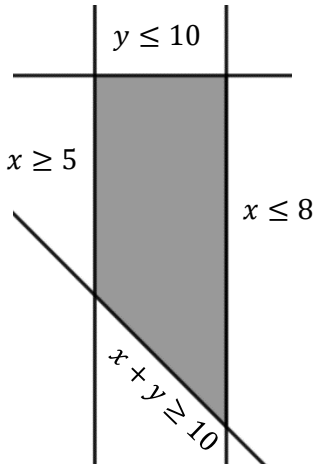
Check Your Understanding

Optimization and Complications

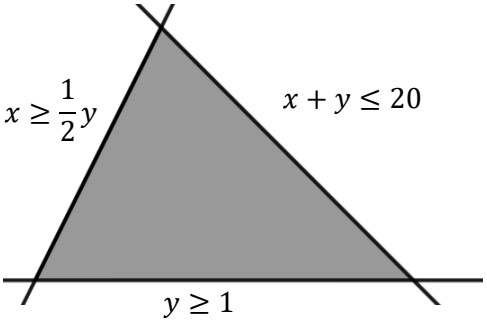
The table below identifies the key concepts from this unit. Complete each question, check your answers, and get help as needed.

Key Concepts	Basic Questions	Intermediate Questions	Advanced Questions
Unclear intersection points	1	2, 5	3, 6
Vertices with decimals	4	5	6
Vertices with dotted lines	7	8	9
Vertices tie for optimal solution		10	

1. Find all vertices of the polygon of constraints given below.



2. Find all vertices of the polygon of constraints given below.



3. All Boxed Up creates a variety of boxes designed for companies that need to package their products. A new client would like to purchase a combination of small square boxes and large cylindrical boxes.

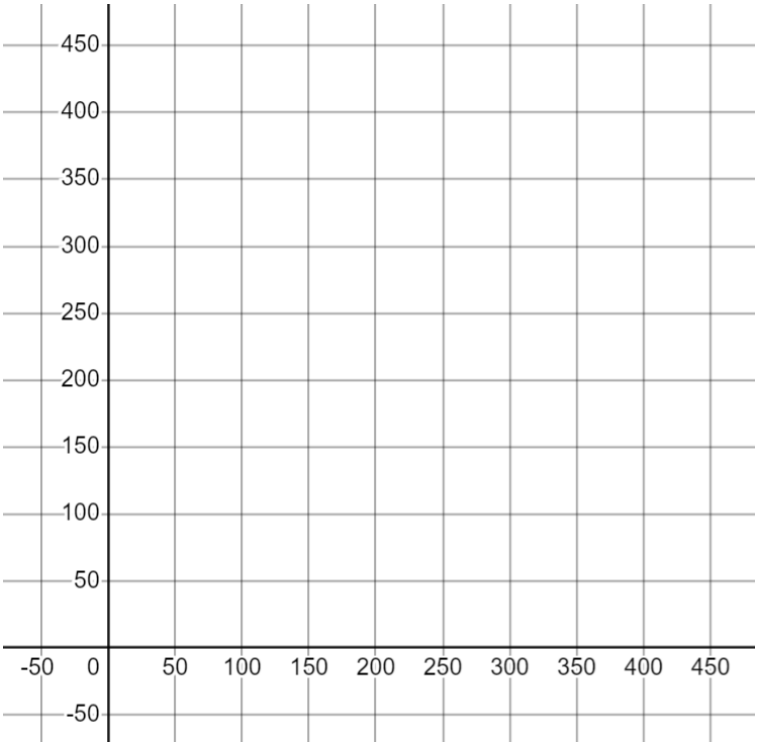
The client needs at most 400 boxes

The client needs at least 200 boxes

The client needs no fewer than three times as many large cylindrical boxes as small square boxes

