LINEAR PROGRAMMING:

I) FEASIBLE SETS

A biker wants from a bag of trail mix

1) 600 or more calories
2) 90 or more gms. carbohydrates.

The mix will consist of peanuts and raisins.

	Gms. Carbos / gm	# of Cals. / gm
Raisins	.8	3
Nuts	.2	6

The biker has to decide how much raisins and nuts to put in the mix.

1

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Raisins	.8	3
Nuts	.2	6

OF INGREDIENT (raisins or nuts)

3 calories per gram of raisins

The biker has to decide how much raisins and nuts to put in the mix.

2

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Raisins	.8	3
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The biker has to decide how much raisins and nuts to put in the mix.

Let x = # of gms of raisins put in the mix.
Let y = # of gms of nuts put in the mix.

3

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Raisins	.8	3
Nuts	.2	6

The biker has to decide how much raisins and nuts to put in the mix.

Let x = # of gms of raisins put in the mix.
Let y = # of gms of nuts put in the mix.

QUESTION: How many calories are in the mix?

4

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I) FEASIBLE SETS

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Raisins	.8	3
Nuts	.2	6

The biker has to decide how much raisins and nuts to put in the mix.

Let x = # of gms of raisins put in the mix.
Let y = # of gms of nuts put in the mix.

QUESTION: How many calories are in the mix?

$3x + 6y$

5

LINEAR PROGRAMMING:

I) FEASIBLE SETS

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	Gms. Carbos / gm	# of Cals. / gm
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The biker has to decide how much raisins and nuts to put in the mix.

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QUESTION: How many calories are in the mix?

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6

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	Gms. Carbos / gm	# of Cals. / gm
Raisins	.8	3
Nuts	.2	6

The biker has to decide how much raisins and nuts to put in the mix.

Let x = # of gms of raisins put in the mix.
Let y = # of gms of nuts put in the mix.

QUESTION: How many calories are in the mix?

$3x + 6y \geq 600$

7

LINEAR PROGRAMMING:

I) FEASIBLE SETS

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1) 600 or more calories
2) 90 or more gms. carbohydrates.

The mix will consist of peanuts and raisins.

	Gms. Carbos / gm	# of Cals. / gm
Raisins	.8	3
Nuts	.2	6

The biker has to decide how much raisins and nuts to put in the mix.

Let x = # of gms of raisins put in the mix.
Let y = # of gms of nuts put in the mix.

QUESTION: How many calories are in the mix?

$3x + 6y \geq 600$

QUESTION: How many grams of carbohydrates are in the mix?

8

Lecture 25

LINEAR PROGRAMMING:

I) FEASIBLE SETS

A biker wants from a bag of trail mix

1) 600 or more calories
2) 90 or more gms. carbohydrates.

The mix will consist of peanuts and raisins.

	Gms. Carbos / gm	# of Cals. / gm
Raisins	.8	3
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The biker has to decide how much raisins and nuts to put in the mix.

Let x = # of gms of raisins put in the mix.
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QUESTION: How many calories are in the mix?

$3x + 6y \geq 600$

9

LINEAR PROGRAMMING:

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	Gms. Carbos / gm	# of Cals. / gm
Raisins	.8	3
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The biker has to decide how much raisins and nuts to put in the mix.

Let x = # of gms of raisins put in the mix.
Let y = # of gms of nuts put in the mix.

QUESTION: How many calories are in the mix?

$3x + 6y \geq 600$

QUESTION: How many grams of carbhydrates are in the mix?

$.8x + .2y \geq 90$

10

LINEAR PROGRAMMING:

I) FEASIBLE SETS

Let x = # of gms of raisins put in the mix.
Let y = # of gms of nuts put in the mix.

$3x + 6y \geq 600$

$.8x + .2y \geq 90$

11

LINEAR PROGRAMMING:

I) FEASIBLE SETS

Want 4 things to hold true:

1) $3x + 6y \geq 600$
2) $.8x + .2y \geq 90$

Let x = # of gms of raisins put in the mix.
Let y = # of gms of nuts put in the mix.

12

LINEAR PROGRAMMING:

I) FEASIBLE SETS

Want 4 things to hold true:

1) $3x + 6y \geq 600$
2) $.8x + .2y \geq 90$
3) $x \geq 0$
4) $y \geq 0$

Let x = # of gms of raisins put in the mix.
Let y = # of gms of nuts put in the mix.

13

LINEAR PROGRAMMING:

I) FEASIBLE SETS

Want 4 things to hold true:

1) $3x + 6y \geq 600$
2) $.8x + .2y \geq 90$
3) $x \geq 0$
4) $y \geq 0$

These are called constraint equations.

Let x = # of gms of raisins put in the mix.
Let y = # of gms of nuts put in the mix.

14

LINEAR PROGRAMMING:

I) FEASIBLE SETS

Want 4 things to hold true:

1) $3x + 6y \geq 600$
2) $.8x + .2y \geq 90$
3) $x \geq 0$
4) $y \geq 0$

These are called constraint equations.

THE SET

$\{(x, y) : (x, y)$ satisfies 1), 2), 3), and 4)$\}$

is called the FEASIBLE SET.

Example:

(1, 2) is not in the feasible set.

