

Ch. 7.5 Word Problem Solutions

1. a) Expenses = \$1125

b) Profit interval \Rightarrow in terms of units sold:

$$10 < \text{units sold} < 90$$

c) Max profit = \$2000 (when 50 units sold)

2. $\frac{n(n+1)}{2} \geq 78$

$$n(n+1) \geq 156$$

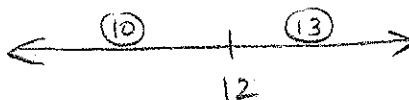
$$n^2 + n - 156 \geq 0$$

$$n^2 + n - 156 = 0$$

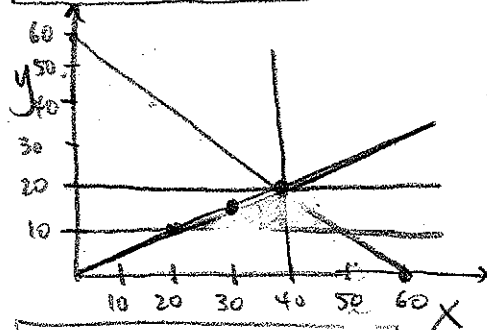
$$(n+13)(n-12) = 0$$

$$n = -13, 12$$

Test: 10: X
13: \checkmark



$$n \geq 12$$



$$y \leq -x + 60$$

$$y = \frac{1}{2}x$$

$$y \geq 10$$

$$y \leq 20$$

$$10 \leq y \leq 20$$

So ...

$$20 \leq x \leq 40$$

3. $2y = x$ $y = \frac{1}{2}x$

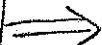
$$y \geq 10$$

$$x + y \leq 60$$

$$2y + y \leq 60$$

$$3y \leq 60$$

$$y \leq 20$$



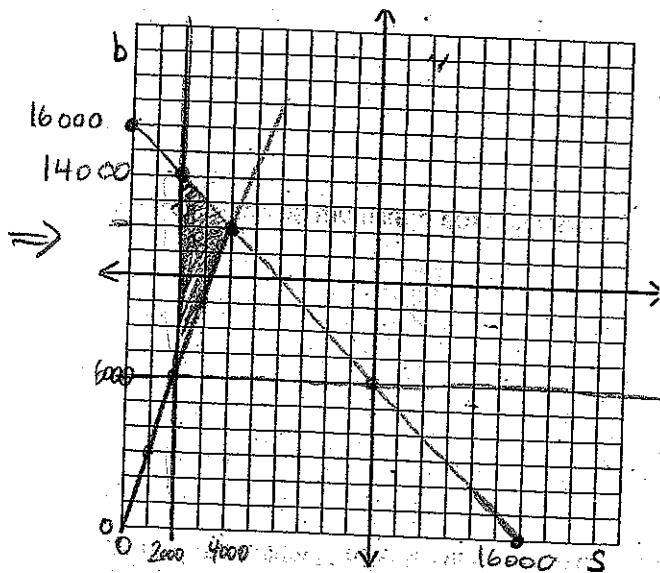
4. Let s = amt. invested in stocks
 let b = amt. invested in bonds

$$s + b \leq 16000$$

$$s \geq 2000$$

$$b \geq 3s$$

$$b \geq 6000$$



$$\left. \begin{array}{l} 2000 \leq s \leq 4000 \\ 6000 \leq b \leq 12000 \end{array} \right\} \begin{array}{l} \text{SUM of} \\ 16000 \text{ max.} \end{array}$$

5. Let t = # tables
 let c = # chairs

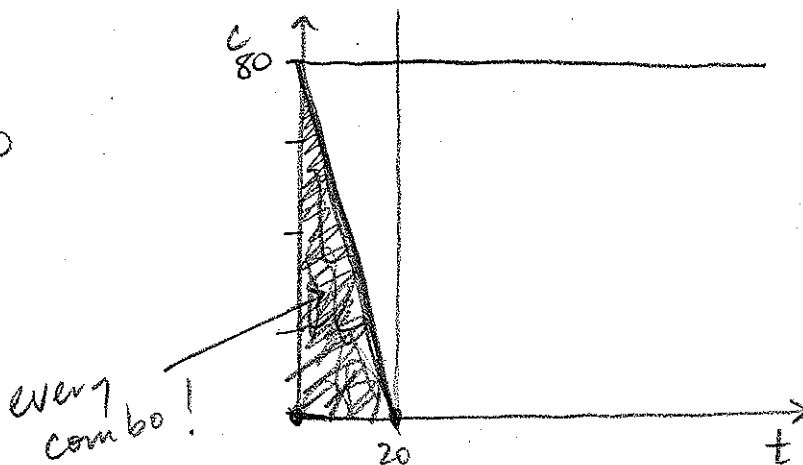
10 workers @ 40 hrs/week = 400 hours max./week

