

1. A certain machine can perform 34 chemical analyses per day, but a lab technician can perform only 7. Suppose a laboratory must make 110 analyses tomorrow and it has only two machines. How many technicians will be needed to complete the job?

- (a) 6
(b) 10
(c) 5
(d) 8
(e) 7

Number of Technicians = x

$$7x + 2(34) = 110$$

(correct)

$$7x = 110 - 68$$

$$x = \frac{42}{7} = 6$$

$$\boxed{x = 6}$$

2. An appliance company makes coffee makers for which the variable cost per unit is \$12 and the fixed cost is \$92,000. What should the selling price be for the company to earn a profit of \$88,000 on 10,000 units?

- (a) \$ 30
(b) \$ 300
(c) \$ 3000
(d) \$ 7000
(e) \$ 5000

$$\text{Total Cost} = 12(10,000) + 92,000$$

(correct)

$$\text{Total Selling Price} = 10,000x$$

$$\text{Profit} = \text{Selling Price} - \text{Cost}$$

$$88,000 = 10,000x - 120,000 - 92,000$$

$$10,000x = 300,000$$

$$x = \frac{300,000}{10,000} = 30$$

$$\boxed{x = 30}$$

3. A manufacturer has 4000 units of product x in stock and is now selling it at \$10 per unit. Next month the unit price will increase by \$2. The manufacturer wants the total revenue received from the sale of the 4000 units to be no less than \$45,000. What is the maximum number of units that can be sold this month?

- (a) 1500
 (b) 2500
 (c) 1000
 (d) 2000
 (e) 3000

$$\begin{aligned} \text{Number of unit sold this month} &= x \\ \text{" " " " next " } &= 4000 - x \end{aligned}$$

(correct)

$$\begin{aligned} \text{Revenue of this month} &= 10x \\ \text{" " next " } &= 12(4000 - x) \end{aligned}$$

$$10x + 12(4000 - x) \geq 45000$$

$$-2x \geq -3000$$

$$x \leq \frac{3000}{2} = 1500$$

$$x \leq 1500$$

4. A company manufactures water filters that cost \$15 for labor and material, plus \$50,000 in fixed costs. If they sell the water filter for \$20, at least how many must be sold to make a profit?

- (a) 10001
 (b) 10000
 (c) 8000
 (d) 2000
 (e) 25000

$$20x - [15x + 50000] > 0$$

$$5x > 50000$$

$$x > \frac{50,000}{5}$$

$$x > 10,000$$

(correct)

5. The slope of the line passing through the points $(4, 9)$ and $(6, k)$ is 5. Find k

- (a) 19
(b) -1
(c) -19
(d) 9
(e) 5

$$\frac{k-9}{6-4} = 5$$

(correct)

$$k-9 = 10$$

$$\boxed{k = 19}$$

6. Find a general linear equation of the line that passes through the points $(4, -3)$ and $(6, -7)$

- (a) $2x + y - 5 = 0$
(b) $5x + 2y = 0$
(c) $2x + y = 0$
(d) $x + 2y = 5$
(e) $2x + 2y = -5$

$$\frac{-7+3}{6-4} = -2$$

(correct)

$$y+3 = -2(x-4)$$

$$y+3 = -2x+8$$

$$\boxed{2x+y-5=0}$$

7. Suppose the variables q and p are linearly related such that $p = 3$ when $q = 20$, and $p = 5$ when $q = 15$. Find p when $q = 12$.

- (a) \$ 6.2
 (b) \$ 3.2
 (c) \$ 8
 (d) \$ 5.5
 (e) \$ 6

$$(20, 3) \text{ and } (15, 5)$$

$$(12, P)$$

(correct)

$$\text{Slope} = \frac{5-3}{15-20} = -\frac{2}{5}$$

$$p-3 = -\frac{2}{5}(12-20)$$

$$= -\frac{2}{5}(-8) = \frac{16}{5}$$

$$p = \frac{16}{5} + 3 = \frac{16+15}{5} = \frac{31}{5} = 6.2$$

8. Suppose that consumers will demand 800 units of a product when the price is \$10 per unit, and 1000 units when the price is \$8 per unit. Find the demand equation for the product assuming that price p and quantity q are linearly related.