(100, 100) is in the feasible set.

Let x = # of gms of raisins put in the mix.
Let y = # of gms of nuts put in the mix.

15

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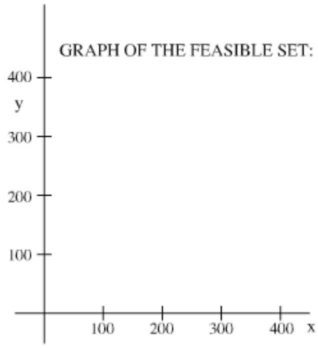

Here are the points that satisfy $x \geq 0$.

17

LINEAR PROGRAMMING:

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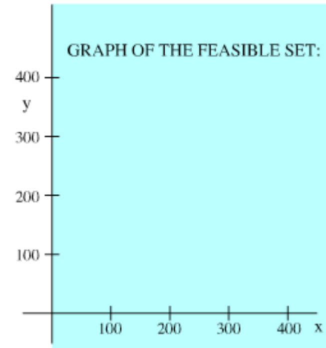

Here are the points that satisfy $x \geq 0$.

18

LINEAR PROGRAMMING:

I) FEASIBLE SETS

Want 4 things to hold true:

1) $3x + 6y \geq 600$
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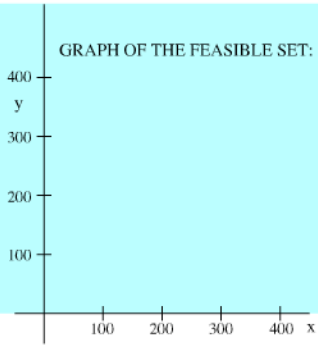

Here are the points that satisfy $y \geq 0$.

19

LINEAR PROGRAMMING:

I) FEASIBLE SETS

Want 4 things to hold true:

1) $3x + 6y \geq 600$
2) $.8x + .2y \geq 90$
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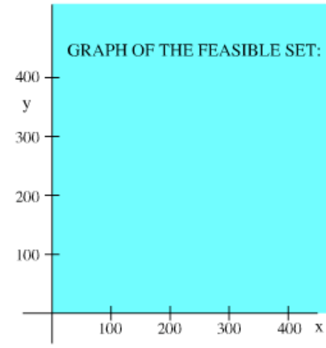

Here are the points that satisfy both $x \geq 0$ and $y \geq 0$.

20

LINEAR PROGRAMMING:

I) FEASIBLE SETS

Want 4 things to hold true:

1) $3x + 6y \geq 600$
2) $.8x + .2y \geq 90$
3) $x \geq 0$
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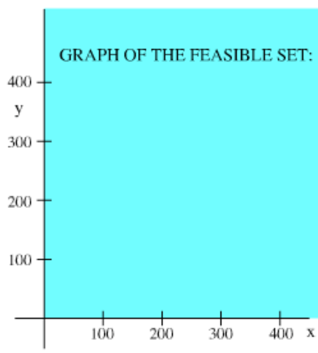


Here are the points that satisfy both $x \geq 0$ and $y \geq 0$.

Now examine constraint 1):

21

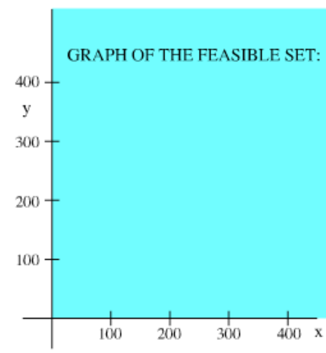
LINEAR PROGRAMMING:

I) FEASIBLE SETS

1) $3x + 6y \geq 600$

Step 1: Graph the line described by

$3x + 6y = 600$



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$.

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22

LINEAR PROGRAMMING:

I) FEASIBLE SETS

1) $3x + 6y \geq 600$

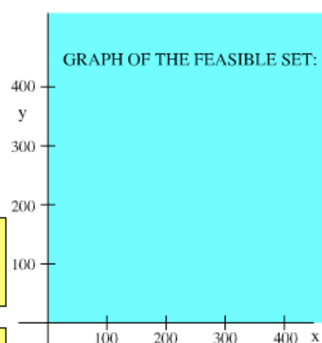
Step 1: Graph the line described by

$3x + 6y = 600$

$\underline{x = 0}$: $3 \cdot 0 + 6y = 600 \Rightarrow 6y = 600$
$\Rightarrow y = 100$
(0, 100) is on the line.

$\underline{y = 0}$: $3x + 6 \cdot 0 = 600 \Rightarrow 3x = 600$
$\Rightarrow x = 200$
(200, 0) is on the line.

PLOT THESE POINTS



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$.

Now examine constraint 1):

23

LINEAR PROGRAMMING:

I) FEASIBLE SETS

1) $3x + 6y \geq 600$

Step 1: Graph the line described by

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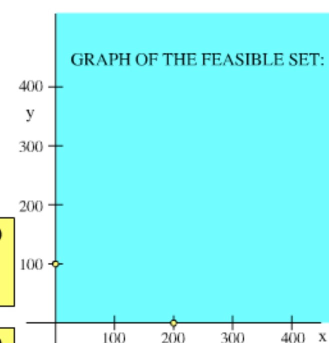
PLOT THESE POINTS



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$.

