Student 1: Low Excellence

NZQA Intended for teacher use only

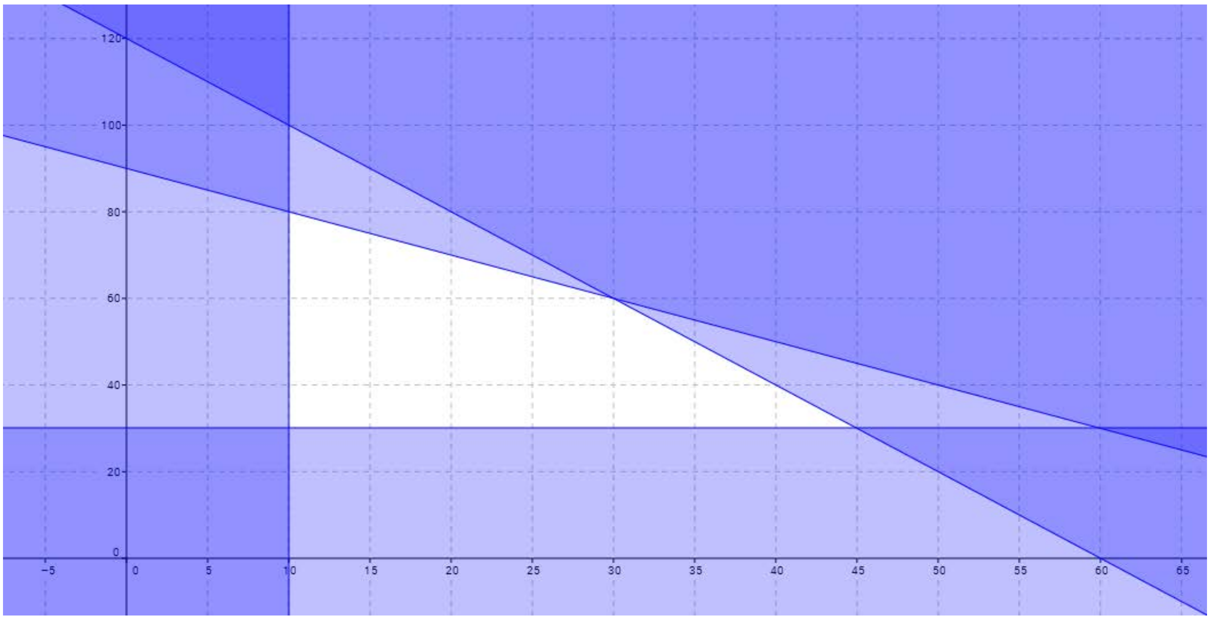
Constraints x = artichokes y = tomatoes

$20x + 10y \leq 1200$ $x + y \leq 90$ $y \geq 30$ $x \geq 10$

Optimisation function

$I = 25000x + 10000y$

Graph of constraints. The unshaded region contains all the feasible points.



Income will be maximised at one of the corners of the region.

Vertex	Income = 25000x+10000y
(10,30)	$550000
(10,80)	$1050000
(30,60)	$1350000
(45,30)	$1425000

To maximise the income in the current year Ted should grow 45 hectares of artichokes and 30 hectares of tomatoes. 1

For future income, the income for artichokes and tomatoes will be in the ratio 2:1, for example the income could be $30000 from artichokes and $15000 from tomatoes. 2
So one possible income is $I = 30000x + 15000y$

Vertex	Income = 30000x+15000y
(10,30)	$750000
(10,80)	$1500000
(30,60)	$1800000
(45,30)	$1800000

In this case growing 30 hectares of artichokes and 60 hectares of tomatoes or 45 hectares of artichokes and 30 hectares of tomatoes will both produce a maximum income of $180000 3

The two points (30,60) and (45,30) lie on the line $20x + 10y = 1200$. This has a gradient of -2.

The future Income function $I = 30000x + 15000y$ also has a gradient of -2 and so it is parallel to the boundary line. 4

This means that any points on $20x + 10y \leq 1200$ between (30,60) and (45,30) will all maximise the income, so there are many possible ways of maximising the income.