Lesson 2-7: Linear Programming *LO:* I can use Linear Programming procedures to solve applications. I CAN recognize situations where exactly one solution to a linear programming application may not exist.

EQ: **How is solving a linear programming problem the same as solving a system of linear inequalities? And how is it different?**

Linear Programming is a process that identifies the **Optimal Solution** (minimum or maximum) within a **Feasible Region** subject to a set of **Constraints** (inequalities) and an **Objective Function** (equation)

EX.1 SOLVING LINEAR PROGRAMMING APPLICATIONS

Step 1 Use marking the text to CIRCLE the numbers. UNDERLINE the word phrases that go with the numbers. BOX the questions**.**
Step 2 Define each of the variables in the problem. (Write what each variable stands for in words)
Step 3 Write a system of inequalities for the constraints in the problem.
Step 4 Graph the system of inequalities (Constraints).
Step 5 Shade the feasible region.
Step 6 Identify the vertices of the shaded region.
Step 7 Write the Objective Function for the application; & Substitute each vertex into the function to find the maximum or minimum value.
Step 8 Write a complete sentence stating what the maximum or minimum value is and where it occurs in the context of the problem.

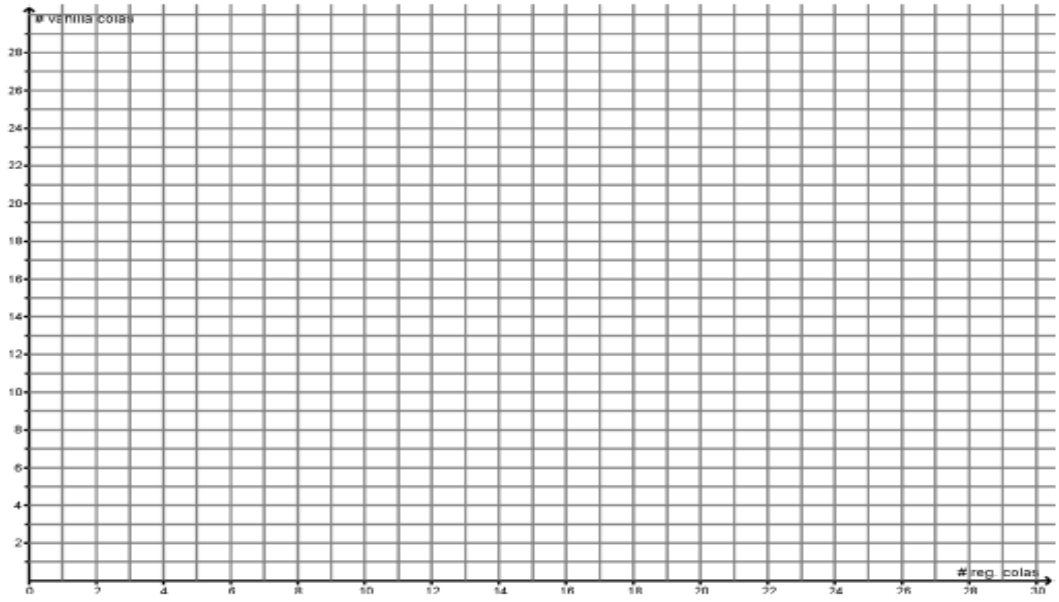
1. You run the Polka Cola bottling plant. You receive $20 per case of regular cola and $25 per case of vanilla cola. The table below shows the number of machine hours and man hours needed to produce one case of each type of cola. It also shows the maximum number of hours available.

	Regular Cola	Vanilla Cola	Maximum Hrs.
Machine Hrs.	3	2	54
Man Hrs.	4	3	75

Objective Quantity representing profit: _____

System of Constraints: _____ _____

_____ _____



Find the number of each type of cola that can be produced in order to maximize profit. Then determine the profit.

