Graphs & Finding regions Difficulty: Medium

Question Paper 2

Level	AS & A Level
Subject	Maths - Pure
Exam Board	Edexcel
Topic	Equations and inequalities
Sub-Topic	Graphs & Finding regions
Difficulty	Medium
Booklet	Question Paper 2

Time allowed: **164 minutes**

Score: **/137**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>76%	61%	52%	42%	33%	23%	<23%

Bernie buys x packets of seeds and y plants for his garden.
He wants to buy more packets of seeds than plants.
The inequality $x > y$ shows this information.

He also wants to buy
  • less than 10 packets of seeds
  • at least 2 plants.

(a) Write down two more inequalities in x or y to show this information. [2]

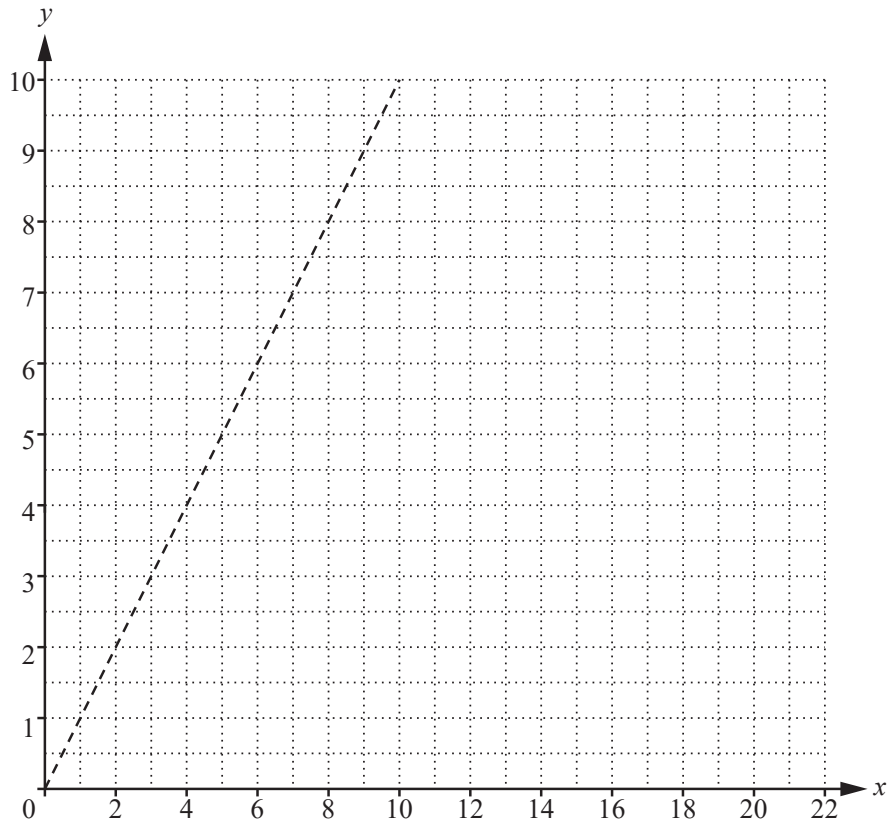**(b)** Each packet of seeds costs \$1 and each plant costs \$3.
The maximum amount Bernie can spend is \$21.

Write down another inequality in x and y to show this information. [1]

(c) The line $x = y$ is drawn on the grid.
Draw three more lines to show your inequalities and shade the **unwanted** regions. [5]

(d) Bernie buys 8 packets of seeds.

(i) Find the maximum number of plants he can buy. [1]

(ii) Find the total cost of these packets of seeds and plants. [1]

3

Sima sells x biscuits and y cakes.

(a) **(i)** She sells at least 100 biscuits.

Write down an inequality in x. [1]

(ii) She sells at least 120 cakes. [1]

Write down an inequality in y.

(iii) She sells a maximum of 300 biscuits and cakes altogether. [1]

Write down an inequality in x and y.

