Maths SN

Name:

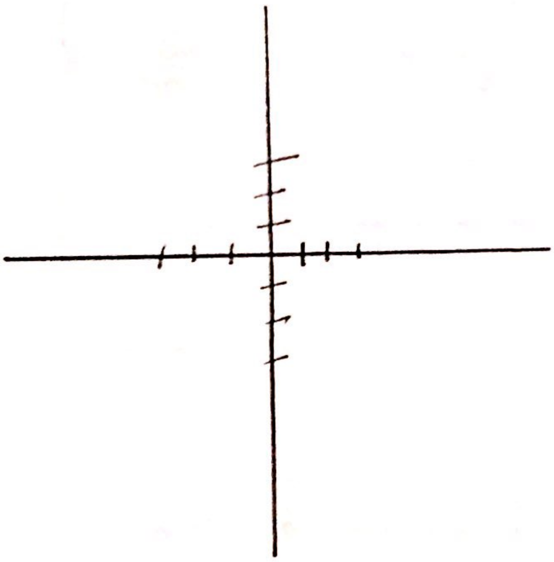
Optimization

A. Graphing Inequalities

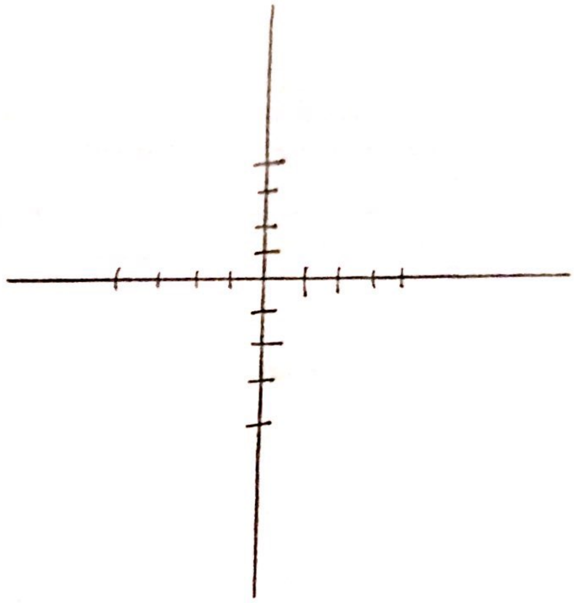
- Understanding test points
- Solid | dotted boundary lines

examples

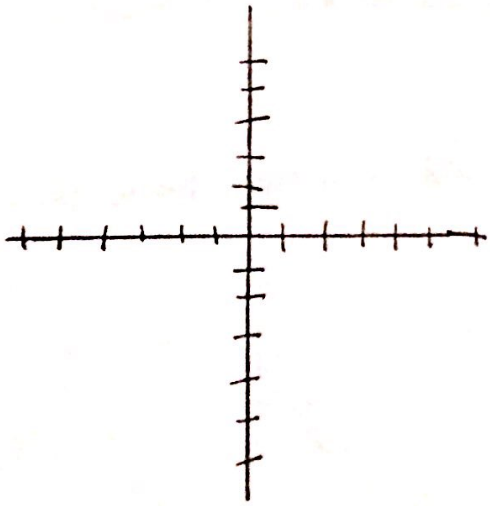
$y \geq x + 3$



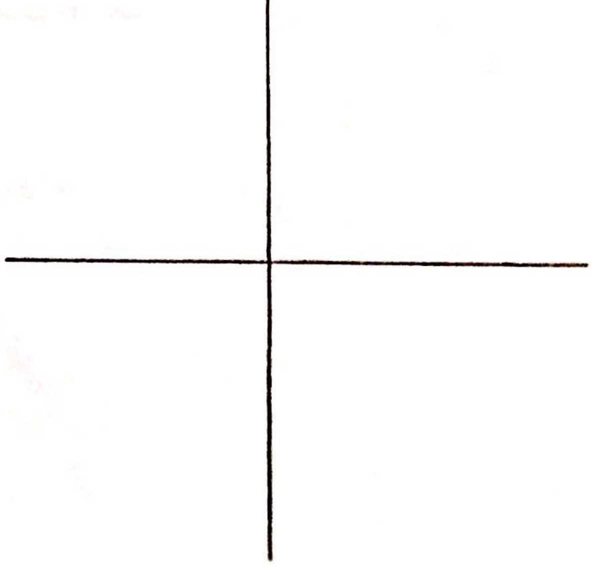
$y < -\frac{2}{3}x - 1$



$4x + 2y > 12$



$3x - 5y \leq 15$



B. Translating Situations into Inequalities

(Using dictionary)