Now examine constraint 1):

24

LINEAR PROGRAMMING:

I) FEASIBLE SETS

1) $3x + 6y \ge 600$

Step 1: Graph the line described by

$3x + 6y = 600$

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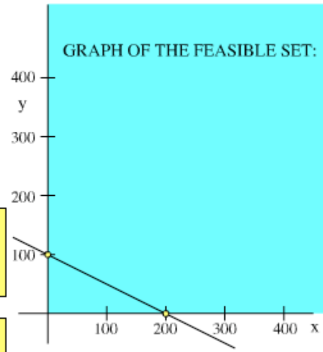
(0, 100) is on the line.

$y = 0$: $3x + 6\cdot 0 = 600 \Rightarrow 3x = 600$
$\Rightarrow x = 200$
(200, 0) is on the line.

DRAW THE STRAIGHT LINE



Here are the points that satisfy both $x \ge 0$ and $y \ge 0$.

Now examine constraint 1):

25

LINEAR PROGRAMMING:

I) FEASIBLE SETS

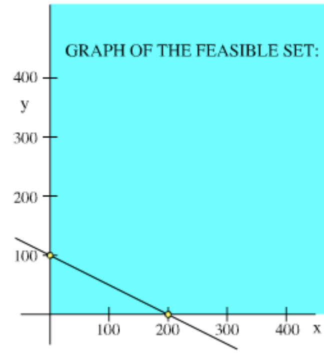
1) $3x + 6y \ge 600$

Step 1: Graph the line described by

$3x + 6y = 600$

Step 2: Test the point (0, 0).

$3\cdot 0 + 6\cdot 0 < 600$.



Here are the points that satisfy both $x \ge 0$ and $y \ge 0$.

Now examine constraint 1):

26

Lecture 25

LINEAR PROGRAMMING:

I) FEASIBLE SETS

1) $3x + 6y \ge 600$

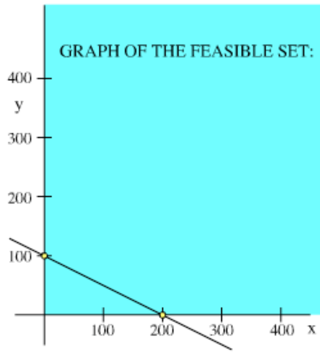
Step 1: Graph the line described by

$3x + 6y = 600$

Step 2: Test the point (0, 0).

$3\cdot 0 + 6\cdot 0 < 600$.

So all points "above" the line $3x + 6y = 600$ satisfy the in-equality.



Here are the points that satisfy both $x \ge 0$ and $y \ge 0$.

Now examine constraint 1):

27

LINEAR PROGRAMMING:

I) FEASIBLE SETS

1) $3x + 6y \ge 600$

Step 1: Graph the line described by

$3x + 6y = 600$

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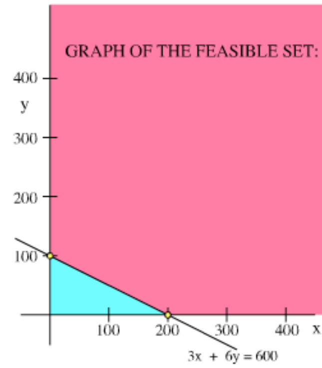


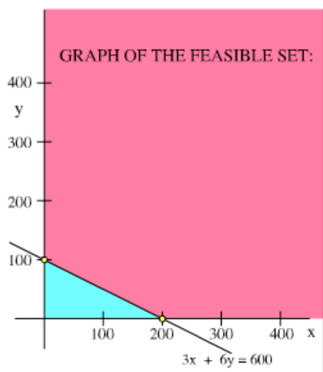
Here are the points that satisfy both $x \ge 0$ and $y \ge 0$ and $3x + 6y > 600$.

28

LINEAR PROGRAMMING:

I) FEASIBLE SETS

NEXT: CONSTRAINT 2)



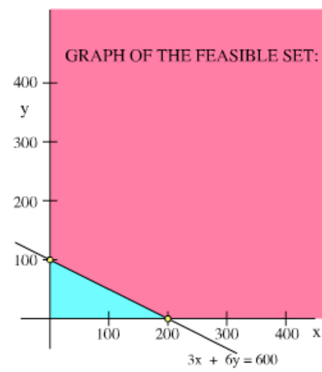
Here are the points that satisfy both $x \ge 0$ and $y \ge 0$ and $3x + 6y > 600$.

29

LINEAR PROGRAMMING:

I) FEASIBLE SETS

2) $.8x + .2y \ge 90$



Here are the points that satisfy both $x \ge 0$ and $y \ge 0$ and $3x + 6y > 600$.

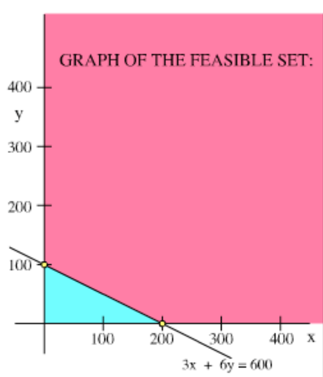
30

LINEAR PROGRAMMING:

I) FEASIBLE SETS

2) $.8x + .2y \ge 90$

$.8x + .2y = 90$



Here are the points that satisfy both $x \ge 0$ and $y \ge 0$ and $3x + 6y > 600$.

