EXAMPLE 5

A small company produces knitted afghans and sweaters and sells them through a chain of specialty stores. The company is to supply the stores with a total of no more than 100 afghans and sweaters per day. The stores guarantee that they will sell at least 10 and no more than 60 afghans per day and at least 20 sweaters per day. The company makes a profit of \$10 on each afghan and a profit of \$12 on each sweater.

A. Write a system of inequalities to represent the constraints.

Let x = # of afghans Let y = # of sweaters

$x + y \leq 100$ → $\cancel{x} + y \leq 100$

$-\cancel{x} \quad -x$

$y \leq -x + 100$

$m = \frac{-1}{1}$

y-int = 100

shade below

$10 \leq x \leq 60$ ← vert.

$y \geq 20$ ← hort.

B. Write an objective function for the company's total profit, P, from the sales of afghans and sweaters.

$P = 10x + 12y$

C. Graph the feasible region.

$P = 10x + 12y$

D. Find when the company's maximum profit will occur.

Max Profit of \$1180 when they sell 10 afghans & 90 sweaters

blue line

shade below

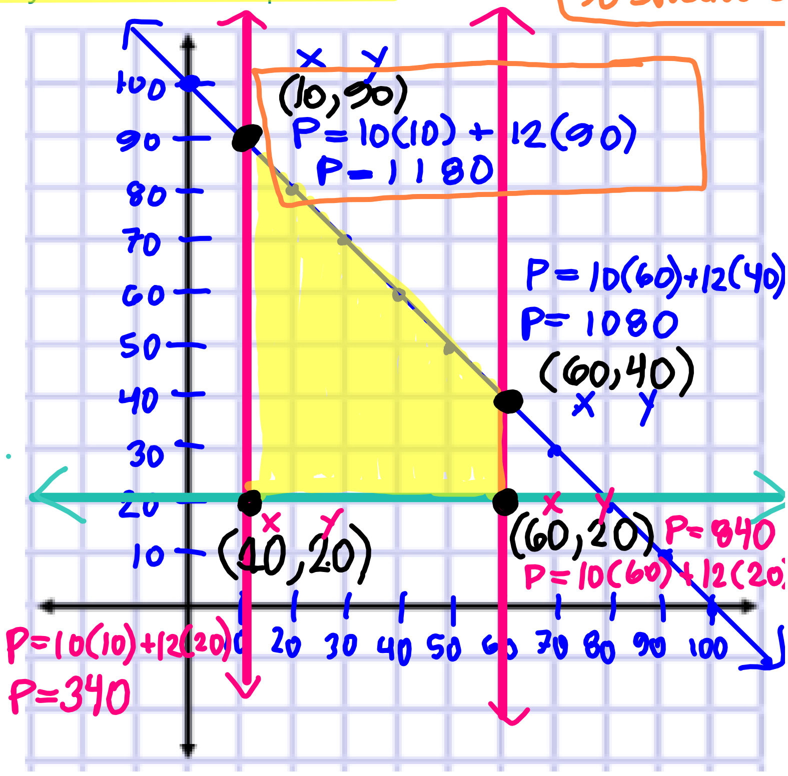
$10 \leq x \leq 60$

shade b/w

10 & 60

$y \geq 20$

shade above hor.



EXAMPLE 6

A carpenter makes bookcases in two sizes, large and small. It takes 6 hours to make a large bookcase and 2 hours to make a small one. The profit on a large bookcase is $50, and the profit on a small bookcase is $20. The carpenter can spend only 24 hours per week making bookcases and must make at least 2 of each size per week.

A. Write a system of inequalities to represent the constraints.

Let x = # of large bookcases Let y = # of small bookcases

$6x + 2y \leq 24$ ⟶

$x \geq 2$

$y \geq 2$

$$6x + 2y \leq 24$$
$$\cancel{-6x} \qquad -6x$$
$$\frac{2y}{2} \leq -\frac{6x}{2} + \frac{24}{2}$$
$$y \leq -3x + 12$$

B. Write an objective function for the company's total profit, P, from the sales of afghans and sweaters.

$P = 50x + 20y$

C. Graph the feasible region. $P = 50x + 20y$

Max profit is $220 when 2 large bookcases & 6 small bookcases are sold.

D. Find when the carpenter's maximum profit will occur.

$y \leq -3x + 12$
$m = \frac{-3}{1}$ y-int = 12
shade below

$x \geq 2$ ← vertical
shade right

$y \geq 2$ ← horizontal
shade above

$P = 50(2) + 20(2)$
$P = 140$