example   let x = red marbles
          y = blue marbles

Inequalities and Keywords

>	<	≥	≤
greater than	less than	at least	at most
more than	smaller than	minimum	maximum
		greater than or equal to	less than or equal to
		____ or more	equal to or less than
		no less than	no more than
			does not surpass
			never ____ more than
			can't be more than
			any more than
			cannot exceed

- At least 20 red marbles
- Less than 10 blue marbles
- A minimum of 100 marbles
- At most 300 marbles
- A red marble sells for $0.10 and blue at $0.25. Max profit is $50

* Atleast 10 times as many red as blue marbles

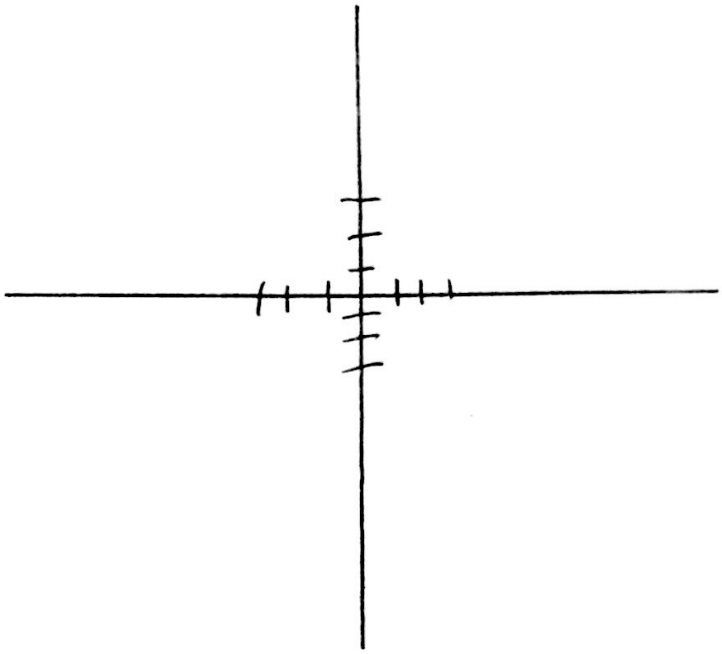
* At most 60 more blue than red marbles

C. Graphing system of inequalities

example

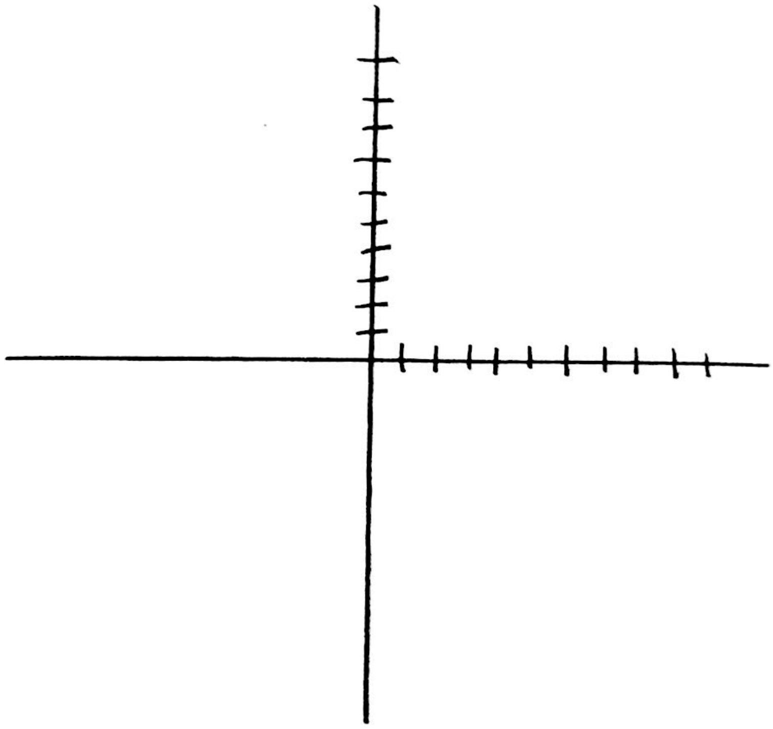
$y > -2x + 3$

$x \leq 2$



$x + y \leq 10$

$x > 2y$



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D. polygon of constraints

Example:

