

You need to buy some filing cabinets. You know that Cabinet X costs \$10 per unit, requires six square feet of floor space, and holds eight cubic feet of files. Cabinet Y costs \$20 per unit, requires eight square feet of floor space, and holds twelve cubic feet of files. You have been given \$140 for this purchase, though you don't spend that much. The office has room for no more than 72 square feet of cabinets. How many of which model should you buy, in order to maximize storage volume?

	Cabinet X	Cabinet Y	Total
Cost \$	$10x$	$+ 20y$	$\leq 140$
Space sq.ft.	$6x$	$+ 8y$	$\leq 72$
Holds ft <sup>3</sup>	$8x$	$12y$	MAX

$$P = 8x + 12y$$

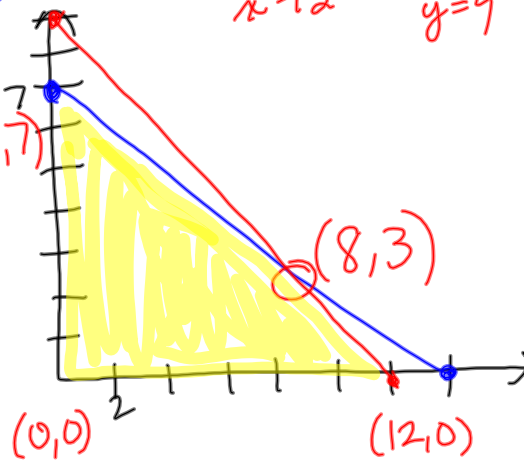
$$\begin{aligned} 0 \leq 140 & \left\{ \begin{aligned} 10x + 20y &\leq 140 \\ 6x + 8y &\leq 72 \end{aligned} \right. \\ \text{TRUE} & \end{aligned}$$

$$\begin{aligned} \frac{10x}{10} &= \frac{140}{10} & \frac{20y}{20} &= \frac{140}{20} \\ x &= 14 & y &= 7 \\ \frac{6x}{6} &= \frac{72}{6} & \frac{8y}{8} &= \frac{72}{8} \\ x &= 12 & y &= 9 \end{aligned}$$

$$\begin{aligned} x &\geq 0 \\ y &\geq 0 \end{aligned}$$

$$\begin{aligned} 3(10x + 20y &= 140) \\ -5(6x + 8y &= 72) \\ \hline 30x + 60y &= 420 \\ -30x - 40y &= -360 \\ \hline 20y &= 60 \\ y &= 3 \end{aligned}$$

$$(8, 3)$$



$$\begin{aligned} 10x + 20 \cdot 3 &= 140 \\ 10x + 60 &= 140 \\ -60 & \quad -60 \\ \hline 10x &= 80 \\ \frac{10x}{10} &= \frac{80}{10} \\ x &= 8 \end{aligned}$$

$$P = 8x + 12y$$

8 Cabinet X  
3 Cabinet Y

$$\begin{aligned} (0,0) & P = 8 \cdot 0 + 12 \cdot 0 = 0 \\ (0,7) & P = 8 \cdot 0 + 12 \cdot 7 = 84 \\ (12,0) & P = 8 \cdot 12 + 12 \cdot 0 = 96 \\ (8,3) & P = 8 \cdot 8 + 12 \cdot 3 \\ & \quad 64 + 36 = 100 \end{aligned}$$