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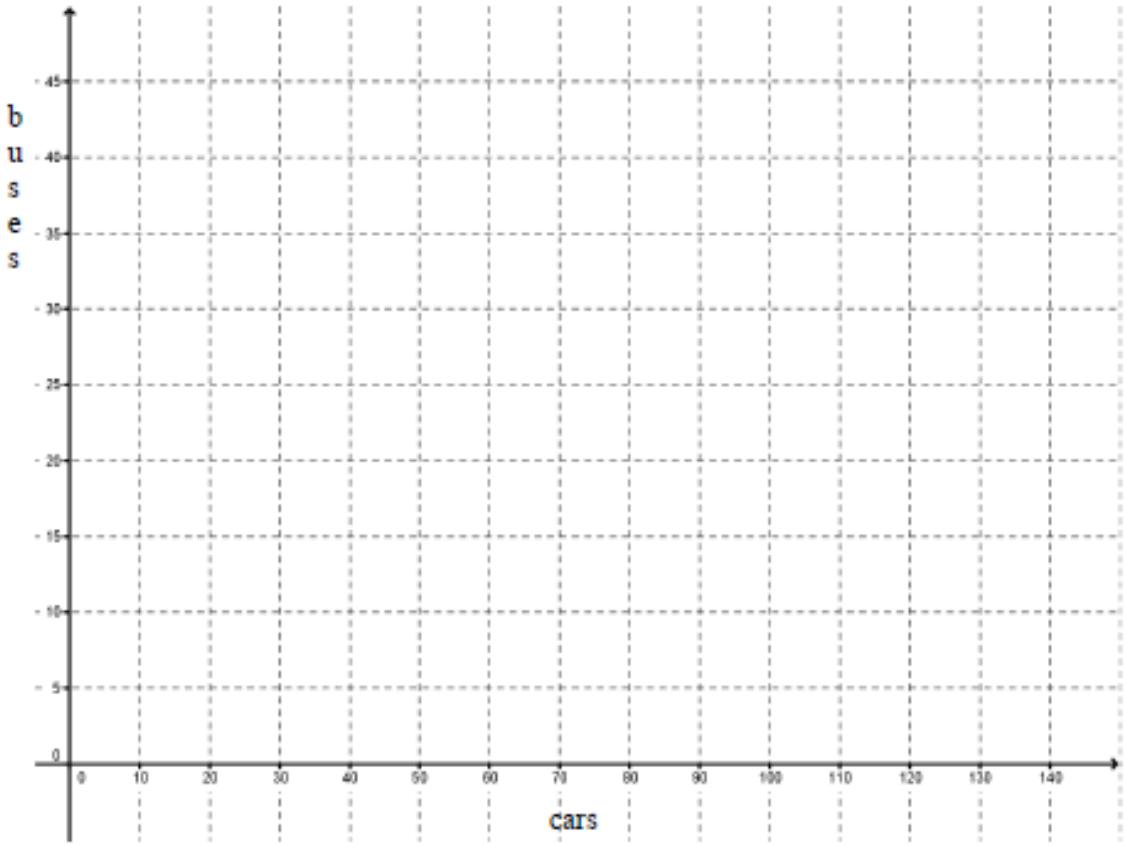
2. You own a small parking lot outside Yankee Stadium. You charge \$25 per car and \$100 per bus. Cars occupy $8m^2$ and buses take up $32m^2$. New York has set a limit of 50 vehicles in your $1120m^2$ parking lot.

	Cars	Buses	Max.
\$			
#			
area			

Objective Quantity representing profit: _____

System of Constraints: _____ _____

_____ _____



Find the number of cars & buses you can park to maximize profit. Then determine the profit.

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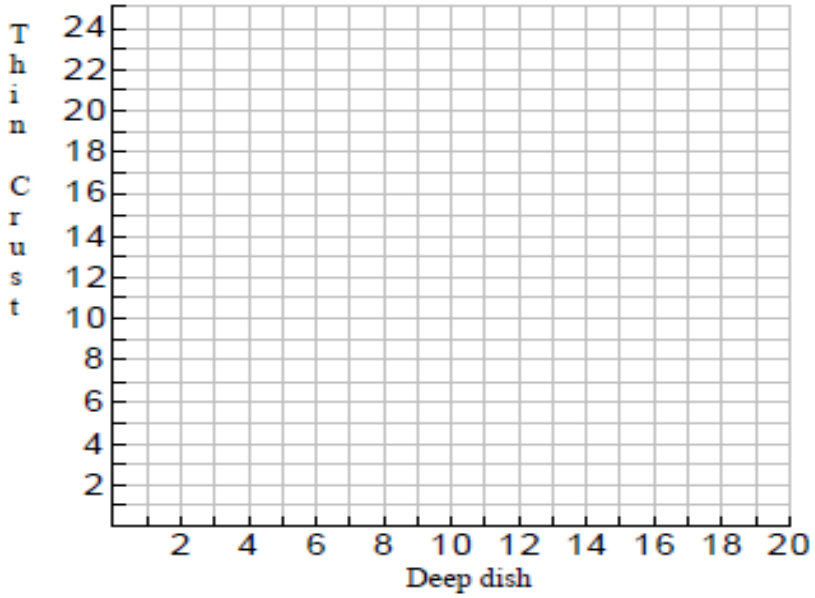
3. It costs \$10 for So Italian to produce a deep-dish pizza, and they spend \$2 per deep-dish in packaging. It costs them \$7.50 to produce a thin-crust pizza, and they spend \$1 per thin-crust in packaging. They can only spend \$145 to make pizzas and \$24 on packaging. So Italian makes \$20 per deep-dish and \$15 per thin-crust.

