

## MA208 Problem Sheet 5

1. Graph the following inequalities:

(i)  $6x - 3y > 18$

(ii)  $2x - 3y \leq 6$

2. A firm manufactures wood screws and metal screws. All the screws have to pass through a threading machine and a slotting machine. A box of wood screws requires 3 minutes on the slotting machine and 2 minutes on the threading machine. A box of metal screws requires 2 minutes on the slotting machine and 8 minutes on the threading machine. In a week, each machine is available for 60 hours.

There is a profit of €10 per box on wood screws and €17 per box on metal screws.

Formulate this problem as a linear programming problem given that the objective is to *maximise* profit.

(Note: you are NOT asked to solve this problem.)

3. A manufacturing company makes two types of water skis, a trick ski and a slalom ski. The trick ski requires 6 labour-hours for fabricating and 1 labour-hour for finishing. The slalom ski requires 4 labour hours for fabricating and 1 labour-hour for finishing. The maximum labour-hours available per day for fabricating and finishing are 108 and 24, respectively.

(i) If  $x$  is the number of trick skis and  $y$  is the number of slalom skis produced per day, write a system of linear inequalities that indicates appropriate constraints on  $x$  and  $y$ .

(ii) Find the region of feasible solutions graphically for the number of each type of ski that can be produced.

(iii) If the profit on a trick ski is €40 and the profit on a slalom ski is €30, how many of each type should be manufactured each day to realise a maximum profit? What is the maximum profit?

(iv) Discuss the effect on the production schedule and the maximum profit if the profit on a slalom ski decreases to €25.

(v) Discuss the effect on the production schedule and the maximum profit if the profit on a slalom ski increases to €45.

4. Ann and Margaret run a small business in which they work together making blouses and skirts. Each blouse takes 1 hour of Ann's time together with 1 hour of Margaret's time. Each skirt involves Ann for 1 hour and Margaret for half a hour. Ann has 7 hours available each day and Margaret has 5 hours each day. They could just make blouses or they could make some of each.

Their first thought was to make the same number of each. But they get €8 profit on a blouse and only €6 on a skirt.

- (i) Formulate the problem as a linear programming problem.
- (ii) Solve the linear programming problem to calculate how many blouses and skirts they should make to maximise their profit. What is the profit?