$$\frac{400 \text{ hours}}{20 \text{ hours/table}} = 20 \text{ tables max.} \rightarrow t \leq 20$$

$$\frac{400 \text{ hours}}{5 \text{ hours/chair}} = 80 \text{ chairs max.} \rightarrow c \leq 80$$

$$20t + 5c \leq 400$$

$$c \leq -4t + 80$$



6. Let c = # of cars
 Let t = # of trucks

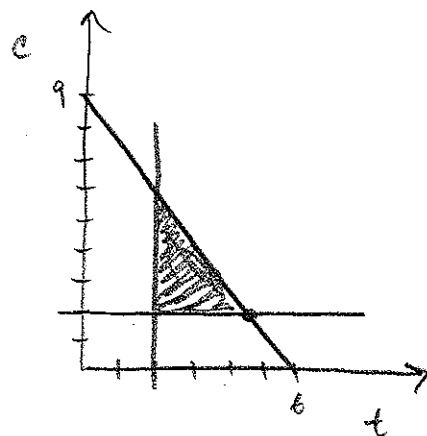
$$c \geq 2$$

$$t \geq 2$$

$$20000c + 30000t \leq 180000$$

$$20000c \leq -30000t + 180000$$

$$c \leq -\frac{3}{2}t + 9$$



7. $400x + 500y \leq 48000$

$$x + y = 100$$

Let $x = 0$

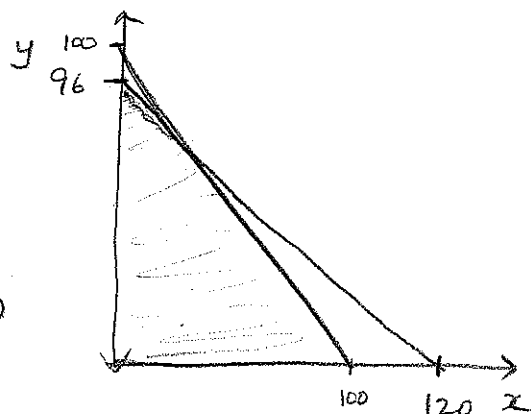
$$y \leq 96$$

Let $y = 0$

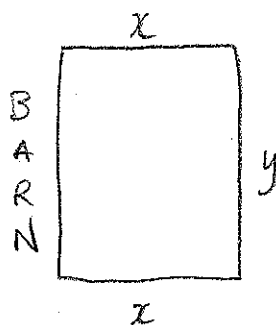
$$x \leq 120 \text{ (but, cannot be } > 100)$$

$$0 \leq y \leq 96$$

$$0 \leq x \leq 100$$



8.



Let x = width

$$2x + y = 120$$

$$xy \leq 1600$$

$$x(-2x + 120) \leq 1600$$

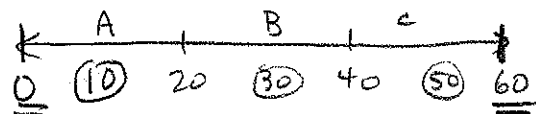
$$-2x^2 + 120x - 1600 \leq 0$$

$$x^2 - 60x + 800 \geq 0$$

$$(x - 20)(x - 40) = 0$$

$$x = 20, 40$$

$$y = -2x + 120$$



Test:

A: ✓

B: X

C: ✓

$$0 < x \leq 20$$

$$40 \leq x < 60$$

9. $N = 60T - T^2$

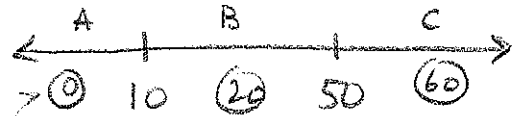
$60T - T^2 > 500$

$0 > T^2 - 60T + 500$

$T^2 - 60T + 500 < 0$

$(T - 50)(T - 10) = 0$

$T = 50, 10$



A: X

B: ✓

C: X

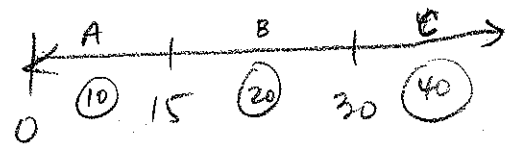
$10 < T < 50$

10. $-x^2 + 45x - 450 > 0$

$x^2 - 45x + 450 < 0$

$(x - 30)(x - 15) = 0$

$x = 30, 15$



A: X

B: ✓

C: X

$15 < x < 30$

11. $x^2 - 18x + 140 < 75$

$x^2 - 18x + 65 < 0$

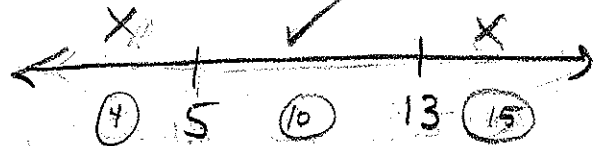
$(x - 13)(x - 5) < 0$

$x = 13, 5$

$x = 93 \pm \sqrt{93^2 - 4 \cdot 65}$

$x = 93 \pm \sqrt{93^2 - 260} = 13$

* MISTAKE



A: X

B: ✓

C: X

$6 \leq x \leq 12$

$5 < x < 13$

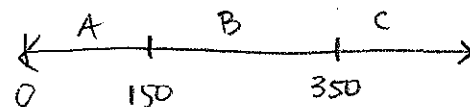
$$12) \quad -0.1x^2 + 50x - 5250 > 0$$

$$0.1x^2 - 50x + 5250 < 0$$

$$x^2 - 500x + 52500 < 0$$

$$(x - 350)(x - 150) = 0$$

$$x = 350, 150$$



A: X

B: ✓

C: X

$$150 < x < 350$$

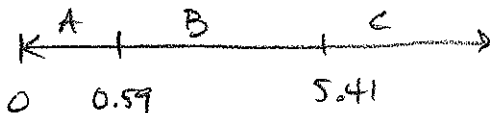
$$13. \quad -4.9t^2 + 29.4t + 24.3 > 40$$

$$-4.9t^2 + 29.4t - 15.7 > 0$$

$$4.9t^2 - 29.4t + 15.7 < 0$$

$$t^2 - 6t + 3.2 < 0$$

$$t = \frac{6 \pm \sqrt{36 - 12.8}}{2} = 0.59, 5.41$$



A: X

B: ✓

C: X

$$0.59 < t < 5.41$$

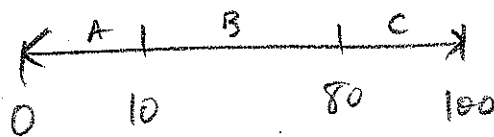
$$14. \quad \frac{1}{20}v^2 + \frac{9}{2}v \geq 40$$

$$\frac{1}{2}v^2 - \frac{9}{2}v + 40 \leq 0$$

$$v^2 - 90v + 800 \leq 0$$

$$(v - 80)(v - 10) = 0$$

$$v = 80, 10$$



A: X

B: ✓

C: X

$$10 \leq v \leq 80$$

$$15. \quad y = -0.0015x^2 + 0.5x \quad y = \frac{1}{8}x$$

SUBSTITUTE

parabola/line
intersection.

$$-0.0015x^2 + 0.5x = \frac{1}{8}x$$

$$0 = 0.0015x^2 - 0.375x$$

$$0 = x^2 - 250x$$

$$x(x - 250) = 0$$

$$x = 0, 250 \Rightarrow y = 31.25$$

starting
pt.

end
point

$$(250, 31.25)$$

16. a) $R = \text{Sales} \times \text{Cost}$

$$R = n(36 - 0.4n)$$

$$R = -0.4n^2 + 36n$$

b) $C = 100 + 20n$

c) $P = -0.4n^2 + 36n - (20n + 100)$

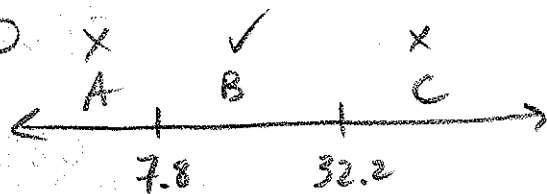
$$P = -0.4n^2 + 16n - 100$$

$$-0.4n^2 + 16n - 100 \geq 0$$

$$n^2 - 40n + 250 \leq 0$$

using Q. Formula:

$$n = 7.8, 32.2$$



$$8 < n < 32$$