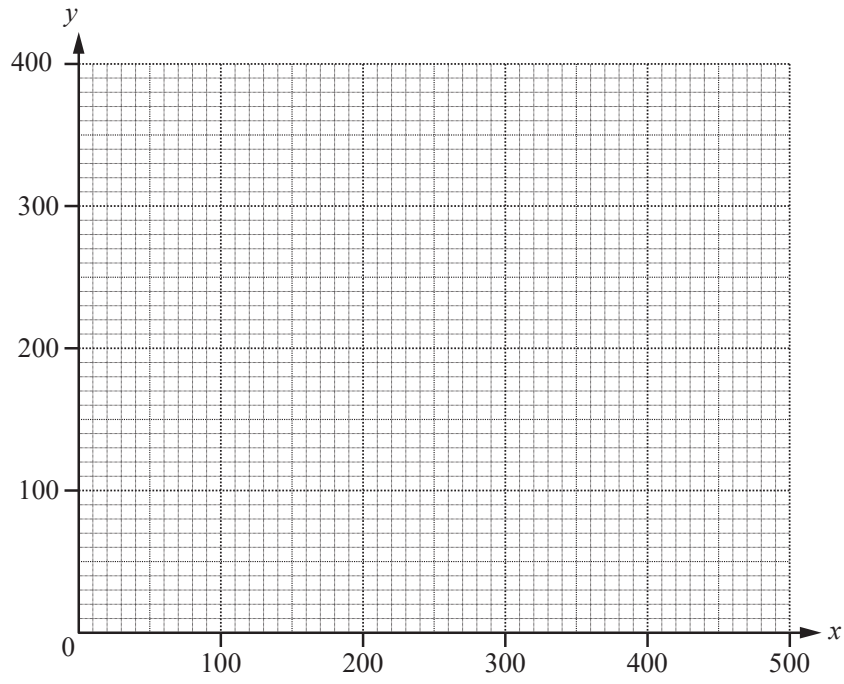**(iv)** Sima makes a profit of 40 cents on each biscuit and 80 cents on each cake. [1]
Her total profit is at least $160.

Show that $x + 2y \geqslant 400$.

(b) On the grid, draw four lines to show the four inequalities and shade the unwanted regions. [6]

(c) Calculate Sima's maximum profit.
Give your answer in dollars. [2]

5

The school cook buys potatoes in small sacks, each of mass 4 kg, and large sacks, each of mass 10 kg.
He buys x small sacks and y large sacks.
Today, he buys less than 80 kg of potatoes. [1]
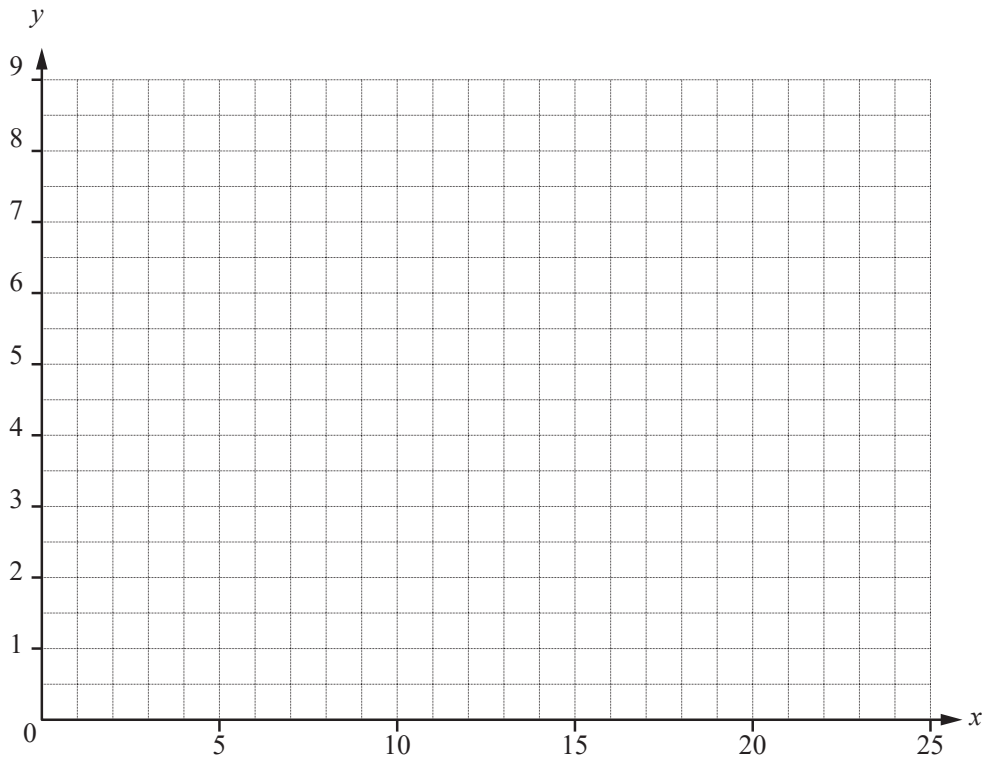
(a) Show that $2x + 5y < 40$.