31

LINEAR PROGRAMMING:

I) FEASIBLE SETS

2) $.8x + .2y \ge 90$

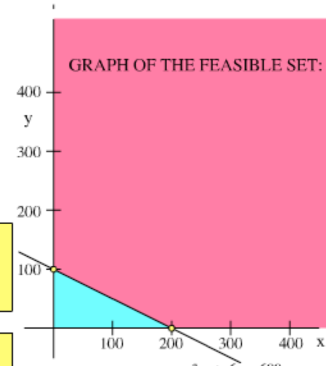
$.8x + .2y = 90$

This is a straight line. It runs thru:

$x = 0$: $.8\cdot 0 + .2y = 90 \Rightarrow .2y = 90$
$\Rightarrow y = 450$
(0, 450) is on the line.

$y = 0$: $.8x + .2\cdot 0 = 90 \Rightarrow .8x = 90$
$\Rightarrow x = 112.5$
(112.5, 0) is on the line.

PLOT THESE POINTS



Here are the points that satisfy both $x \ge 0$ and $y \ge 0$ and $3x + 6y > 600$.

32

LINEAR PROGRAMMING:

I) FEASIBLE SETS

2) $.8x + .2y \geq 90$

$.8x + .2y = 90$

This is a straight line. It runs thru:

$x = 0$: $.8 \cdot 0 + .2y = 90 \Rightarrow .2y = 90$
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$(0, 450)$ is on the line.

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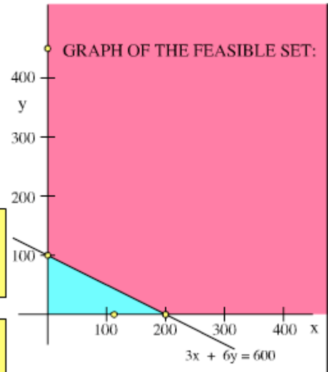
PLOT THESE POINTS



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$.

33

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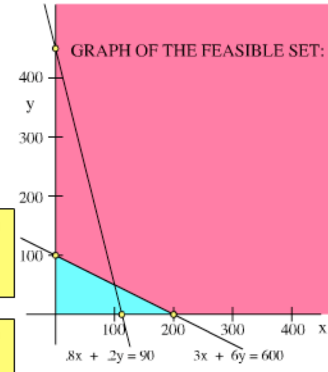
PLOT THESE POINTS



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$.

34

Lecture 25

LINEAR PROGRAMMING:

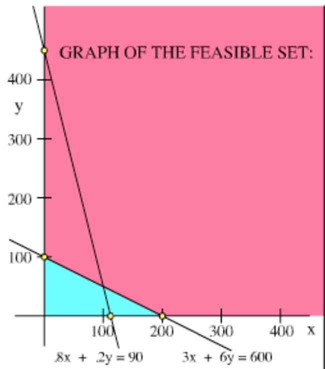
I) FEASIBLE SETS

2) $.8x + .2y \geq 90$

Now try the point $(0, 0)$:

$.8 \cdot 0 + .2 \cdot 0 = 0 \leq 90$

So $(0, 0)$ DOES NOT satisfy constraint equation 2. The points on the "other side" of $.8x + .2y = 90$ do satisfy 2.



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$.

35

LINEAR PROGRAMMING:

I) FEASIBLE SETS

2) $.8x + .2y \geq 90$

Now try the point $(0, 0)$:

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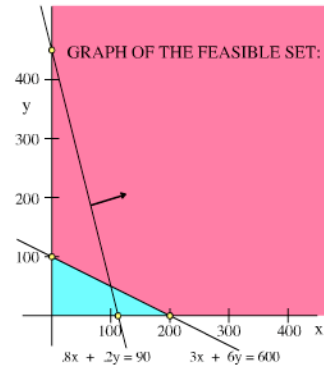

Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$.

36

LINEAR PROGRAMMING:

I) FEASIBLE SETS

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Now try the point $(0, 0)$:

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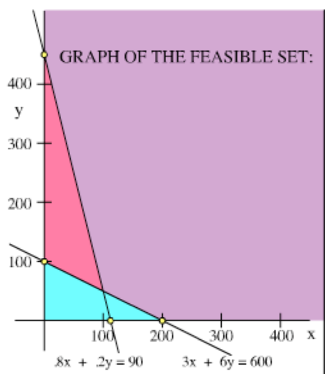

Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

37

LINEAR PROGRAMMING:

I) FEASIBLE SETS

2) $.8x + .2y \geq 90$

Now try the point $(0, 0)$:

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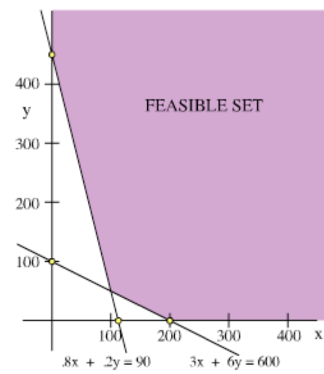
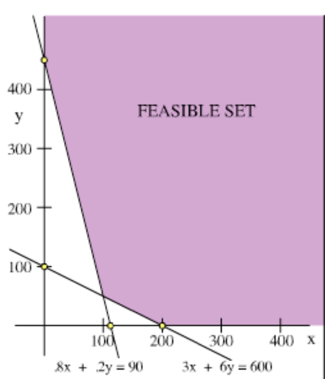


Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

38

grams raisins	x
grams nuts	y
grams carbohydrate	$.8x + .2y$
calories	$3x + 6y$

Grab the ○ and move around to see the values at various points



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

39

LINEAR PROGRAMMING: NEW INFORMATION

2) OBJECTIVE FUNCTIONS

A biker wants from a bag of trail mix

1) 600 or more calories
2) 90 or more gms. carbohydrates.

MEET THESE REQUIREMENTS BUT AT MINIMAL COST

The mix will consist of peanuts and raisins.

	Gms. Carbos gm	# of Cals. gm	cents gm
Raisins	.8	3	4
Nuts	.2	6	5

One gram of raisins costs 4 cents. One gram nuts costs 5 cents. How can the biker meet the restrictions and minimize his cost?

40

LINEAR PROGRAMMING

2) OBJECTIVE FUNCTIONS

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Nuts	.2	6	5

One gram of raisins costs 4 cents. One gram nuts costs 5 cents. How can the biker meet the restrictions and minimize his cost?

Let x = # of gms of raisins put in the mix.
Let y = # of gms of nuts put in the mix.

What is the cost???

41

LINEAR PROGRAMMING

2) OBJECTIVE FUNCTIONS

A biker wants from a bag of trail mix

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	Gms. Carbos gm	# of Cals. gm	cents gm
Raisins	.8	3	4
Nuts	.2	6	5

One gram of raisins costs 4 cents. One gram nuts costs 5 cents. How can the biker meet the restrictions and minimize his cost?

Let x = # of gms of raisins put in the mix.
Let y = # of gms of nuts put in the mix.

What is the cost???

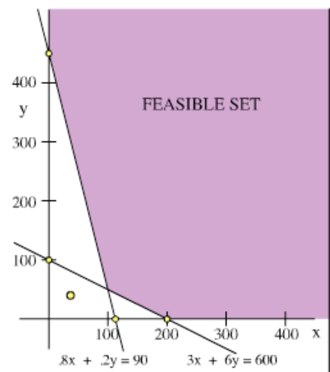
$4x + 5y$ cents

42

Lecture 25

grams raisins	x
grams nuts	y
grams carbohydrate	.8x + .2y
calories	3x + 6y
cents	4x + 5y

It's not too hard to see that the minimum cost occurs at the point ● shown in the next frame.



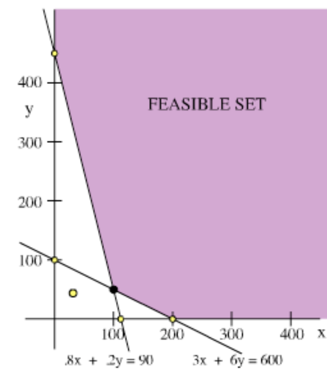
Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

43

grams raisins	x
grams nuts	y
grams carbohydrate	.8x + .2y
calories	3x + 6y
cents	4x + 5y

It's not too hard to see that the minimum cost occurs at the point ●.

WHY? IS THIS PART OF A PATTERN?



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

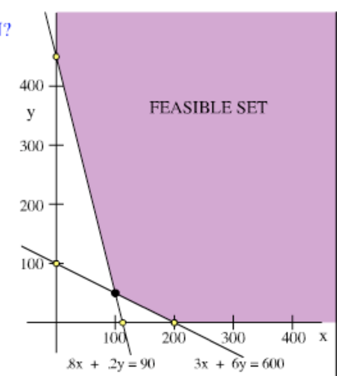
44

WHY? IS THIS PART OF A PATTERN?

To answer this question, it is easiest to consider all points in the feasible set that give the same cost. Consider

Total Cost = $4x + 5y = 2000$

where the value 2000 was arbitrarily selected.



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

45

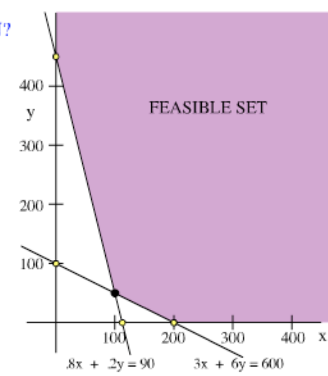
WHY? IS THIS PART OF A PATTERN?

To answer this question, it is easiest to consider all points in the feasible set that give the same cost. Consider

Total Cost = $4x + 5y = 2000$

where the value 2000 was arbitrarily selected. This is the equation of a straight line. It goes thru the points

(500, 0) and (400, 0).



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

46

WHY? IS THIS PART OF A PATTERN?

