1. Shawna sells carnations for Mother's Day. She has two prices: a small one for 50¢ and a large one for $1. She knows that she will not be able to sell more than 100 carnations, including no more than 60 of the more expensive kind. She predicts that the number of sales of the small ones will not be more than double the number of the large ones. She wishes to sell at least $40 worth of flowers.

    She receives a commission of 10¢ on a small carnation and 25¢ on the larger one. How many of each kind must she sell to make the most money from commissions?

2. Mary's doctor recommended that she take a daily dose of at least 24 units of vitamin B_1 and at least 25 units of vitamin B_2. Unfortunately, these vitamins are not sold separately. The pharmacist sells them in pills and capsules: each pill contains 1 unit of B_1 and 5 units of B_2 while each capsule contains 4 units of B_1 and 1 unit of B_2.

    If each pill costs 1¢ and each capsule costs 3¢, how many pills and capsules must Mary take in order to minimize the cost of her daily dose?

3. Sean is an accountant for TN Mines Ltd. The company has recently received the following order: at least 100 tonnes of high grade mineral, 160 tonnes of medium grade and 200 tonnes of low grade. The daily production of the first mine is 1 tonne of high grade mineral, 2 tonnes of medium grade and 4 tonnes of low grade. The second mine produces 2 tonnes of each type of mineral daily. The first mine has expenses of $2500 per day for its mining operations and the second costs $2000 per day.

    How many days should each mine be in operation to fill this order at the lowest cost?

1. x: # of small carnations
y: # of large carnations

$$x + y \leq 100$$
$$y \leq 60$$
$$x \leq 2y$$
$$.5x + 1y \geq 40$$

$$C = .1x + .25y$$
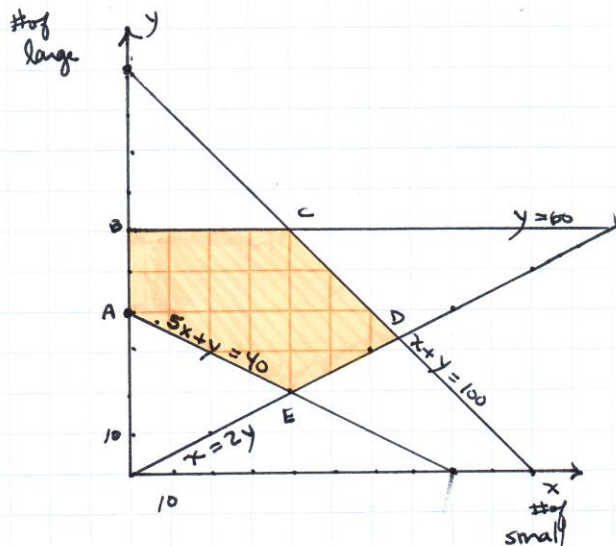
Vertices	$C = 0.1x + 0.25y$
A $(0, 40)$	\$ 10
B $(0, 60)$	15
C $(40, 60)$	19
D $(200/3, 100/3)$	15
E $(40, 20)$	9

D: $\quad x = 2y$
$\qquad \underline{x + y = 100}$
$\qquad 2x + y = 100$
$\qquad 3y = 100$
$\qquad y = \frac{100}{3}$
$\qquad x = 200/3$

Answer: 40 small carnations and 60 large carnations

2. x: # of pills
y: # of capsules

	B_1	B_2
Pills	x	$5x$
Capsules	$4y$	y
Dose	$24u$	$25u$

$$x \geq 0$$
$$y \geq 0$$
$$x + 4y \geq 24$$
$$5x + y \geq 25$$

$$C = 1x + 3y$$
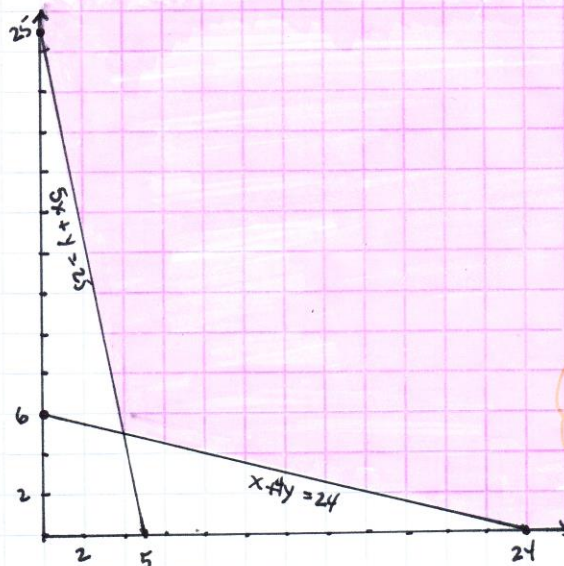
Answer:
4 pills & 5 capsules

$x + 4y = 24$
$\underline{5x + y = 25}$
$x + 4y = 24$
$\underline{-20x - 4y = -100}$
$-19x = -76$

$x = 4$
$20 + y = 25$
$y = 5$
check: $4 + 20 = 24$ ✓

Vertices	$C = x + 3y$
$(24, 0)$	24 ¢
$(4, 5)$	19
$(0, 25)$	75

3. x: # of days of operation of Mine 1
    y: # of days of operation of Mine 2

	Mine 1	Mine 2	Total
High Grade	x	$2y$	≥ 100
Medium Grade	$2x$	$2y$	≥ 160
Low Grade	$4x$	$2y$	≥ 200

$x \geq 0$
$y \geq 0$
$x + 2y \geq 100$
$2x + 2y \geq 160$
$4x + 2y \geq 200$

$$C = 2500x + 2000y$$

Vertices	$C = 2500x + 2000y$
A $(0, 100)$	\$ 200 000
B $(20, 60)$	170 000
C $(60, 20)$	190 000
D $(100, 0)$	250 000

Answer:
Mine 1 should operate for 20 days and Mine 2, for 60 days.