	deep	thin	max.
Profit			
Make			
Package			

Objective Quantity representing profit: _____

System of Constraints: _____ _____

_____



Find the number of deep-dish and thin-crust pizzas you can make to maximize profit. Then determine the profit.

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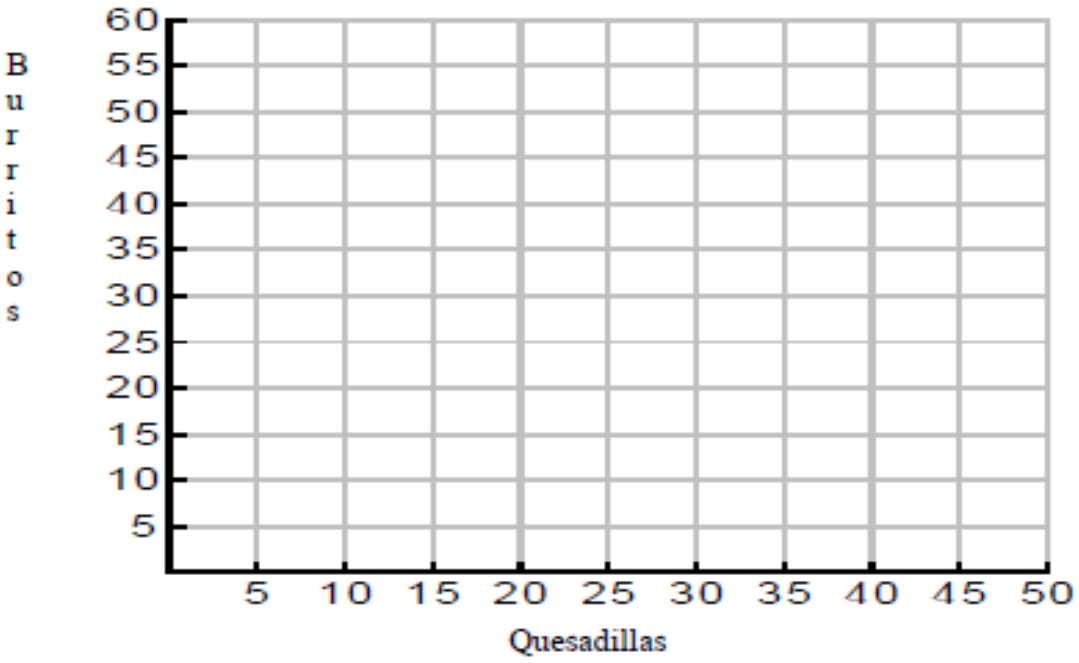
4. Señor Roberto opens a catering business with his wife. They sell quesadillas for $1.50 each and burritos for $3.50 each. The table below shows the number of minutes it takes Señor and Señora Roberto to assemble and cook each item, as well as the maximum number of minutes they can spend assembling and cooking.

	Quesadilla	Burrito	Maximum Hrs.
Assembly	5	2	115
Cooking	10	15	450

Objective Quantity representing profit: _____

System of Constraints: _____ _____

_____ _____



Find the number of quesadillas and burritos you can make to maximize profit. Then determine the profit.

