A farmer uses two types of fertilizers. A 50 lb bag of type A contains 8 lb of nitrogen, 2 lb of phosphorous, and 4 lb of potassium. A 50 lb bag of type B fertilizer contains 5 lb of each of nitrogen, phosphorous and potassium. A field needs at least 440 lb of nitrogen, 260 lb of phosphorous and 360 lb of potassium. Each 50 lb bag of type A costs $30 and each 50 lb bag of type B costs $20. How many 50 lb bags of each type of fertilizer should he use to minimize his cost while meeting the requirements?

\[ x = \text{# of 50 lb bags of A} \]
\[ y = \text{# of 50 lb bags of B} \]

\[
\begin{align*}
N & : 8x + 5y \geq 440 \\
\text{Ph} & : 2x + 6y \geq 260 \\
K = \text{Pot} & : 4x + 5y \geq 360
\end{align*}
\]

Costs: \[ C = 30x + 20y \] to be minimized.

![Graph showing the feasible region with corner points and cost values.]

Corner points:
- \((0, 88)\) : 1760
- \((20, 56)\) : 1720
- \((50, 32)\) : 2140
- \((130, 0)\) : 3900

Min cost is $1720 at using 20 bags of A and 56 bags of B.

+1 pt for writing out or just boxing the answer.
S1 is the region \(-2x + y \leq 10\) and \(2x + y \geq 10\) and \(y \geq 0\).

a) Sketch S1.

b) Does \(P = 2x + 5y\) have a minimum on S1? If so, what is the minimum and at what point or points does it occur?

\[\text{Yes} \quad P(5, 0) = 10 \quad P(0, 10) = 50 \quad \text{so} \quad \min P \text{ is 10 at (5, 0).}\]

c) Does \(P\) have a maximum on S1? If so what is the maximum and at what point does it occur?

No

S2 is the region \(-2x + y \leq 10\) and \(2x + y \geq 10\) and \(x \leq 6\).

d) Is S2 bounded or unbounded?

e) Does \(P = 2x + 5y\) have a minimum on S2 and if so, what is the minimum and at what point or points does it occur?

\[\text{Yes} \quad \min P \text{ is still 10 at (5, 0).}\]

f) Does \(P\) have a maximum on S2? If so what is the maximum and at what point does it occur?

\[\text{Yes, Max P is } 12 + 110 = 132 \text{ at (6, 22)}.\]
3. Fill in the blank with the appropriate symbol choosing from $\in$, $\cup$, $\cap$, $\subseteq$, $\varnothing$.

2 $\subseteq$ (1, 2) $\subseteq$ (1, 2, 3, 4)

$\{1, 2\} \cap \{3, 4\} = \varnothing$

$\{1, 2, 3\} \cup \{3, 4, 5\} = \{1, 2, 3, 4, 5\}$

$\{1, 2, 3\} \Delta \{3, 4, 5\} = \{3\}$

4. Draw Venn diagrams for each set:

$(E \cap F) \cup G$

$(E \cap F) \cup G^c$

$(E \cap F^c) \cup G$

$E \cap (F^c \cup G)$