<u>Solution Set 1</u>

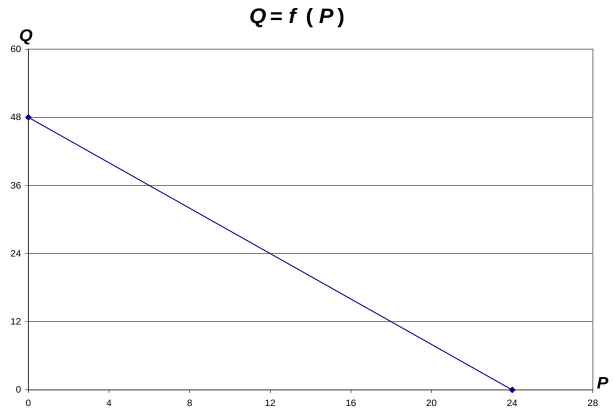
1. a) Choke price $Q = A - BP = 0$

$$BP = A$$

$$P = \frac{A}{B}$$

b) **Plot** $Q = 48 - 2P$

2 points P = 0 Q = 48
Q = 0 P = 24



c) $P = f(Q)$

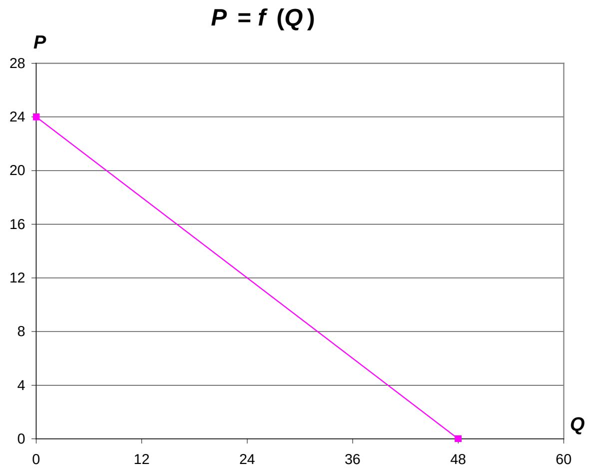
$$Q = A - BP$$

$$BP = A - Q$$

$$P = \frac{A}{B} - \frac{1}{B}Q$$

Plot $P = 24 - 0.5Q$

2 points Q = 0 P = 24
P = 0 Q = 48



2. We are given $C = aH + bA$

We also know that

Patient	**Days in Hospital (H)**	**Hours of Attention (A)**	**Total Bill (C)**
1	4	10	\$500
2	7	30	\$1125

Using the data on patient 1,

$$500 = 4a + 10b \Rightarrow a = \frac{500 - 10b}{4}$$

Using the data from patient 2,

$$7a + 30b = 1125$$

$$7(\frac{500 - 10b}{4}) + 30b = 1125$$ multiply both sides by 4

$$4\left[7(\frac{500 - 10b}{4}) + 30b\right] = [1125]4$$

$$7(500 - 10b) + 120b = 4500$$

$$3500 - 70b + 120b = 4500$$

$$50b = 1000$$

$$b = 20$$

Finally, $a = \frac{500 - 10b}{4} = \frac{500 - 10(20)}{4} = \frac{500 - 200}{4} = \frac{300}{4} = 75$