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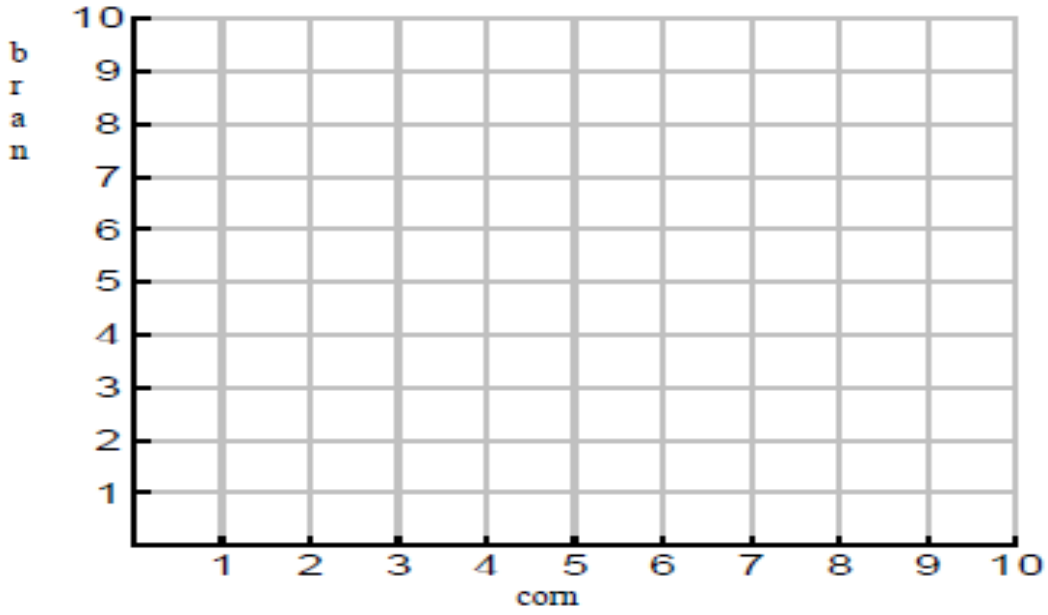
5. Baking a tray of corn muffins takes 4 c milk and 3 c wheat. A tray of bran muffins takes 2 c milk and 3 c wheat flour. A baker has 16 c milk and 15 c wheat flour. He makes $3 per tray of corn muffins and $2 per tray of bran muffins. How many trays of each type of muffin should the baker make to maximize his profit?

	Corn	Bran	Max.
Profit			
Milk			
Wheat			

Objective Quantity representing profit: _____

System of Constraints: _____ _____

_____



Find the number of corn and bran muffins you can make to maximize profit. Then determine the profit.

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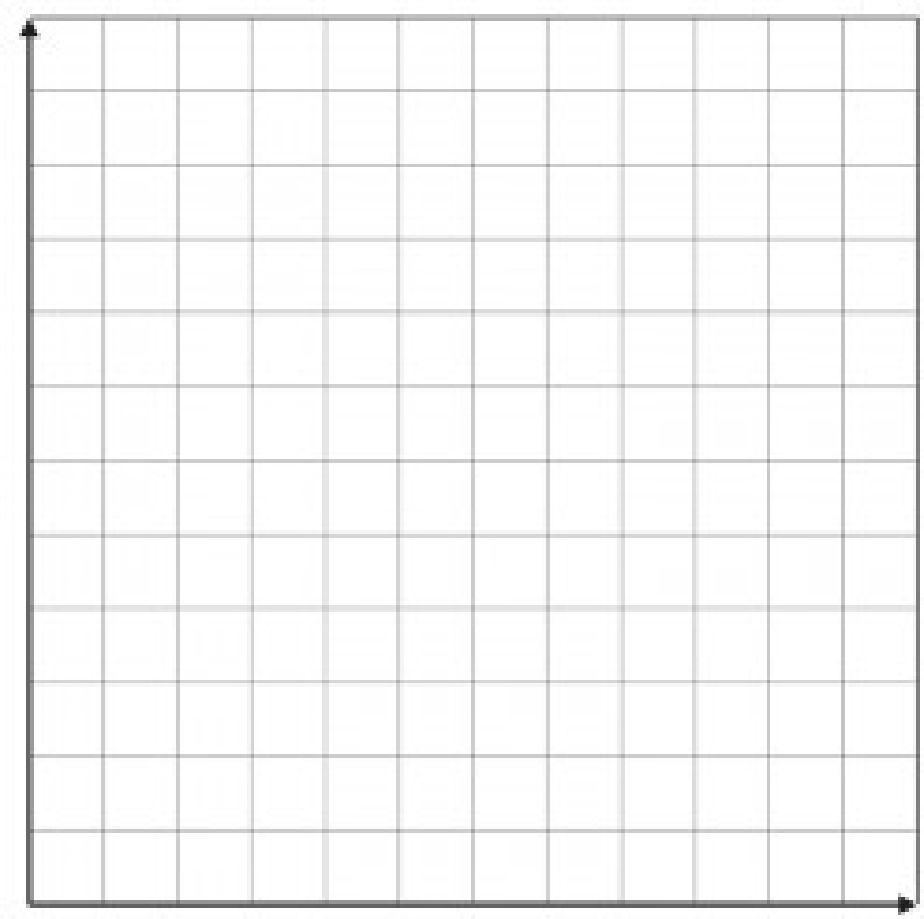
6. A potato chip company produces snack-size and family-size bags of chips. Each week the company cannot exceed 2,400 units of chips. They must produce at least 600 units of snack-size chips and at least 900units of family-size chips. If it cost the company $6 to product a unit of snack-size bags of chips and $4 to product a unit of family-size bags of chips, how much of each type of chip should be produced to minimize costs?