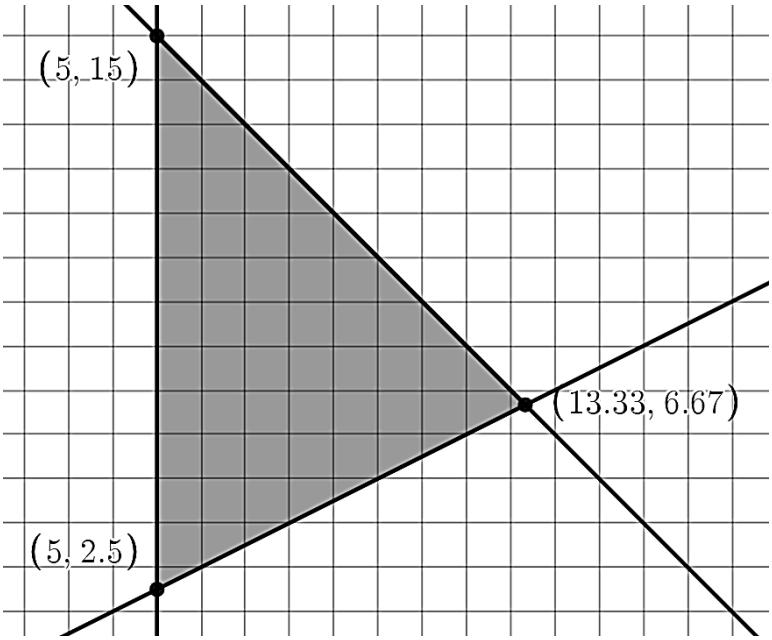
The client needs a minimum of 20 small square boxes

Each small square box costs $0.70 and each large cylindrical box costs $2.30. What is the minimum cost the client could spend purchasing new boxes?



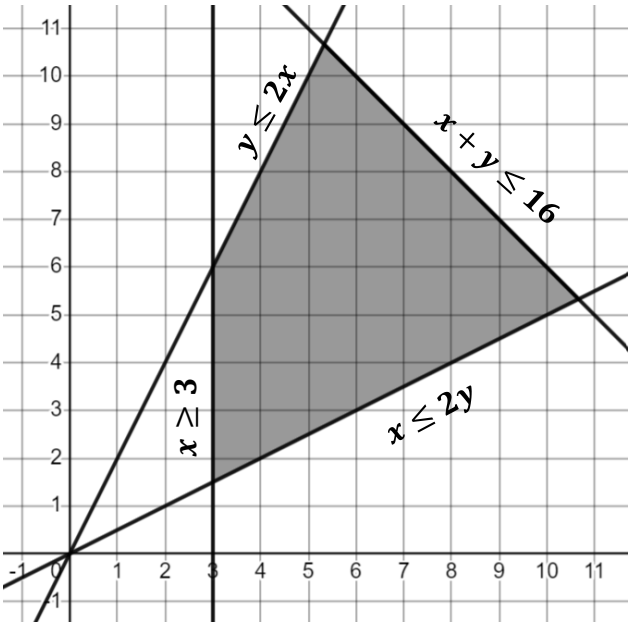
4. Students are holding a car wash. They are washing cars (x) and trucks (y). The number of each type of vehicle the students can wash are represented in the polygon of constrains below.

The students charge $10 for each car and $7 for each truck. What is the maximum profit the student could earn?



5. John has a collection of stuffed animals. He has stuffed dinosaurs (x) and stuffed bears (y). The polygon of constraints below shows the possible combinations of stuffed dinosaurs and stuffed bears John can have in his collection.

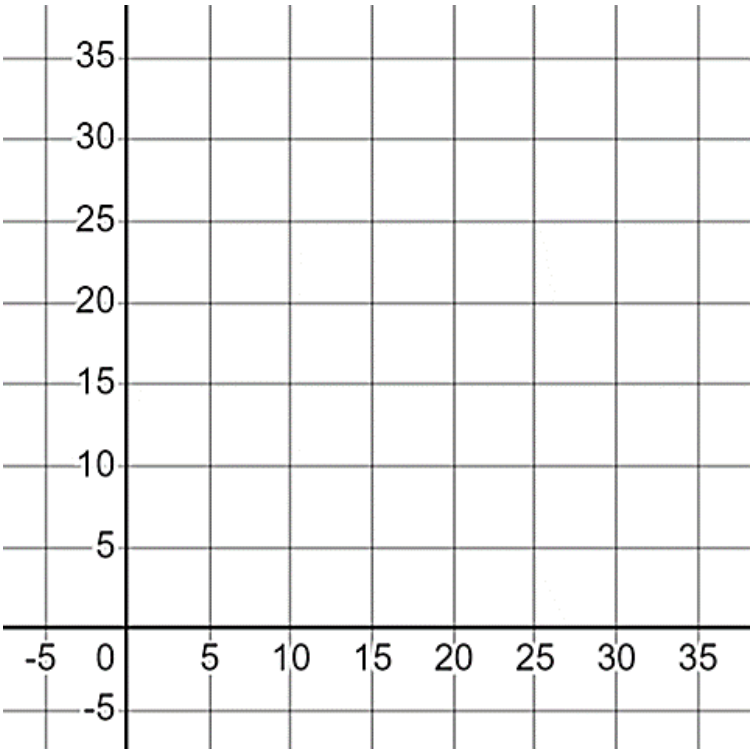
Given each dinosaur is worth $15 and each bear is worth $10, what is the maximum value of John's collection?



