Application: **Armchair Quarterback**

Linear programming is a management tool used to maximize or minimize a quantity subject to certain restrictions. Study the following problem as an example, then you will be asked to create one of your own.

A simplified version of a football game has just two plays - a running play and a pass play. We assume these facts to be true:

Type of Play	Distance Gained in Yards	Time Required in Seconds
Running	3	30
Pass	6	10

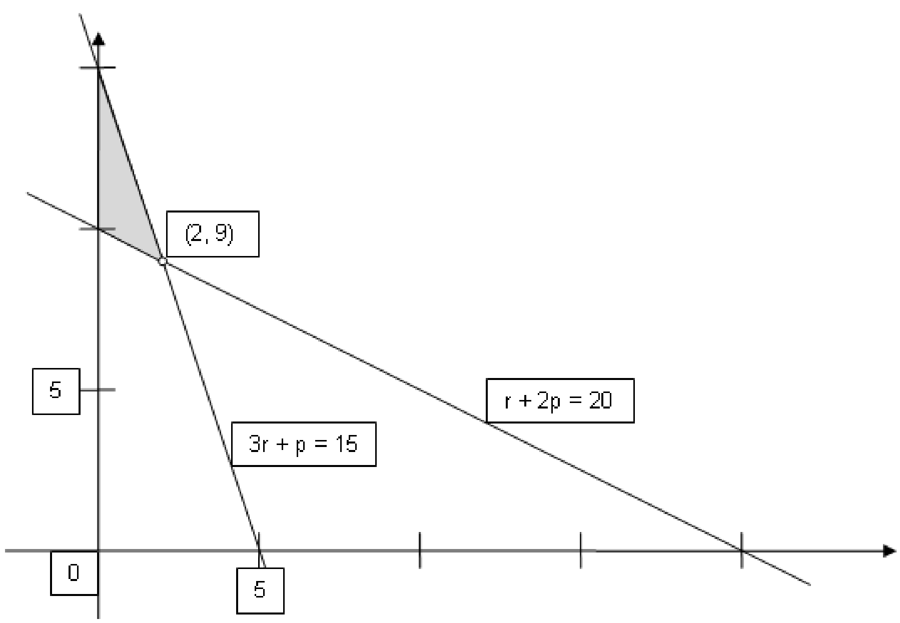
Suppose there are 60 yards to go for the touchdown and that 150 seconds remain in the game. Ignore the requirements of having to make 10 yards in four downs and other considerations of score and strategy. Suppose that on the average there is one injury in every five running plays and one injury in every ten pass plays. What combination of plays should the quarterback call to secure the touchdown in the allotted time with minimum risk of injuries? Let *r* represent running plays, *p* represent pass plays, and *i* represent injuries.

So the conditions of the problem above may be written:

$3r + 6p \geq 60$

$30r + 10p \leq 150$

$i = r/5 + p/10 \; \{i \geq 0, r \geq 0, p \geq 0\}$



The quarterback can then select his pattern of plays from anywhere in the shaded region while actual maxima and minima are located at the corner points.

0 running plays and 10 pass plays = 60 yds = 100 sec
0 running plays and 15 pass plays = 90 yds = 150 sec
2 running plays and 9 pass plays = 60 yds = 150 sec
1 running plays and 12 pass plays = 75 yds = 150 sec
0 running plays and 14 pass plays = 84 yds = 140 sec

Using the equation for calculating the number of injuries, what combination of plays should the quarterback call to secure the touchdown in the allotted time with the minimum risk of injuries?

The answer is 0 running plays and 10 pass plays. Now, with this linear programming technique in mind, interview a manufacturing firm or business office near your school or on your campus. Find the obvious constraints for their operation. Write at least two inequalities and make a graph of this system. Find maxima and minima for the business operation. Recommend the optimum choice for greatest financial solvency.

Present your exercise to a math class digitally or on paper. Also share your findings with the persons you interviewed for the data.