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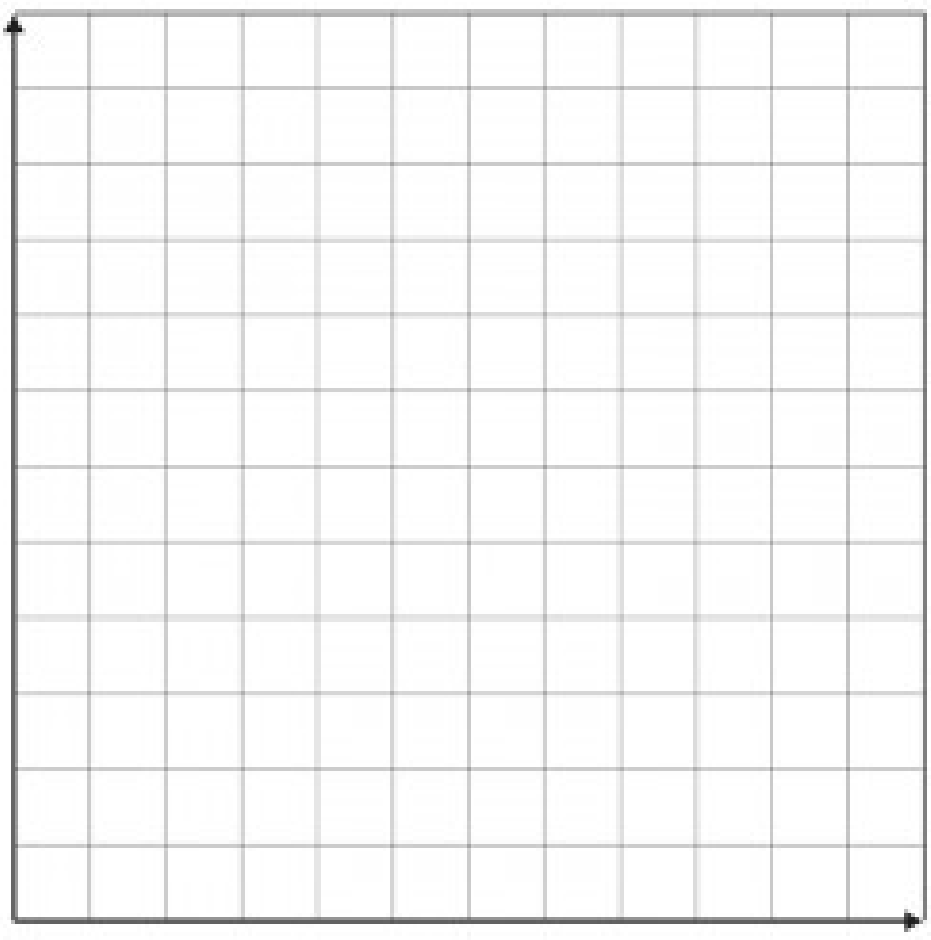
7. At Eric's Pizza Palace, he sells two kinds of pizza pepperoni and combination. Each day he only has 78 pounds of cheese and 84 pounds of pepperoni. Each pepperoni pizza requires 2 pounds of cheese and 5 pounds of pepperoni, while each combination requires 3 pounds of cheese and 2 pounds of pepperoni. The profit from the sale of each pepperoni is $7 and $11 form each combination. How much of each type of pizza should Erick make to maximize his profit every day?