6. Henrique loves fish and wants to purchase an aquarium and put lots of fish in it. Henrique's favorite fish are goldfish and platy fish. The number of goldfish and platy fish in the aquarium must adhere to the following constraints:

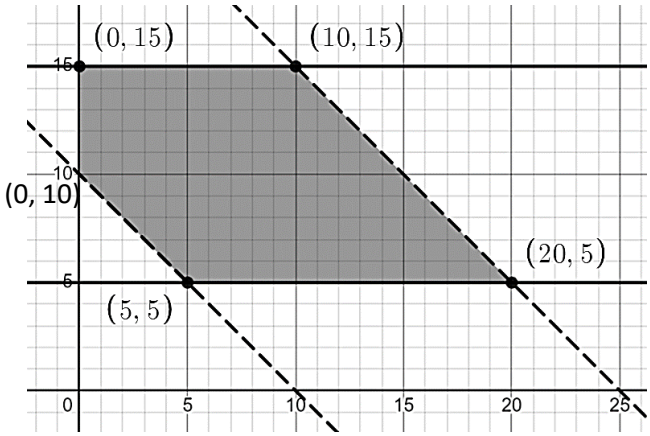
- There can be a maximum of 25 fish
- There can be a minimum of 5 fish
- There are at least half as many goldfish as platy fish
- There are no fewer than half as many platy fish and goldfish

Given each goldfish costs $2.50 and each platy fish costs $4, what is the minimum amount of money Henrique could spend on fish for his aquarium? How many of each type of fish would Henrique buy?



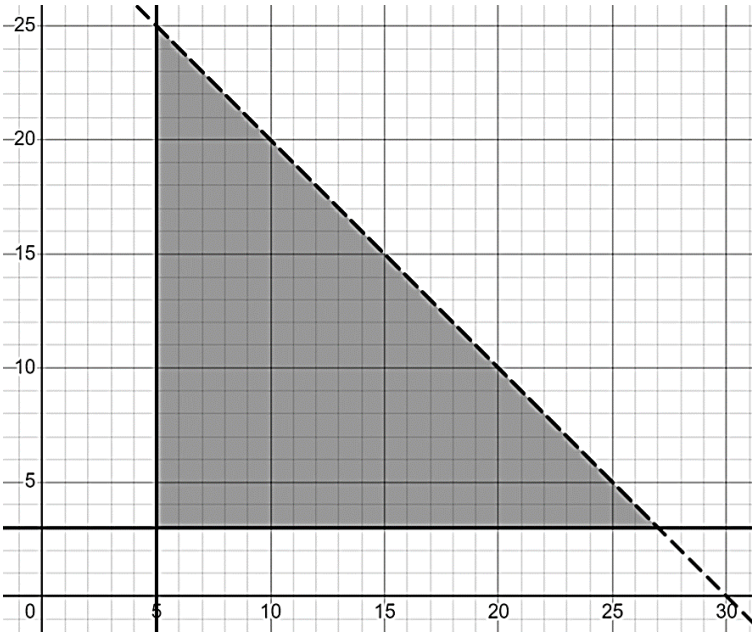
7. Veronica went to the bulk food store and bought some bubble gum (x) and tootsie pops (y). The numbers of each type of candy Veronica bought are shown in the polygon of constraints below.

If each piece of bubble gum costs $0.25 and each tootsie pop costs $0.75, what is the minimum amount of money Veronica could have spent?



8. Jeremiah is making bracelets (x) and necklaces (y) to sell. Because of the time it takes to make both items, Jeremiah is limited in how many he can make, as shown in the polygon of constraints below.