To raise funds for learning disabilities, members of an association organize a concert in a theater. They want to allocate seats for donors and the rest of the seats are reserved for general admission. The theater contains a maximum of 500 seats. In order to satisfy the fundraising campaign requirements, there must be three times as many seats for general admission than seats reserved for donors. Organizers wish to have at least 50 seats reserved for donors and a maximum of 300 seats for general admission.

a) Identify the variables in this situation.

____

____

b) What are the two inequalities that translate the fact that, in a situation, the variables usually take positive or zero values? ________________

c) Translate each of the constraints of this situation into an inequality. ________________

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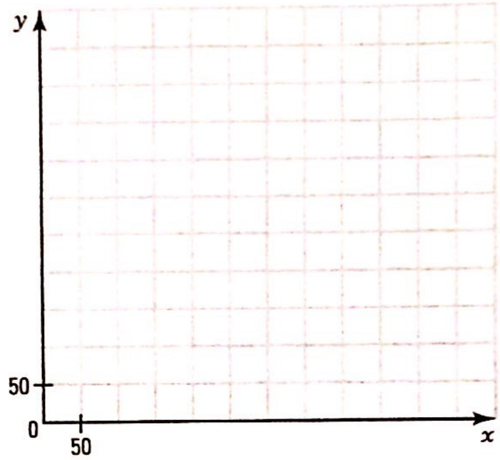

d) Represent each of the constraints in the Cartesian plane on the right and color the region that satisfies all the constraints. The region obtained is a closed polygon called **polygon of constraints.**

* e) Determine the vertices of the polygon of constraints.

* by comparison, substitution or elimination

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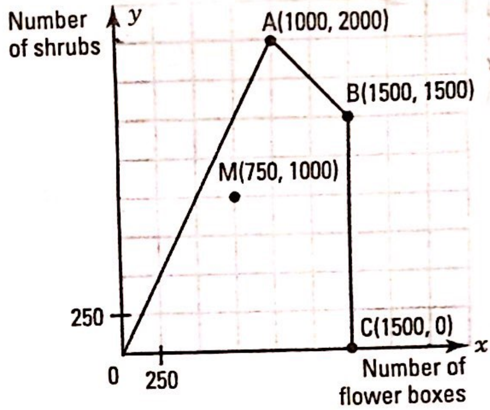
Optimization of a situation

-Substituting the vertices of a polygon of constraints into an OBJECTIVE FUNCTION RULE to determine the maximum or minimum of the function. ($M = Ax + By$ → objective function rule)

At the end of the season, the manager of a nursery garden wants to clear his inventory which contains 1500 flower boxes and 2000 shrubs.

Let x and y represent respectively the number of flower boxes and the number of shrubs sold.

The constraints associated with the sale of the flower boxes and shrubs are represented by the polygon of constraints on the right. The revenue R (in \$) generated by selling x flower boxes and y shrubs is given by $R = 3x + 8y$.



a) The interior point M(750, 1000) of the polygon satisfies the constraints and corresponds to the sale of 750 flower boxes and 1000 shrubs. What is the revenue R generated by this sale?

b) Evaluate, for each vertex of the polygon of constraints, the revenue associated with the sale.

Vertices	Revenue: $R = 3x + 8y$
O (0, 0)	
A (1000, 2000)	
B (1500, 1500)	
C (1500, 0)	

C. What is the maximum revenue?

D. What is the minimum revenue?

F. New Constraints

In previous problem, there are now a maximum of 2000 flower boxes and shrubs sold.
What is the new maximum and minimum profit?
CHange in the

* NOTE: IF THERE ARE 2 MAXIMUM or MINIMUM Vertices, then EVERY point in between is also a MAXIMUM or MINIMUM

G.

Summary

1. Identify variables
2. Translate constraints into a system of inequalities
3. Draw polygon of constraints
4. Determine vertices (elimination, substitution, comparison)
5. Establish Objective Function Rule, $M = Ax + By$
6. Determine maximum or minimum
7. Repeat process if there is a new constraint.