To answer this question, it is easiest to consider all points in the feasible set that give the same cost. Consider

Total Cost = TC = $4x + 5y = 2000$

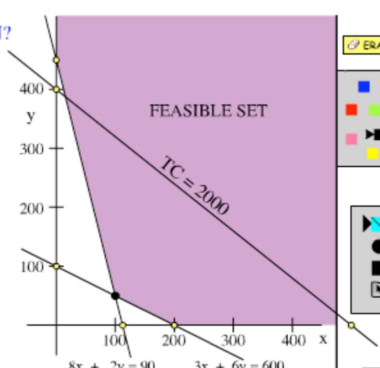
where the value 2000 was arbitrarily selected. This is the equation of a straight line. It goes thru the points

(500, 0) and (0, 400).

Note that the equation fot this line can be rewritten as

$y = -(4/5)x + 2000$

Its slope is -(4/5) and this did NOT depend on the choice TC = 2000.



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

47

WHY? IS THIS PART OF A PATTERN?

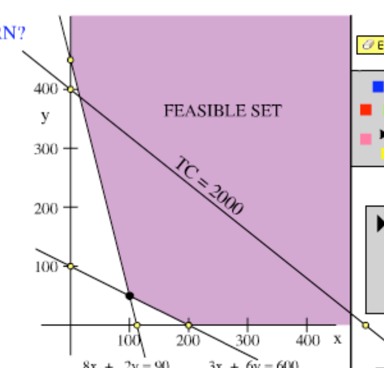
Now what happens if the total cost is 1500. Consider

Total Cost = TC = $4x + 5y = 1500$

This is the equation of a straight line. The equation of this new line can be rewritten as:

$y = -(4/5)x + 1500$

Its slope is also -(4/5), so it is parallel to the line given by $4x + 5y = 2000$. Here's its graph:



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

48

WHY? IS THIS PART OF A PATTERN?

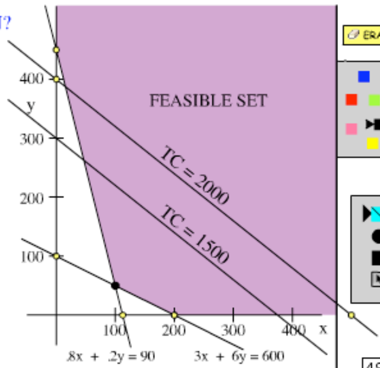
Now what happens if the total cost is 1500. Consider

Total Cost = TC = 4x + 5y = 1500

This is the equation of a straight line. The equation of this new line can be rewritten as:

$y = -(4/5)x + 1500$

Its slope is also -(4/5), so it is parallel to the line given by 4x + 5y = 2000. Here's its graph:



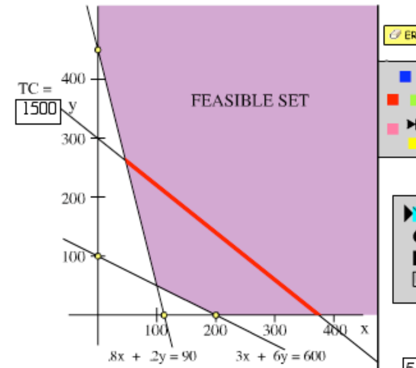
Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

49

Now try different values for TC:

Those points in the feasible set which have the selected value for TC are shown in red.

TC = 4x + 5y



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

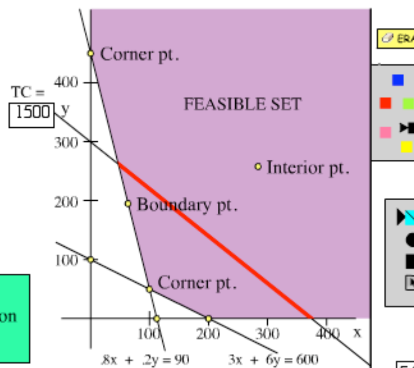
50

Now try different values for TC:

Nomenclature:

1) The boundary of the feasible set consists of all points in the feasible set that are on constraint lines.

2) A point on the boundary is called a corner point if it is at the intersection of two constraint lines.



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

51

Now try different values for TC:

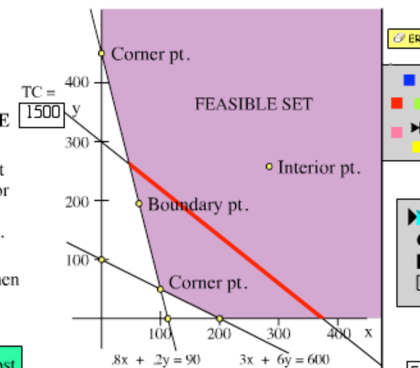
When the **MINIMUM COST LINE** is drawn, notice:

1) The line only hits the feasible set on the boundary. If it hits an interior point, then there are points in the feasible set of lower cost "below" it.

2) If the minimum cost line hits a boundary point not on the corner, then by travelling on that constraint line, lower cost can be found*.

CONCLUSION: The minimum cost occurs at a corner point.

