25. \( \text{max } P = 3x + 2y \)

Constraints:
\( x + y \leq 10 \)
\( 2x + 3y \leq 24 \)
\( x \geq 3, \quad y \geq 2 \)

Feasible region is the region ABCD where:
- \( A = (3, 2) \), \( B = (8, 2) \), \( C = (8, 4) \), \( D = (3, 6) \)

\[
\begin{align*}
P(3, 2) &= 13 \\
P(8, 2) &= 28 \\
P(4, 4) &= 26 \\
P(3, 6) &= 21
\end{align*}
\]

\( \rightarrow \text{ maximum occurs at } (8, 2) \)

And the maximum value is 28
Let $x$ be the number of hours spent on math and $y$ be the number spent on other courses.

So to maximise $P = 2x + y$,

constraint $12x + 8y \leq 48$

$x \geq 0, \ y \geq 0$

Check that max occurs at $(4,0)$ i.e. 4 math courses and 0 others.

Now if $x \geq 2, \ y \geq 2$, then

Check that max occurs at $(5/3, 2)$ but $5/3$ is not integer, so the student should take 2 math and 2 other courses.
Let \( x \) be the number of modest houses.

\( y \) be the number of deluxe houses.

So \( \text{max } P = 25x + 60y \).

Constraints:
1. \( x + y \leq 100 \) (\( \therefore \text{a house is built} \))
2. \( 20x + 40y \leq 2500 \) (\( \text{on 1-acre plots} \))
3. \( x \geq 0 \)
4. \( y \geq 0 \)

Feasible region: \( OABC \)

\( O = (0, 0) \)
\( A = (100, 0) \)
\( B = (70, 30) \)
\( C = (0, 65) \)

So \( P(0, 0) = 0 \)
\( P(100, 0) = 2500 \)
\( P(70, 30) = 3550 \)
\( P(0, 65) = 3900 \) \( \checkmark \text{ max occurs when building 65 deluxe houses and 0 modest houses} \)
New with additional constraints

\[ x \geq 20, \ y \geq 20 \]

\[ \begin{align*}
A &= (20, 20) \\
B &= (80, 20) \quad \text{intersection of } y = 20 \text{ and } x + y = 100 \\
C &= (70, 30) \quad \text{intersection of } x + y = 100 \\
D &= (20, 55) \quad \text{intersection of } x + y = 100 \text{ and } 40x + 10y = 2600.
\end{align*} \]

Check that max occurs at \((20, 55)\).