- (a) $p = -\frac{1}{100}q + 18$
 (b) $p = -\frac{1}{100}q$
 (c) $p = \frac{1}{100}q - 18$
 (d) $p = \frac{-1}{100}q - 18$
 (e) $p = q + 18$

$$(800, 10), (1000, 8)$$

(correct)

$$\frac{8-10}{1000-800} = \frac{-2}{200} = -\frac{1}{100}$$

$$p-10 = -\frac{1}{100}(q-800)$$

$$p = -\frac{1}{100}q + 8 + 10$$

$$p = -\frac{1}{100}q + 18$$

9. The demand function for a manufacturer's product is $p = f(q) = 800 - 2q$, where p is the price (in dollars) per unit when q units are demanded (per week). Find the level of production that maximizes the manufacturer's total revenue. And what is maximum total revenue.

- (a) production level = 200 and maximum total revenue = 80000 (correct)
 (b) production level = 200 and maximum total revenue = 90000
 (c) production level = 200 and maximum total revenue = 85000
 (d) production level = 125 and maximum total revenue = 68750
 (e) production level = 175 and maximum total revenue = 78750

$$r = pq = (800 - 2q)q = 800q - 2q^2$$

$$\text{vertex} = \left(\frac{-b}{2a}, r\left(\frac{-b}{2a}\right) \right) \quad \text{so} \quad \frac{-b}{2a} = \frac{-(800)}{2(-2)}$$

$$= \frac{200}{1} = 200$$

10. The solution of following system:

$$\begin{cases} 3x - 4y = 18 \\ 2x + 5y = -11 \end{cases}$$

is

- (a) $x = 2, y = -3$
 (b) $x = 3, y = 2$
 (c) $x = 2, y = 2$
 (d) $x = -2, y = -2$
 (e) $x = -3, y = 2$

$$\begin{aligned} 2(3x - 4y) &= 2 \times 18 \\ 3(2x + 5y) &= -11 \times 3 \end{aligned}$$

(correct)

$$\begin{array}{r} 6x - 8y = 36 \\ -6x + 15y = -33 \\ \hline -23y = 69 \end{array}$$

$$y = -\frac{69}{23} = -3$$

$$3x - 4(-3) = 18$$

$$3x = 18 + 12 = 6$$

$$x = \frac{6}{3} = 2$$

$$\boxed{x = 2}$$

11. Solution of the system $\begin{cases} 12x - 6y = 7 \\ 2x + 9y = 20x + 3 \end{cases}$ is

- (a) no solution
 (b) $x = 0, y = 0$
 (c) $x = -1, y = 0$
 (d) $x = 0, y = -1$
 (e) $x = 1, y = 1$

$$\begin{aligned} 12x - 6y &= 7 & (i) \\ 18x - 9y &= -3 & (ii) \end{aligned}$$

(correct)

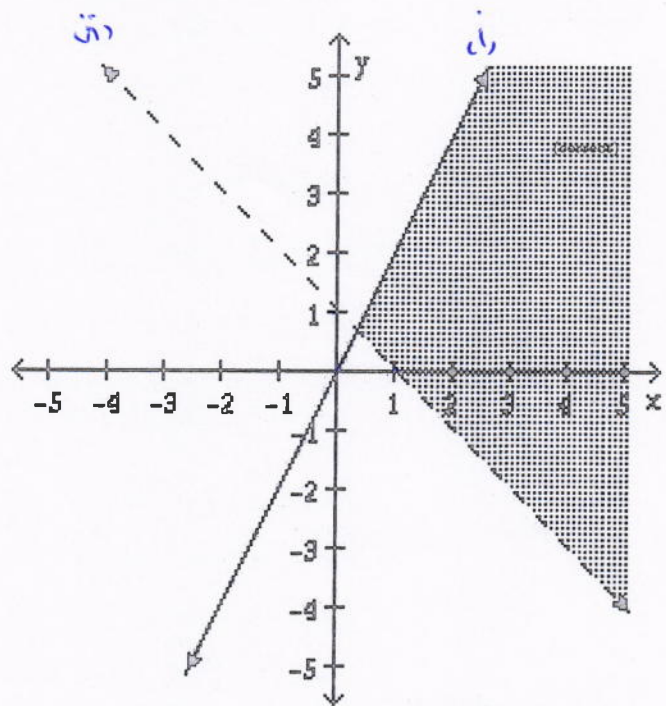
$$\begin{aligned} (i) \Rightarrow y &= \frac{1}{6}(12x - 7) \\ y &= 2x - \frac{7}{6} \end{aligned}$$

$$\begin{aligned} (ii) \Rightarrow y &= \frac{1}{9}(18x + 3) \\ y &= 2x + \frac{1}{3} \end{aligned}$$

