Practice for L3 Linear Programming #3

A firm makes two devices, widgets and thingies.

It takes 1.2 hours to make a widget. It takes 0.8 hours to make a thingie.

There are 20 workers on the factory floor, each doing an eight hour day (so 160 hours a day total).

Six can only make widgets (so $6 \times 8 \div 1.2 = 40$ per day) and five can only make thingies (so $5 \times 8 \div 0.8 = 50$ per day). The rest can make either device.

These relationships can be represented by the equations:

$W + T \leq 160$ $\qquad$ $1.2 W + 0.8T \leq 160$ $\qquad$ $W \geq 40$ $\qquad$ $T \geq 50,$

The profit on a widget is $200. The profit on a thingie is $150.

How should the workers' time be distributed to maximise profit?
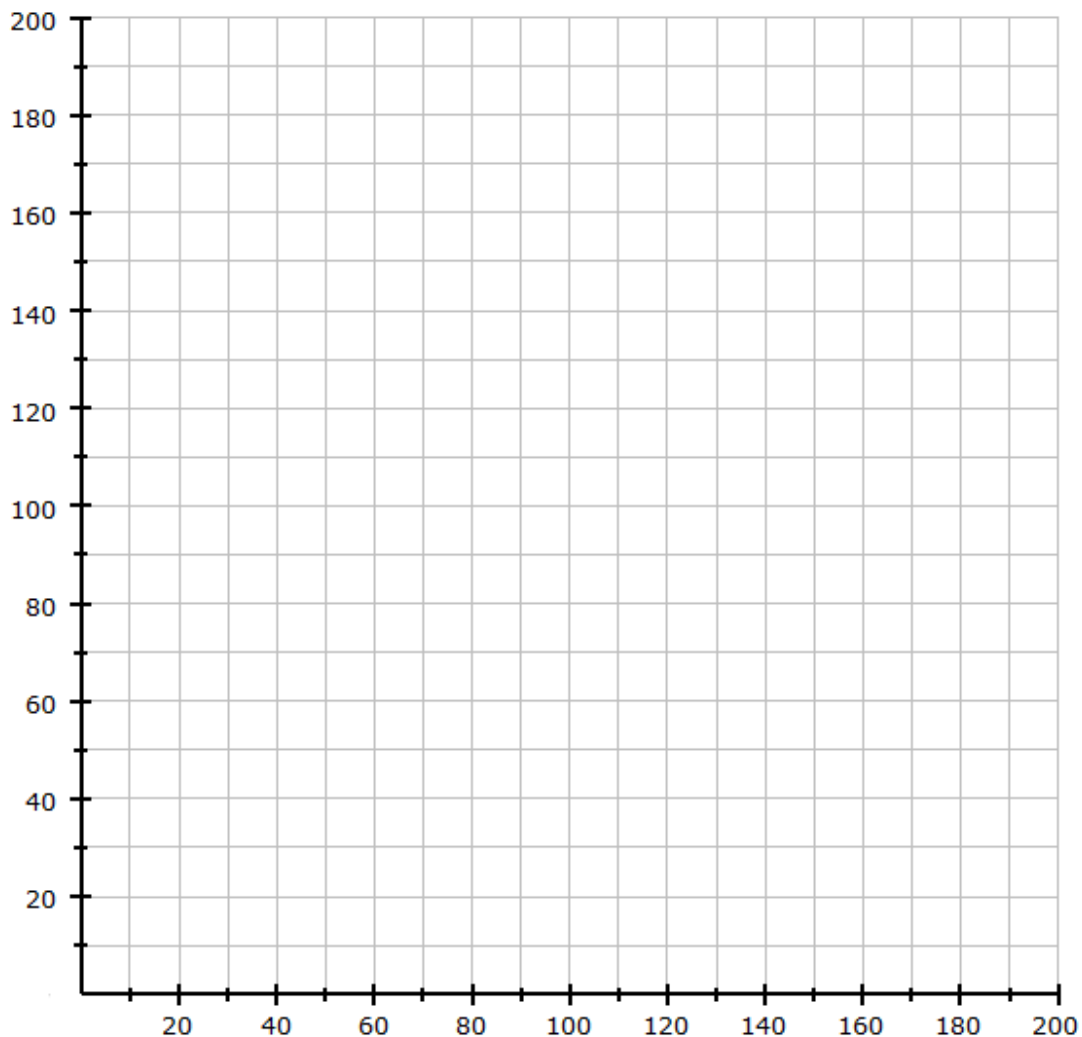
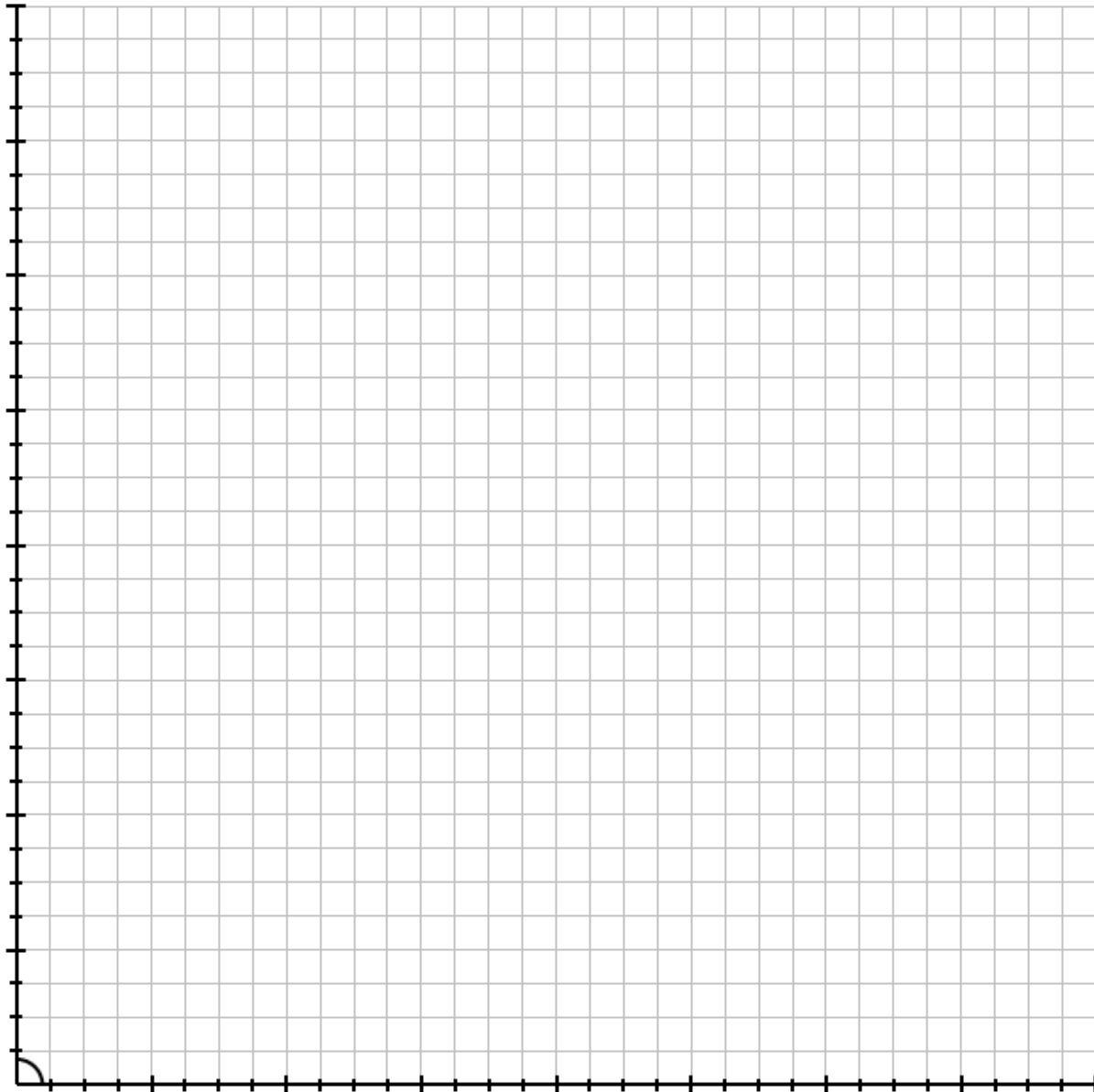At what price should production move to making more widgets?