C = 75H + 20A

3. We want to solve for P_w and P_b if $D_w = S_w$ and $D_b = S_b$.
$S_w = D_w$ gives

$$50 + 20P_w - 5P_b = 50 - 10P_w + 5P_b$$

$$30P_w = 10P_b$$

$$3P_w = P_b$$

$D_b = S_b$ gives

$$400 + 10P_w - 10P_b = -10P_w + 10P_b$$

$$400 = -20P_w + 20P_b$$

$$400 = -20P_w + 20(3P_w)$$

$$400 = -20P_w + 60P_w$$

$$400 = 40P_w$$

$$P_w = 10$$

$$P_b = 3P_w = 3(10) = 30$$

4. $\text{P}_d = -(Q+4)^2 + 100 = -(Q^2 + 8Q + 16) + 100$

$\text{P}_d = -Q^2 - 8Q + 84$

$\text{P}_s = (Q+2)^2 = Q^2 + 4Q + 4$

Equilibrium when $\text{P}_d = P_s$

$-Q^2 - 8Q + 84 = Q^2 + 4Q + 4$

$2Q^2 + 12Q - 80 = 0$

$Q^2 + 6Q - 40 = 0$

a = 1
b = 6
c =-40

$$Q = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-6 \pm \sqrt{36 + 4_* 40}}{2} = \frac{-6 \pm \sqrt{196}}{2}$$

$Q_1 = \frac{-6+14}{2} = 4$ $\qquad$ $Q_2 = \frac{-6-14}{2} = -10$ impossible

Market equilibrium for Q = 4

$\text{P} = (Q+2)^2 = 6^2 = 36$

5. Price = f (demand) Express demand in hundreds

P = a + bD

140 = a + b*3

92 = a + b*11

Substract (2) from (1)

48 = -8b

$b = -\frac{48}{8} = -6$

replace b by –6 in (1)

140 = a + (-6) $_*$ 3 = a - 18

a = 140 + 18 = 158

P = 158 – 6 D

Price at a demand of 700 watches?

P = f(7) = 158 - 6 $_*$ 7 = 158 – 42 = 116

Price at a demand of 1200 watches

P = f(12) = 158 - 6 $_*$ 12 = 158 – 72 = 86

6. Let x = # of magazine units, and y = # of television units.
Budget = (a) (# magazine units) + (c) (# television units), or
$B = ax+cy$.

Recall the manager wants to buy twice as many television units as magazine units, i.e. wants y = 2x. Substituting,

$$\begin{aligned} B &= ax + c(2x) \\ &= x(a + 2c) \end{aligned}$$

$$x = \frac{B}{a + 2c}$$

7.

x	**y**
Activity level (units)	Total Production Cost (‘000s)
5000	100
40000	240

Linear equations can be written in the form $y = mx + b$

m = *slope* = $\dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{240\ 000 - 100\ 000}{40\ 000 - 5\ 000} = \dfrac{140\ 000}{35\ 000} = 4$***, so***

$y = 4x + b$

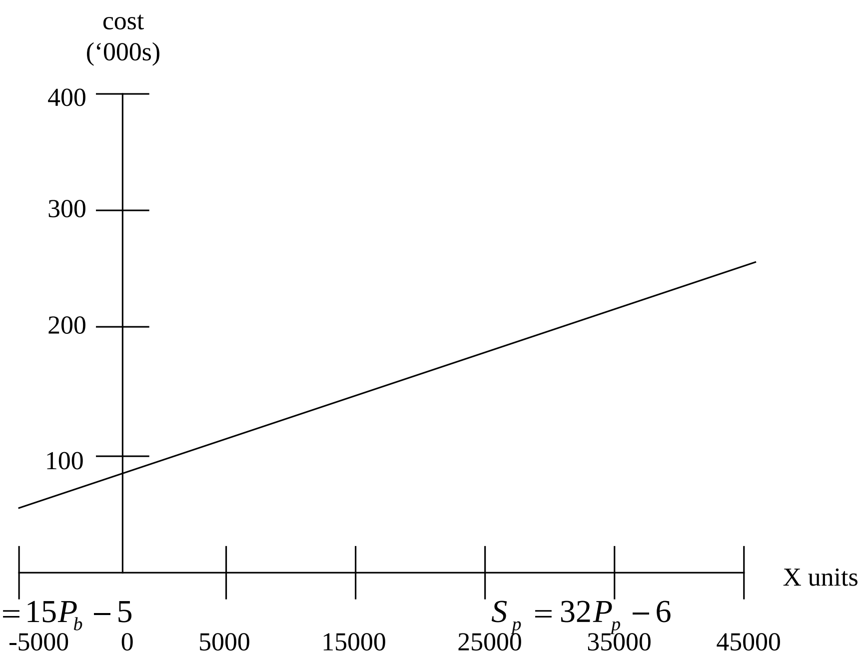
$b = y$ intercept = total cost when activity level = 0.