* Exception: See next frame



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

52

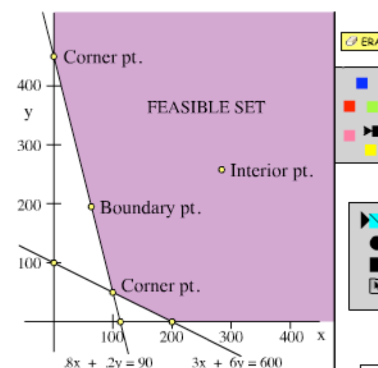
Now try different values for TC:

Suppose TC = 4x + y

If the **MINIMUM COST LINE** hits a boundary point that is not corner point, then the minimum cost line and constraint line coincide. The corner points at the end of that constaint segment lie on the minimum cost line.

The conclusion still holds.

CONCLUSION: The minimum cost occurs at a corner point.

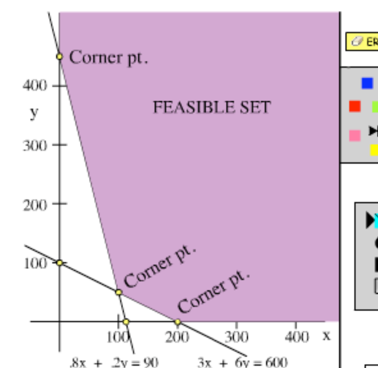


Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

53

What are the corner points?

1) $3x + 6y \geq 600$
2) $.8x + .2y \geq 90$
3) $x \geq 0$
4) $y \geq 0$



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

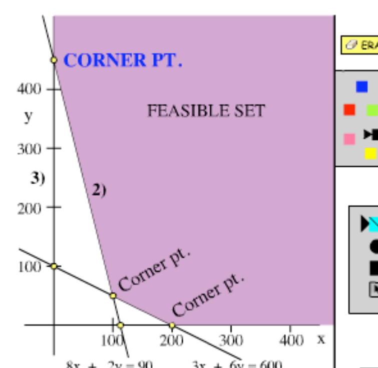
54

What are the corner points?

1) $3x + 6y = 600$
2) $.8x + .2y = 90$
3) $x = 0$
4) $y = 0$

I) $.8x + .2y = 90$, $x = 0$ → $.2y = 90$

$y = 450$ (0,450)



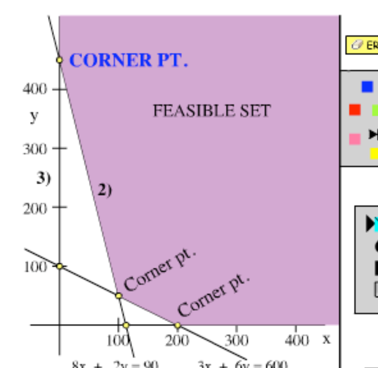
Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

55

What are the corner points?

1) $3x + 6y = 600$
2) $.8x + .2y = 90$
3) $x = 0$
4) $y = 0$

I) (0, 450)



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

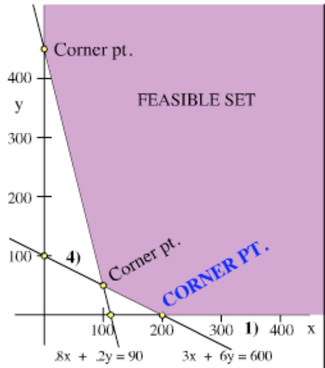
56

What are the corner points?

1) $3x + 6y = 600$
2) $.8x + .2y = 90$
3) $x = 0$
4) $y = 0$

I) (0, 450)
II) $3x + 6y = 600$, $y = 0$ → $3x = 600$

$x = 200$ (200,0)



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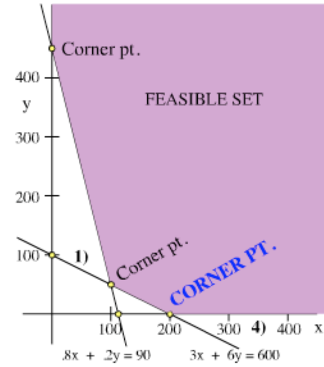
57

What are the corner points?

1) $3x + 6y = 600$
2) $.8x + .2y = 90$
3) $x = 0$
4) $y = 0$

I) (0, 450)
II) (200, 0)



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58

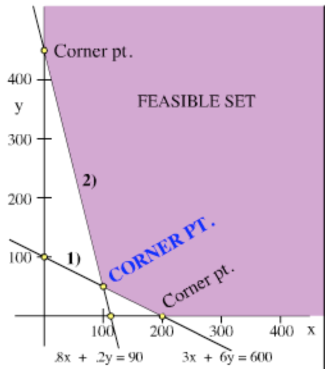
What are the corner points?

1) $3x + 6y = 600$
2) $.8x + .2y = 90$
3) $x = 0$
4) $y = 0$

I) (0, 450)
II) (200, 0)
III) $.8x + .2y = 90$ (x 30)
$3x + 6y = 600$

$24x + 6y = 2700$
$3x + 6y = 600$
$21x = 2100$

$x = 100$ $y = 50$ (100, 50)



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59

What are the corner points?