Question 2

A factory makes a machine in two models, Type I and Type II.

It has contracts to supply 100 Type Is and 150 Type IIs every week.

It can ship no more than 575 machines a week.

The factory has 3500 production hours a week. It takes 5 of these hours to make a Type I, and 7 of these hours to make a Type II.

The profit on a Type I is $4800. The profit on a Type II is $5800.

What production scheme maximises the factory's profit?

Answers: Practice for L3 Linear Programming #3

P = $200 W + $150 T.

Intersections at

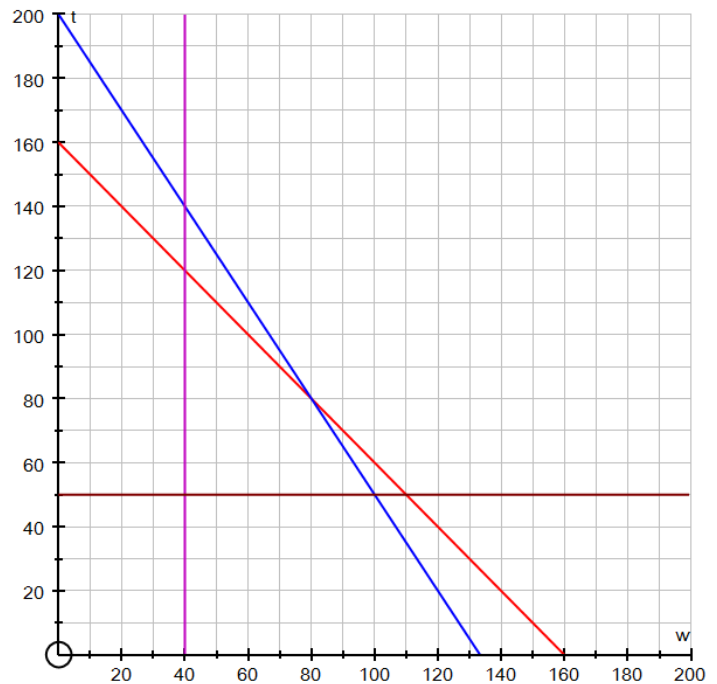|	
(40, 120)	26,000
(80, 80)	28,000
(100, 50)	27,500

So maximum profit at
80 widgets and 80 thingies.

Merit:

When (100, 50) is better than (80, 80)

More widgets when: $w × 100 + 150 × 50 ≥ $w × 80 + 150 × 80

When $w > $225, so **when a Widget sells for at least $225**

Constraints are: TI + TII ≤ 575, TI ≥ 100, TII ≥ 150, 5 TI + 7TII ≤ 3500

Objective function is P = 4800 TI + 5800 TII

Intersections	Nearest whole	Profit
(100, 428.57)	(100, 428)	2,962,400
(262.5, 312.5)	(261, 313)	3,068,200
	(263, 312)	3,072,000
	(262, 313) is too large (5 TI + 7TII = 3501)	
(425, 150)	(425, 150)	2,910,000

Maximum profit at **263 Type I and 312 Type II**