AS91574 Linear Programming Practice Test

***Eric’s Electronics***

Show ALL working

An online store called *Eric’s Electronics* is considering selling *zPhones* and *zPods* from their website.

 Constraints

They have obtained the following information from the wholesale suppliers:

* + The storage space required for each *zPhone* or *zPod* is the same, and currently the store only has space to store a maximum of 1000 units. This can be written as *x* + *y* ≤ 1000 where *x* represents the number of *zPhones*  ordered and *y* represents the number of *zPods* the store orders.
	+ The wholesale price for each *zPhone* is $600 and the wholesale price for each *zPod* is $200. The shop has a budget of $320 000 to spend on their order.
	+ The minimum number of *zPhones* they can order is 200
	+ The mimimum number of *zPods* they can order is 400

 Income

 The store originally decided to sell the *zPhones* and *zPods* for the recommended selling price of $1000 for each zPhones and $400 for each zPod.

The income *I* ($) can be expressed as *I* = 1000*x* + 400*y*

Calculate how many *zPhones* and *zPods* the store should order to maximise their income.



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Future Income

Eric does not know what the exact selling price will be for *zphones* and *zpods* in the future but it is predicted that the selling prices of *zphones* and *zpods* will be in the ratio of 3:1.

Recommend to Eric how many *zphones* and how many *zpods* he should order to maximise his profit.

You must clearly justify your answer.

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 **AS91574 Linear Programming Exemplar Assessment Schedule**

Achieved

Students are required to demonstrate at least two of the following methods.

(1) Find the equation of a linear inequality, for example, the equation for the available budget



(2) Graph and shade feasible region, including labelling points where inequalities intersect (found using blue calculators or from reading off the graph on grid paper)

 At least two of the constraints must be correctly shown.

(3) Calculate income for each point.

|  |  |  |
| --- | --- | --- |
| **No. of *zPhones* (x)** | **No. of *zPods* (y)** | **Income($) = 1000x + 400y** |
| 200 | 800 | $520000 |
| 300 | 700 | $580000 |
| 400 | 400 | $560000 |

State the answer clearly in context

The store would maximise their income when they order 300 *zPhones* and 700 *zPods*.

**Achieved: Parts 1 and 2 correct or parts 1 and 3 correct**

**Merit: Parts 1, 2 and 3 correct - including putting the answer into context**

**Future Income**

|  |  |  |
| --- | --- | --- |
| **No. of *zPhones* (x)** | **No. of *zPods* (y)** | **Income($) = 3x + y** (or equivalent) |
| 200 | 800 | $1400 |
| 300 | 700 | $1600 |
| 400 | 400 | $1600 |

The student identifies that there are multiple solutions for this situation in future years

The student identifies that the points (300, 700) and (400,400) both maximise the profit.

The student identifies that the linear relationship linking these two points and the future income relationship are in the same proportion.

ie. the inequality for the wholesale price 600x + 200y ≤ 320 000 has the same gradient as the income relationship P = 3x + y

Since the gradient of the inequality is the same as the gradient of the Profit equation all the whole number points along the line between this two points will also maximise the profit.