1 | 1 | 1, 3, 4, 10 |
| 2 | 2 | 2 |
| 3 | 2, 4, 5 | 2, 5, 9 |