(b) He buys more large sacks than small sacks. He buys no more than 6 large sacks.

[2]

Write down two inequalities to show this information.

(c) On the grid, show the information in **part (a)** and **part (b)** by drawing three straight lines and shading the unwanted regions.

[5]

(d) Find the greatest mass of potatoes the cook can buy today.

[2]

Pablo plants x lemon trees and y orange trees.

(a) (i) He plants at least 4 lemon trees.

Write down an inequality in x to show this information. [1]

(ii) Pablo plants at least 9 orange trees.

Write down an inequality in y to show this information. [1]

(iii) The greatest possible number of trees he can plant is 20.

Write down an inequality in x and y to show this information. [1]

(b) Lemon trees cost $5 each and orange trees cost $10 each.

The maximum Pablo can spend is $170.

Write down an inequality in x and y and show that it simplifies to $x + 2y \leqslant 34$. [1]

(c) (i) On the grid opposite, draw four lines to show the four inequalities and shade the **unwanted** [7]
region.
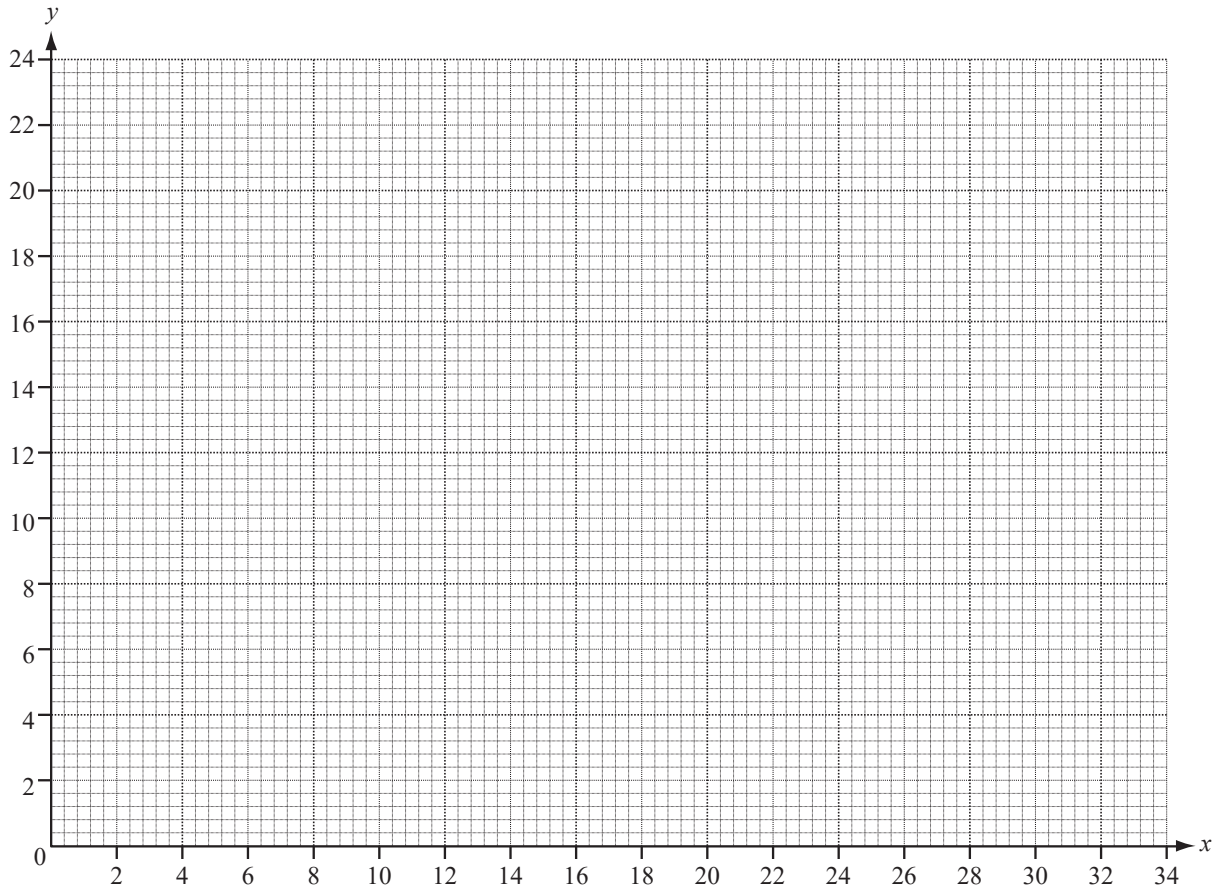
(ii) Calculate the smallest cost when Pablo buys a total of 20 trees. [2]

9

Mr Chang hires x large coaches and y small coaches to take 300 students on a school trip.
Large coaches can carry 50 students and small coaches 30 students.
There is a maximum of 5 large coaches.

(a) Explain clearly how the following two inequalities satisfy these conditions.
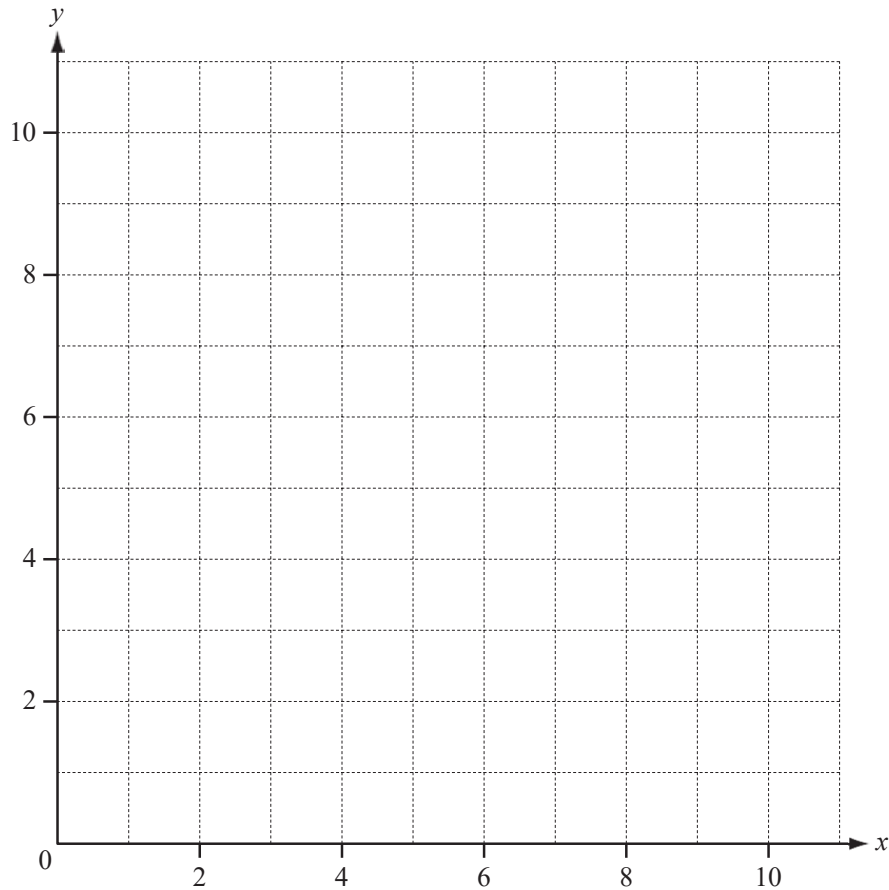
(i) $x \leqslant 5$ [1]