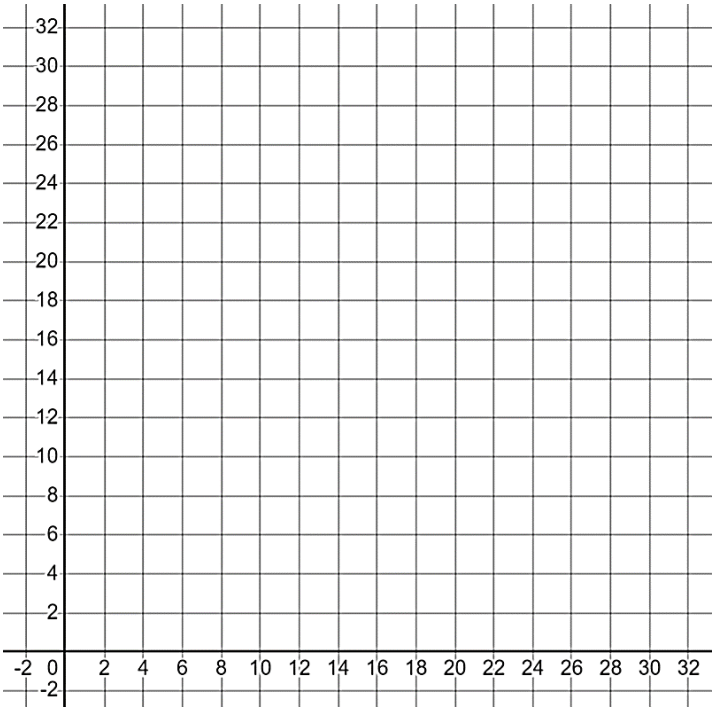
Given Jeremiah makes $20 for each bracelet and $45 for each necklace, what is the maximum profit Jeremiah could make?



9. Andrew loves to watch movies. His favorite genres are comedy and horror. Each month, Andrew tries to watch as many movies as possible, given the following constraints:

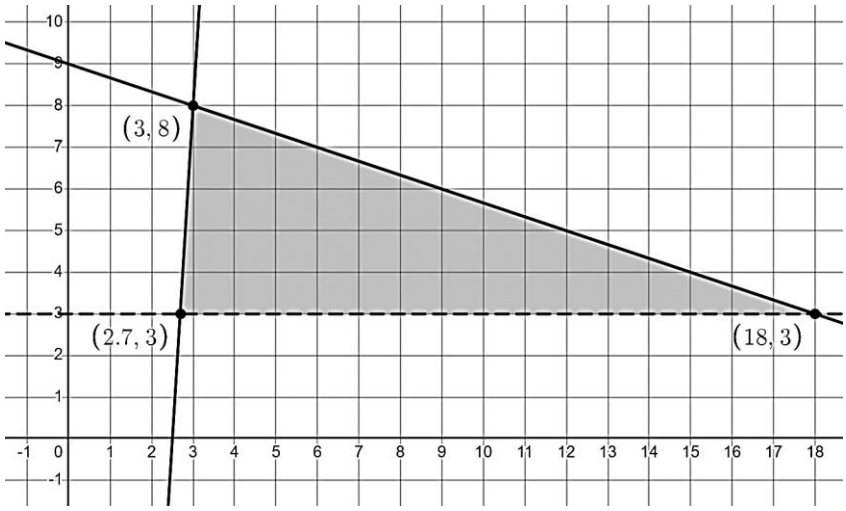
- Andrew watches fewer than 30 movies
- Andrew watches more than 9 movies
- Andrew watches a minimum of half as many horror movies as comedy movies
- Andrew watches at least 2 comedy movies

If each comedy movie is an average of 95 minutes and each horror movie is an average of 105 minutes, what is the minimum amount of time Andrew could spend watching movies each month.



10. The polygon of constraints for an optimization scenario is given below.

The optimizing function is: $Profit = 2x + 6y$



How many points maximize this scenario?

Answer Key

1) $(5, 10), (8,10), (8,2), (5, 5)$
2) $(6.66, 13.33), (19, 1), (0.5, 1)$
3) $380
4) $179
5) $210
6) $18
7) $5.25
8) $1180
9) 990 minutes
10) 5 points