

Workforce Planning at Pizza p 's - Alternate Scenario

Toni Pepperoni is the manager of one of the largest Pizza π franchises in the country. In working out her summer staffing needs, she is trying to determine the best mix of experienced and inexperienced workers. Inexperienced workers are paid \$5.25 per hour, compared to \$7.20 per hour for experienced workers. However, inexperienced workers are only 75% as productive as experienced workers.

Based on many years of experience running fast-food outlets, Ms. Pepperoni has come to the conclusion that there must be at least one experienced worker for every two inexperienced workers for the operation to run smoothly. She estimates that she needs, on average, the equivalent of 10 experienced workers at all times in order to handle the workload during the course of the week. In addition, she has made a commitment to the community to hire at least 4 neighborhood teenagers with no previous work experience.

Toni wonders: "What is the optimal workforce that minimizes my average total hourly labor costs?"

To help Toni answer this question, we must identify the *decision variables* in the problem. What decisions must Toni make in this situation?

1

What variable quantities are affected by those decisions?

2

Suppose we let:

E = the number of experienced workers,
I = the number of inexperienced workers, and
W = the average total hourly wages.

Decision variables: a set of variable quantities completely describing the decisions to be made

Write an equation which Toni could use to compute her average total hourly wages.

3

Objective Function: a quantity to be optimized which is defined in terms of the decision variables

This equation is called the *objective function*, because Toni's objective is to *minimize* the average total hourly wages she must pay. In coming up with a plan, what three restrictions on the decision variables must Toni meet?

4

a)

b)

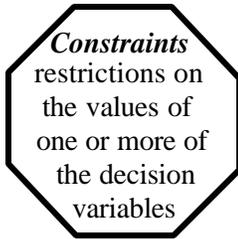
c) _____

Now, try to write a mathematical expression representing each of these restrictions.

5 _____ a)

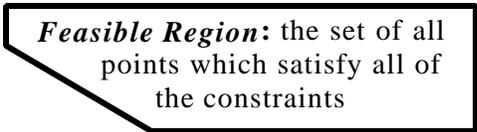
b) _____

c) _____



We call these restrictions *constraints*, and we say that the decision variables are acting under constraint.

On a sheet of your own graph paper, graph each of the constraints, and identify the region containing all of the points which satisfy all of the constraints. This set of points is known as the *feasible region*. Each point in the feasible region *could be the optimal solution*, because it satisfies all of the constraints. However, only the optimal solution(s) minimizes the average total hourly wages.



6 Use your graph to identify one point in the feasible region. _____ In terms of the problem situation, what does that point mean?

What is the average total hourly wages that Toni would have to pay if she used the values of *I* and *E* depicted by the point you selected:

7 _____

Now select a second point in the feasible region, and compute the average total hourly wages for that point. If possible, try to select a point having smaller average total hourly wages than the first point.

8 _____

Now, for each of the two values of the average total hourly wages which you just computed, set the objective function equal to that value. This should give you two equations. Add the graph of each of those equations to your graph of the feasible region. What do you notice about the two lines you have graphed?

9

If you repeated this process for a third point, would the third line share this same relationship with the first two?

10

Look at the two lines you have graphed. Describe the location of the one which came from the smaller average total hourly wages relative to the one which came from the larger average total hourly wages. If a point represented an even smaller average total hourly wages, where would the graph of its line be, relative to the other two?

11

Try to use this principle to identify the point in the feasible region which represents the smallest average total hourly wages.

12

Optimal Solution: the set of values of the decision variables which satisfies all of the constraints and achieves the goal of minimizing (or maximizing) the objective function

The point you identified in #12 represents the optimal solution. How would you describe the location of this optimal point in the feasible region?

13

The Corner Principle

Extensions

Ms. Pepperoni is concerned that as the minimum wage increases to \$5.10 per hour, she may have to pay as much as \$5.35 per hour to attract reliable inexperienced workers. Would this affect her optimal workforce plan?

1

What if she has to pay as much as \$5.50 per hour?

2

Suppose instead of needing the equivalent of 10 experienced workers at all times, she needs the equivalent of 11 experienced workers. Will this affect her optimal plan?

3

Finally, what if the inexperienced workers needed an even higher level of supervision. Suppose the ratio of experienced to inexperienced workers had to be one-to-one. What would be the effect, if any, on the optimal solution?

4
