1.

1.1 Formalise the problem.

1.1.1. Decision Variables: x_1 represents ~~to~~ the number of soldiers

Search space: R^2 $\qquad$ x_2 represents the number of trains

1.1.2. Objective: maximize weekly profits

$$\cancel{\Rightarrow \arg\max_{x \in (x_1, x_2)}}$$

$$\text{weekly profits for soldiers} = (27-10-14)x_1 = 3 \cdot x_1$$

$$\text{weekly profits for trains} = (21-9-10) \cdot x_2 = 2 \cdot x_2.$$

$$\Rightarrow \arg\max_{x \in X} (3x_1 + 2x_2).$$

1.1.3. Constraints:

$40 \geq x_1 \geq 0$. the number of soldiers is not negative and should be no greater than 40.

$x_2 \geq 0$, trains

$2x_1 + 1x_2 \leq 100$. Limitations on finishing hours. The actual working time should less and equal to 100 hours.

$1 \cdot x_1 + 1 \cdot x_2 \leq 80$ Limitations on carpentry hours.

3. The optimum is $(\cancel{40, 20})$ 20, 60.

And the weekly profits of optimum $(\cancel{40, 20})$ 20, 60 $= 3 \times \cancel{40}\,20 + 2 \times \cancel{20}\,60$

$= \cancel{160}$ \$. 180 \$

- The optimum of my solution is manufacturing 20 soldiers and 60 trains. then we obtain the max weekly profits 180 \$.

- ~~The~~ We need $20 + 60 = 80$ carperery hours totally per week. And the constraint of carperery hours is 80, so we can use all carperery hours ~~one~~ available.

- We need $2 \times 20 + 1 \cdot 60 = 100$ finishing hours totally per week. And the constraint of ~~finishing~~ finishing hours is 100, so we can use all finishing hours available.

- If we choose the number of soldiers and the number of trains in infeasible area, it will obey the constraints ~~of~~. Therefo~~re~~. $(20, 60)$ is the optimum.