To find b, plug in known values for x and y and solve for b :

$b = y - 4x = 100\ 000 - 4(5\ 000) = 80\ 000$,

in other words, fixed cost = \$ 80 000

The equation of the line is $y = 4x + 80\ 000$, the corresponding graph is shown below



8.

$S_b = 15P_b - 5$	$S_p = 32P_p - 6$
$D_b = -3P_b + P_p + 82$	$D_p = 2P_b - 4P_p + 92$
$S_b = D_b$	$S_p = D_p$
$15P_b - 5 = -3P_b + P_p + 82$	$32p_p - 6 = 2P_b - 4P_p + 92$
$18P_b - P_p = 87$	$36P_p - 2P_b = 98$

$P_p = 18P_b - 87$

$36(18P_b - 87) - 2P_b = 98$

$648P_b - 3132 - 2P_b = 98$

$646P_b = 3230$

$P_b = 5$

$$P_p = 18(5) - 87 = 3$$

$$D_b = S_b = 15(5) - 5 = 70$$

$$D_p = S_p = 32(3) - 6 = 90$$

9. Demand function:

$$P = 1000 \quad Q = 10$$

$$P = 2000 \quad Q = 6$$

P is a linear function of Q

$$P = a + bQ$$

$$1000 = a + b * 10$$

$$2000 = a + b * 6$$

Subtract the first equation from the second

$$1000 = -4b$$

$$b = -\frac{1000}{4} = -250$$

$$a = 2000 - 6b = 2000 - 6 * (-250)$$

$$a = 2000 + 1500$$

$$a = 3500$$

Demand function $P = 3500 - 250Q$

Supply function $P = 500 + 125Q$

Market equilibrium: Supply = Demand

$$500 + 125Q = 3500 - 250Q$$

$$125Q + 250Q = 3500 - 500$$

$$375Q = 3000$$

$$Q = \frac{3000}{375} = 8$$

$$P = 500 + 125 * 8 = 1500$$

10. Let's use demand in thousands*:*

1. Price = f (demand)

$$P = 88 \qquad D = 2$$

$P = 38 \qquad D = 12$

$P = a + bD$

$88 = a + b * 2$

$38 = a + b * 12$

From the first equation

$a = 88 - 2b$

Report in the second equation

$38 = 88 - 2b + 12b$

$38 - 88 = 10b$

$\frac{-50}{10} = b$

$-5 = b$

$a = 88 - 2b = 88 - 2 * (-5) = 98$

So the price function is

$P = 98 - 5D$

If D = 8, $P(8) = 98 - 5 * 8 = 58$

If D = 15, $P(15) = 98 - 5 * 15 = 23$

2. Demand = f (price)

$D = 2 \qquad P = 88$

$D = 12 \qquad P = 38$

$D = a + bP$

$2 = a + b * 88$

$12 = a + b * 38$

$a = 2 - 88b$

$12 = 2 - 88b + 38b$

$12 - 2 = -50b$

$\frac{-10}{50} = b$

$-0.2 = b$

$a = 2 - 88b = 2 - 88 * (-0.2) = 2 + 17.6$

$a = 19.6$

$D = 19.6 - 0.2P$

If D = 8, $8 = 19.6 - 0.2P$

$0.2P = 11.6$

$$P = \frac{11.6}{0.2} = 58$$

If $D = 15$, $15 = 19.6 - 0.2P$

$$0.2P = 4.6$$

$$P = \frac{4.6}{0.2} = 23$$