

# 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 – 5 are intended to be completed without the use of technology. Parts 6 – 7 include the use of technology.

### Part 1

Consider the set of points and coordinates given below:

Point	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>
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:

- the gradient
- the coordinates of the midpoint
- the length
- the equation of the line that contains the line segment
- 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)

find the equation of the line that passes through *P* and is parallel to the line segment *AB*

find the equation of the line that passes through *P* and is perpendicular to the line segment *AB*

draw both of these lines on the graph

### Part 4

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

find the equation of the line that passes through  $Q$  and is parallel to the line segment  $CD$

find the equation of the line that passes through  $Q$  and is perpendicular to the line segment  $CD$

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

$AB$ ,  $BC$ ,  $CD$  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 – 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.

Unit 1	
Area of study	Content dot point
Functions and graphs	1
Algebra	1, 2, 8
Calculus	-
Probability and statistics	-

### Outcomes

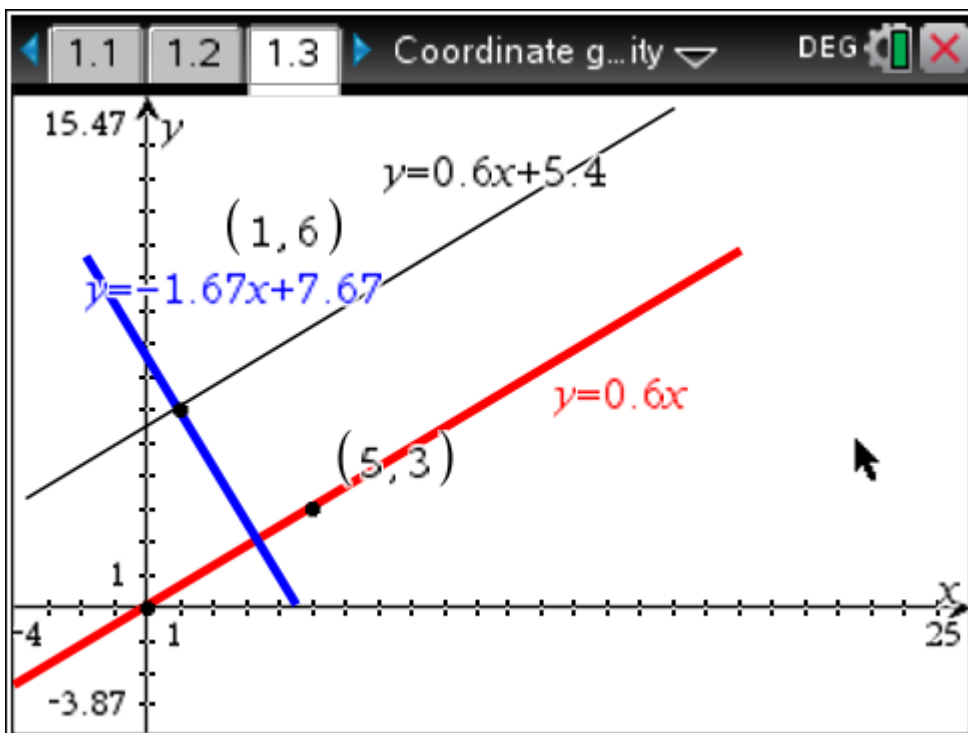
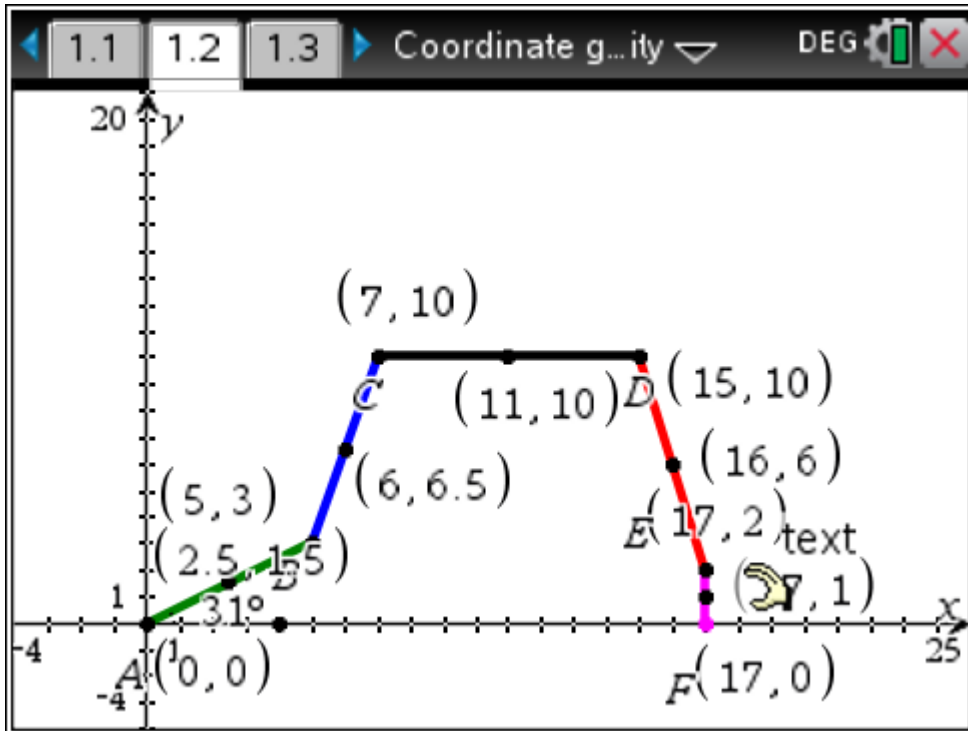
The following outcomes, key knowledge and key skills are addressed through this task.