(ii) $5x + 3y \geqslant 30$ [2]

Mr Chang also knows that $x + y \leqslant 10.$

(b) On the grid, show the information above by drawing three straight lines and shading the unwanted regions.

[5]

(c) A large coach costs $450 to hire and a small coach costs $350.

   (i) Find the number of large coaches and the number of small coaches that would give the minimum hire cost for this school trip.

                              [2]

   (ii) Calculate this minimum cost.   [1]

Hassan stores books in large boxes and small boxes.
Each large box holds 20 books and each small box holds 10 books.
He has x large boxes and y small boxes.

(a) Hassan must store at least 200 books.

Show that $2x + y \geq 20$. [1]

(b) Hassan must not use more than 15 boxes.
He must use at least 3 small boxes.
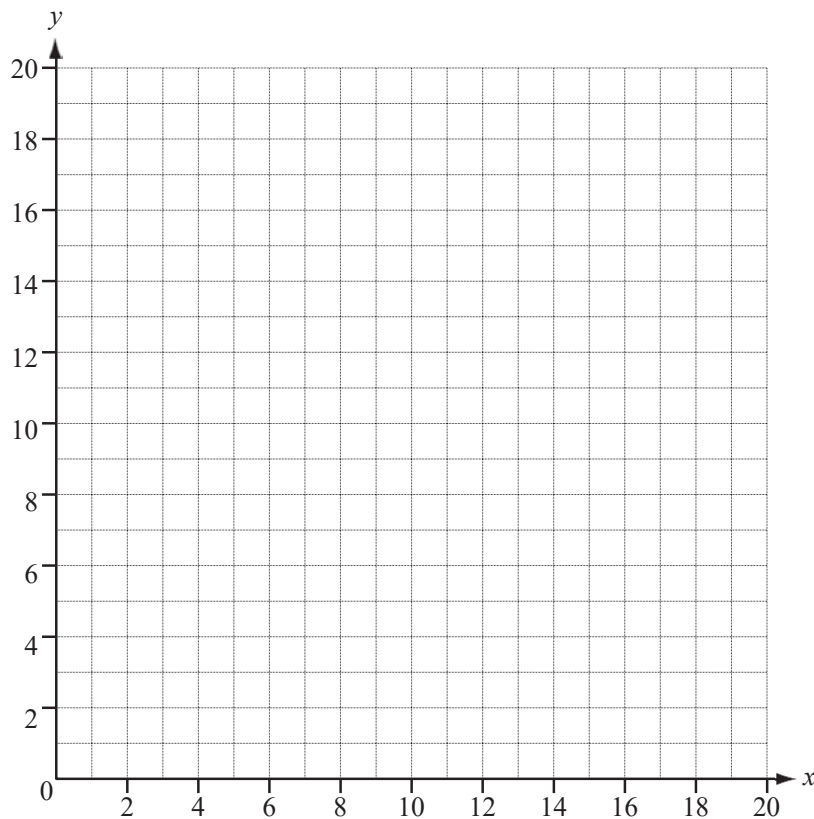The number of small boxes must be less than or equal to the number of large boxes.

