PART A

(1/1 point)

A commercial printing firm is trying to determine the best mix of printing jobs it should seek, given its current capacity constraints in its four capital-intensive departments: typesetting, camera, pressroom, and bindery. It has classified its commercial work into three classes: A, B, and C, each requiring different amounts of time in the four major departments.

The production requirements in hours per unit of product are as follows:

Table 1: Production requirements in hours per unit of product

	Class A	Class B	Class C
Typesetting	0	2	3
Camera	3	1	3
Pressroom	3	6	2

Bindery	5	4	0

Assuming these units of work are produced using regular time, the contribution to overhead and profit is $200 for each unit of Class A work, $300 for each unit of Class B work, and $100 for each unit of Class C work.

The firm currently has the following regular-time capacity available in each department for the next time period: typesetting, 40 hours; camera, 60 hours; pressroom, 200 hours; bindery, 160 hours. In addition to this regular time, the firm could utilize an overtime shift in typesetting, which would make available an additional 35 hours in that department. The premium for this overtime (i.e., incremental costs in addition to regular time) would be $4/hour.

Since the firm wants to find the optimal job mix for its equipment, management assumes it can sell all it produces. However, to satisfy long-established customers, management decides to produce at least 10 units of each class A,B, and at least 5 units of class C of work in each time period.

Assuming that the firm wants to maximize its contribution to profit and overhead, we can formulate the above situation as a linear program, as follows:

- X_{AR} = Number of units of Class A work produced on regular time
- X_{BR} = Number of units of Class B work produced on regular time
- X_{CR}= Number of units of Class C work produced on regular time
- X_{BO} = Number of units of Class B work produced on overtime typesetting

- X_{CO} = Number of units of Class C work produced on overtime typesetting

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\begin{array}{rcl}
\textbf{max} & z = 200X_{AR} + 300X_{BR} + 100X_{CR} + 292X_{BO} + 88X_{CO} & \\
\textbf{s.t.:} & & \\
\textbf{Regular Typesetting} & 2X_{BR} + 3X_{CR} & \leq \ 40 \\
\textbf{Overtime Typesetting} & 2X_{BO} + 3X_{CO} & \leq \ 35 \\
\textbf{Camera} & 3X_{AR} + X_{BR} + 3x_{CR} + X_{BO} + 3X_{CO} & \leq \ 60 \\
\textbf{Pressroom} & 3X_{AR} + 6X_{BR} + 2x_{CR} + 6X_{BO} + 2X_{CO} & \leq \ 200 \\
\textbf{Bindery} & 5X_{AR} + 4X_{BR} + 4X_{BO} & \leq \ 160 \\
\textbf{Class A, minimum} & X_{AR} & \geq \ 10 \\
\textbf{Class B, minimum} & X_{BR} + X_{BO} & \geq \ 10 \\
\textbf{Class C, minimum} & X_{CR} + X_{CO} & \geq \ 5
\end{array}
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The optimal objective value is 6980. The sensitivity reports are given below.

Sensitivity report 1

Sensitivity report 2

What is the optimal production mix?

- ◉ $x_{AR} = 10, x_{BR} = 15, x_{CR} = 3.33, x_{BO} = 0, x_{CO} = 1.67, z = 6980$ ✔

- $x_{AR} = 15, x_{BR} = 10, x_{CR} = 1.67, x_{BO} = 0, x_{CO} = 3.33, z = 6980$
- $x_{AR} = 15, x_{BR} = 10, x_{CR} = 1.67, x_{BO} = 0, x_{CO} = 1.67, z = 6980$
- $x_{AR} = 15, x_{BR} = 10, x_{CR} = 1.67, x_{BO} = 0, x_{CO} = 3.33, z = -6980$
- $x_{AR} = 10, x_{BR} = 15, x_{CR} = 1.67, x_{BO} = 0, x_{CO} = 0, z = -6980$

You have used 1 of 2 submissions

PART B

(1/1 point)

Is there any unused production capacity?

- (selected) Yes ✔
- No
- Not enough information

You have used 1 of 2 submissions

PART C

(1/1 point)
Is there a unique optimum solution for the LP?

This question is unusual because there is nothing in the videos or in the practice problems that addresses the issue of whether there are multiple optimal solutions. We did discuss the possibility of multiple optimum solutions in Week 2 when we discussed geometry, but the information from Week 2 would not be enough to answer this question. Nevertheless, there is information in the sensitivity analysis report(s) that you can use to figure out the answer. Try to use these reports before guessing an answer. For this part, you only have one attempt.

- Yes
- No ✔
- Not enough information

You have used 1 of 1 submissions

PART D

(1/1 point)

If the printing firm has a chance to sell a new type of work that requires 0 hours of typesetting, 2 hours of camera, 2 hours of pressroom, and 1 hour of bindery, what contribution is required to make it attractive?

584 ✔

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You have used 2 of 3 submissions