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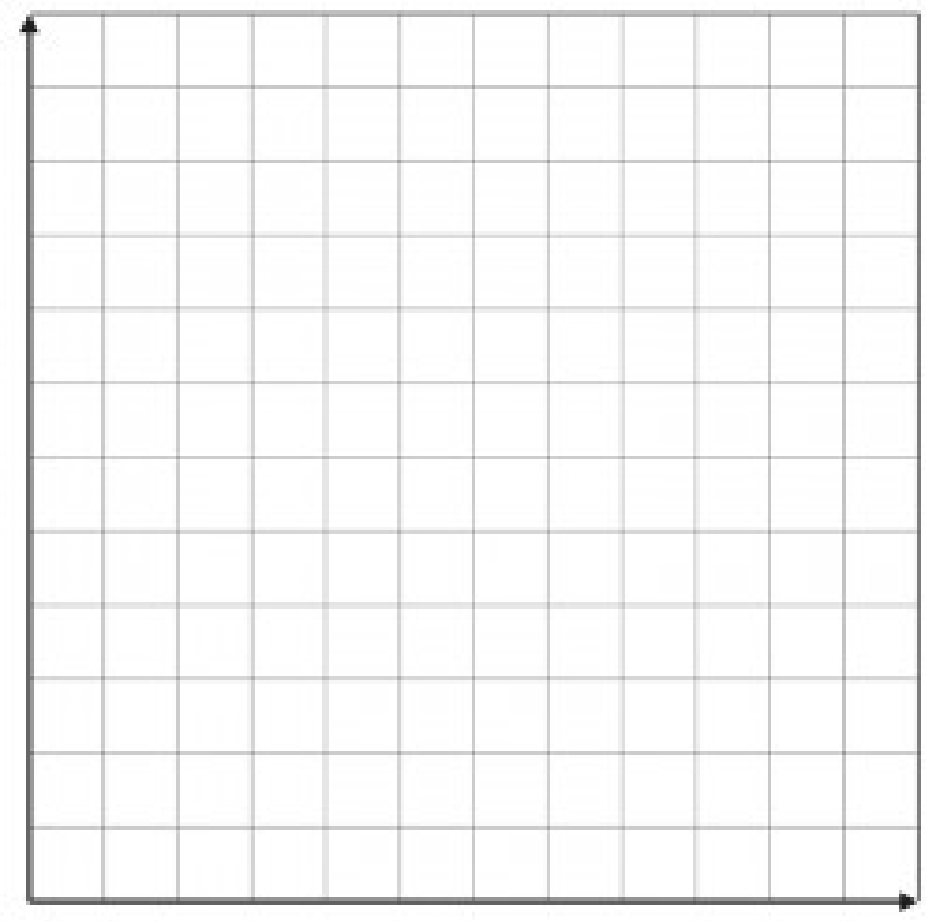
8. Memorial Hospital wants to hire nurses and nurse's aides to meet patient needs at minimum cost. The average annual salary is $55,000 for a nurse and & 32,000 for a nurse's aide. The hospital can hire up to 50 people, but needs to hire at least 12 aides, but the number of nurses must be at least twice the number of aides to meet state regulations. How many nurses and nurse's aides should be hired to minimize salary costs?



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9. Mrs. Hunter has written a final exam for her Precalculus Class that contains two different sections. Questions in section I are worth 10 points each, and questions in section II are worth 15 points each. Her students will have 90 minutes to complete the exam. From past experience, she knows that on average, questions from section I take 6 minutes to complete and questions from section II take 15 minutes. Mrs. Hunter requires her students to answer at least 2 questions from section II. Assuming they answer correctly, how many questions from each section will her students need to answer to get the highest possible score?