Write down three inequalities to show this information. [3]

(c) On the grid, show the information in part (a) and part (b) by drawing four straight lines and shading the unwanted regions.

[6]

(d) A large box costs $5 and a small box costs $2.

   (i) Find the least possible total cost of the boxes. [1]

   (ii) Find the number of large boxes and the number of small boxes which give this least   possible cost.

[2]

Peter wants to plant x plum trees and y apple trees.

He wants at least 3 plum trees and at least 2 apple trees.

(a) Write down one inequality in x and one inequality in y to represent these conditions. [2]

(b) There is space on his land for no more than 9 trees.

Write down an inequality in x and y to represent this condition. [1]

(c) Plum trees cost $6 and apple trees cost $14.

Peter wants to spend no more than $84.

Write down an inequality in x and y, and show that it simplifies to $3x + 7y \leq 42$.

[1]

(d) On the grid, draw four lines to show the four inequalities and shade the unwanted regions.

[7]

(e) Calculate the smallest cost when Peter buys a total of 9 trees.

[2]

A company has a vehicle parking area of 1200 m^5 with space for x cars and y trucks.

Each car requires 20 m^5 of space and each truck requires 100 m^5 of space.

(a) Show that $x + 5y \leqslant 60$. [1]

(b) There must also be space for

    (i) at least 40 vehicles,

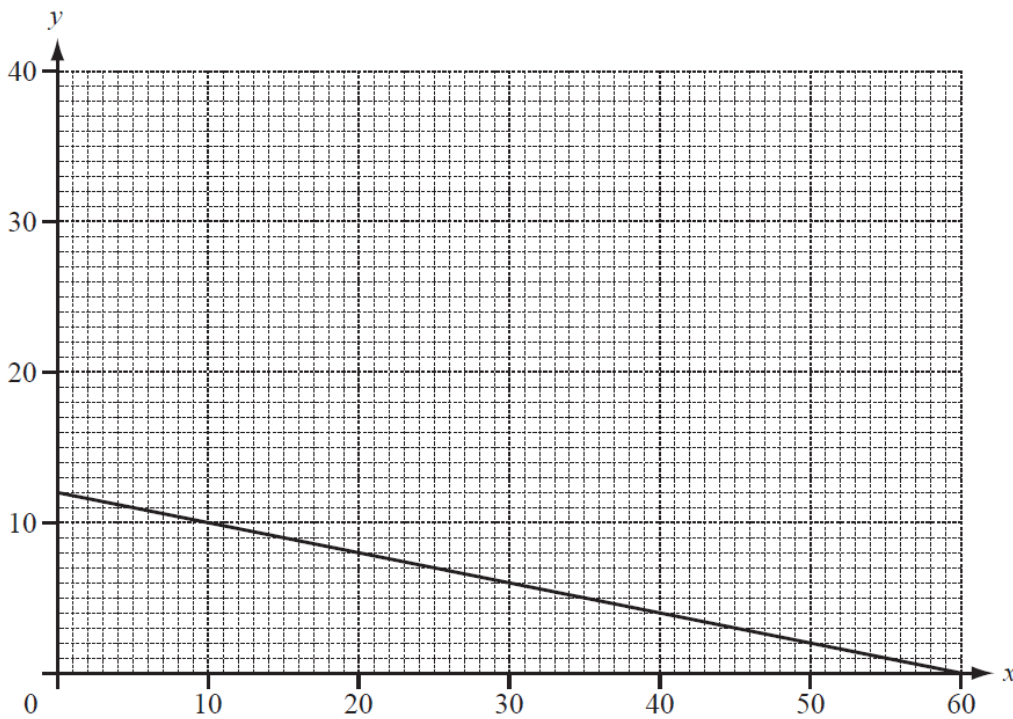   (ii) at least 2 trucks.