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2) $.8x + .2y = 90$
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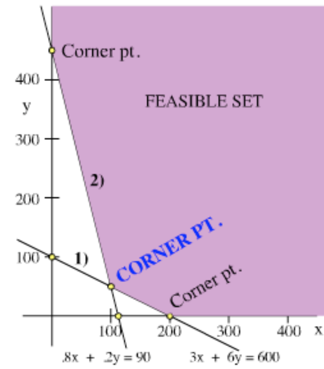
4) $y = 0$

I) (0, 450)
II) (200, 0)
III) (100, 50)



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60

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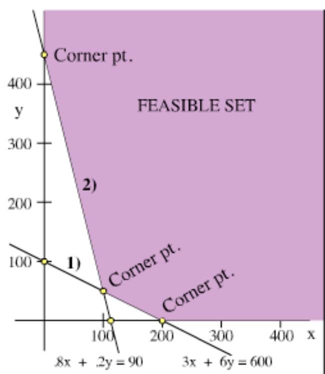
4) $y = 0$

I) (0, 450)
II) (200, 0)
III) (100, 50)

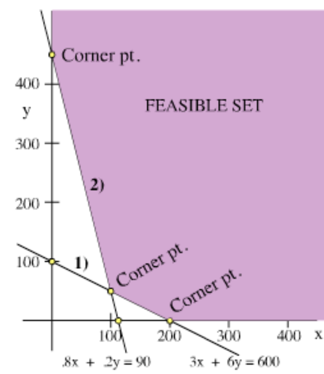


Here are the points that satisfy both $x \ge 0$ and $y \ge 0$ and $3x + 6y > 600$ and $.8x + .2y \ge 90$.

61

CALCULATE TC AT EACH CORNER POINT

	TC = 4x + 5y
I) (0, 450)	
II) (200, 0)	
III) (100, 50)	

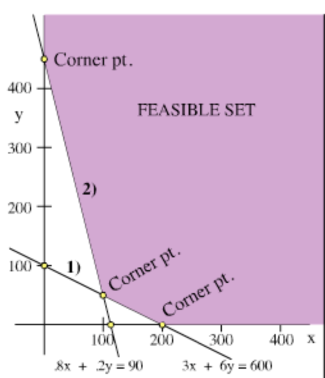


Here are the points that satisfy both $x \ge 0$ and $y \ge 0$ and $3x + 6y > 600$ and $.8x + .2y \ge 90$.

62

CALCULATE TC AT EACH CORNER POINT

	TC = 4x + 5y
I) (0, 450)	2250
II) (200, 0)	800
III) (100, 50)	650



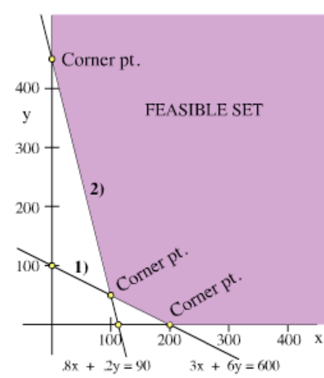
Here are the points that satisfy both $x \ge 0$ and $y \ge 0$ and $3x + 6y > 600$ and $.8x + .2y \ge 90$.

63

CALCULATE TC AT EACH CORNER POINT

	TC = 4x + 5y
I) (0, 450)	2250
II) (200, 0)	800
III) (100, 50)	650

The minmum cost is 650 cents = \$6.50.
This can be achieved by using:
1) 100 grams raisins
2) 50 grams nuts.



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64

LINEAR PROGRAMMING

2) OBJECTIVE FUNCTIONS

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1) 600 or more calories
2) 90 or more gms. carbohydrates.

The mix will consist of peanuts and raisins.

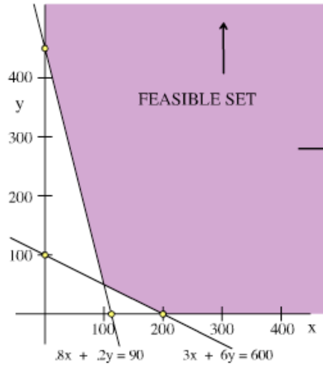
	Gms. Carbos / gm	# of Cals. / gm	cents / gm
Raisins	.8	3	4
Nuts	.2	6	5

One gram of raisins costs 4 cents. One gram nuts costs 5 cents. How can the biker meet the restrictions and MAXIMIZE his cost?

In finding the minimum, we used:

CONCLUSION: The minimum cost occurs at a corner point.

65



Here are the points that satisfy both $x \geq 0$ and $y \geq 0$ and $3x + 6y > 600$ and $.8x + .2y \geq 90$.

THERE IS NO SOLUTION:

If a biker claims to have a solution, another biker could just add one gram of raisins to it. This would cost more and still meet the constraints.

This stems from the fact that the feasible set is "unbounded." A minimum existed since the set is effectively bounded in the direction ↙ of decreasing cost.

66

Lecture 25

The function that is being maximized or minimized is called the objective function. In this case it was 4x + 5y.

The conclusion about the maximum of minimum occuring at a corner point is more accurately stated:

CONCLUSION: If the objective function has a maximum in the feasible set, then that maximum occurs at a corner point.

The same conclusion holds for minimums. If the feasible set is bounded, then the objective function has a maximum and a minimum in the feasible set. So:

CONCLUSION: If the feasible set is bounded, then the objective function has a maximum (minimum) that occurs at a corner point.

67

In all problems that we will deal with, you will only be asked to find a minimum in the feasible set if a minimum exists (and likewise for maximum).

68

69

70

71

72