Unit 1		
Outcome	Key knowledge dot point	Key skill dot point
1	1	1, 3, 4, 10
2	2	2

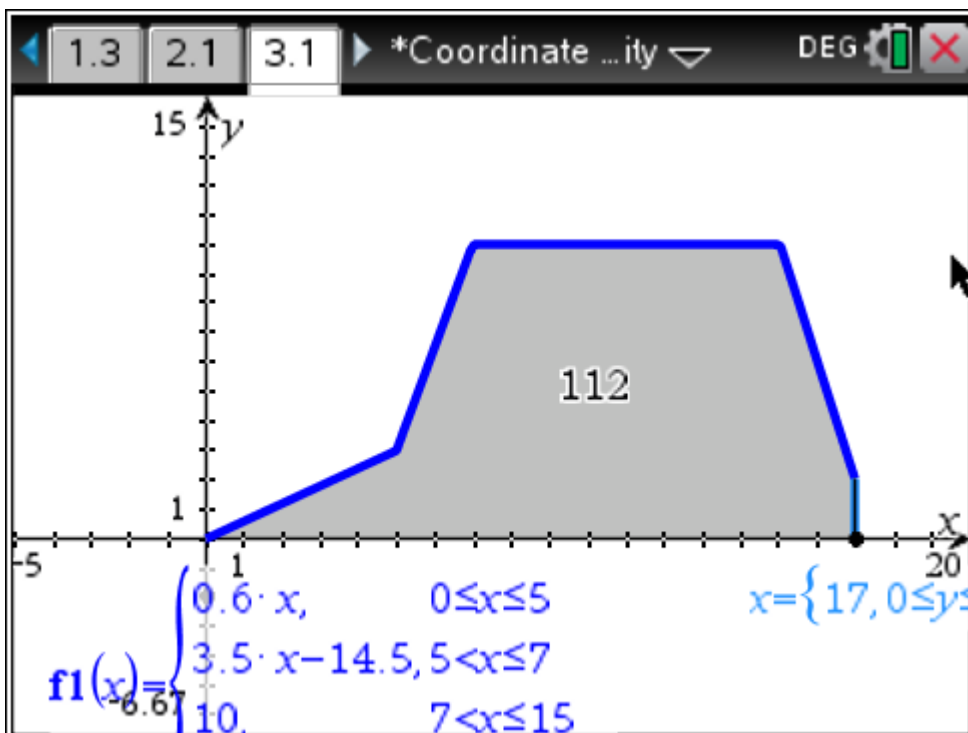
3

2, 4, 5

2, 5, 9



	A x	B y	C	D
=				=LinRegM
1	15	10	Title	Linear R...
2	17	2	RegEqn	m*x+b
3			m	-4.
4			b	70.
5			r <sup>2</sup>	1.



Angle of inclination with a slider.