    Write down two more inequalities to show this information. [1]

(c) One line has been drawn for you.
On the grid, show the three inequalities by drawing the other two lines and shading the **unwanted** regions. [1]

(d) Use your graph to find the largest possible number of trucks.

[1]

(e) The company charges $5 for parking each car and $10 for parking each truck.
Find the number of cars and the number of trucks which give the company the greatest possible income.

Calculate this income.

[3]

Answer the whole of this question on a sheet of graph paper.

Tiago does some work during the school holidays.
In one week he spends x hours cleaning cars and y hours repairing cycles.
The time he spends repairing cycles is at least equal to the time he spends cleaning cars.
This can be written as $y \geqslant x$.

He spends no more than 12 hours working.
He spends at least 4 hours cleaning cars.

(a)   Write down two more inequalities in x and/or y to show this information.   [3]

(a)   Draw x and y axes from 0 to 12, using a scale of 1 cm to represent 1 unit on each axis.   [1]

(a)   Draw three lines to show the three inequalities. Shade the **unwanted** regions.   [5]

(a) Tiago receives \$3 each hour for cleaning cars and \$1.50 each hour for repairing cycles.

(i) What is the least amount he could receive? [2]

(ii) What is the largest amount he could receive? [2]

Answer the whole of this question on a sheet of graph paper.

A taxi company has "SUPER" taxis and "MINI" taxis.
One morning a group of 45 people needs taxis.
For this group the taxi company uses x "SUPER" taxis and y "MINI" taxis.
A "SUPER" taxi can carry 5 passengers and a "MINI" taxi can carry 3 passengers.
So $5x + 3y \geqslant 45$.

(a) The taxi company has 12 taxis.
   Write down **another** inequality in x and y to show this information.   [1]

(b) The taxi company always uses at least 4 "MINI" taxis.
   Write down an inequality in y to show this information.   [1]

(c) Draw x and y axes from 0 to 15 using 1 cm to represent 1 unit on each axis.   [1]

(d) Draw three lines on your graph to show the inequality $5x + 3y \geqslant 45$ **and** the inequalities from **parts** (a) and (b).
   Shade the **unwanted** regions.   [6]

(e) The cost to the taxi company of using a "SUPER" taxi is $20 and the cost of using a "MINI" taxi is $10.
The taxi company wants to find the cheapest way of providing "SUPER" and "MINI" taxis for this group of people.
Find the two ways in which this can be done.   [3]

(f) The taxi company decides to use 11 taxis for this group.
   (i)   The taxi company charges $30 for the use of each "SUPER" taxi and $16 for the use of each "MINI" taxi.
         Find the two possible **total** charges.   [3]

   (ii) Find the largest possible **profit** the company can make, using 11 taxis.   [1]

Answer all of this question on a sheet of graph paper.

A shop buys x pencils and y pens.
Pencils cost 15 cents each and pens cost 25 cents each.

(a) There is a maximum of $20 to spend.
Show that $6x + 8y \leqslant 400$. [1]

(b) The number of pens must not be greater than the number of pencils.
Write down an inequality, in terms of x and y, to show this information. [2]

(c) There must be at least 35 pens.
Write down an inequality to show this information. [1]

(d) (i) Using a scale of 1 cm to represent 10 units on each axis, draw an *x*-axis for $0 \leqslant x \leqslant 150$ and a *y*-axis for $0 \leqslant y \leqslant 100$. [1]

(ii) Draw three lines on your graph to show the inequalities in **parts (a), (b) and (c).** Shade the **unwanted** regions. [5]

(e) When 70 pencils are bought, what is the largest possible number of pens? [1]

(f) The profit on each pencil is 5 cents and the profit on each pen is 7 cents. Find the largest possible profit. [3]