Both Equations have same slope.
 So no solution.

12. The region indicated in the diagram is described by

- (a) $y \leq 2x, x + y > 1$
 (b) $y \geq 2x, x + y > 1$
 (c) $y \leq 2x, x + y \geq 1$
 (d) $y \leq 2x, x + y \leq 1$
 (e) $y < 2x, x + y > 1$



(i) $y = 2x$
 Test point $(1, 0)$ $0 < 2$
 $y \leq 2x$

(ii) $(1, 0), (0, 1)$

$$m = \frac{1-0}{0-1} = -1$$

$$y - 0 = -(x - 1)$$

$$y + x = 1$$

use $(0, 0)$ as test point

and $0 < 1$ region is shaded on other side

So $x + y > 1$

13. One solution of the system

$$\begin{cases} x - y^2 = 0 \\ 3x + 2y - 5 = 0 \end{cases} \longrightarrow x = y^2$$

is $x = 1$ and $y = 1$. Another solution is

(a) $x = \frac{25}{9}, y = -\frac{5}{3}$

(b) $x = \frac{9}{25}, y = -\frac{5}{3}$

(c) $x = 1, y = -1$

(d) $x = \frac{49}{2}, y = -\frac{7}{2}$

(e) $x = 0, y = 0$

$3(y^2) + 2y - 5 = 0$

$3y^2 + 5y - 3y - 5 = 0$

$y(3y+5) - 1(3y+5) = 0$

$(3y+5)(y-1) = 0$ (correct)

$y = -5/3, y = 1$

$x = (-5/3)^2$

$= \frac{25}{9}$

14. Suppose the supply and demand equations for a manufacturer's product are
- $p = \frac{3}{100}q + 6$
- and
- $p = -\frac{1}{50}q + 14$
- , respectively, where
- q
- represents number of units and
- p
- represents price per unit in dollars. If a tax of \$1.00 per unit is imposed on the manufacturer, then new equilibrium quantity and the new equilibrium price after imposing the tax is.

- (a) new equilibrium quantity 140 and new equilibrium price is \$11.20 (correct)

- (b) new equilibrium quantity 160 and new equilibrium price is \$10.8

- (c) new equilibrium quantity 140 and new equilibrium price is \$10.8

- (d) new equilibrium quantity 160 and new equilibrium price is \$11.20

- (e) new equilibrium quantity 150 and new equilibrium price is \$11.20

After tax,

$p = \frac{3}{100}q + 7$

Before tax

demand function

$p = -\frac{1}{50}q + 14$

$\frac{3}{100}q + 7 = -\frac{1}{50}q + 14$

$q = 140$

$$\begin{aligned} \text{Then } p &= \frac{3}{100}(140) + 7 \\ &= \frac{21}{5} + 7 = \frac{56}{5} \\ &= 11.20 \end{aligned}$$

15. Reducing $\begin{bmatrix} 2 & 2 & 4 \\ 1 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$ gives

(a) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & 0 & 3 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{bmatrix}$

(d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

(e) $\begin{bmatrix} 1 & 1 & 2 \\ 0 & 0 & 0 \\ 1 & 0 & 1 \end{bmatrix}$

$$\begin{bmatrix} 2 & 2 & 4 \\ 1 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$$

$$\frac{1}{2}R_1$$

(correct)

$$\begin{bmatrix} 1 & 1 & 2 \\ 1 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$$

$$R_2 - R_1$$

$$\begin{bmatrix} 1 & 1 & 2 \\ 0 & 0 & 0 \\ 0 & -1 & -1 \end{bmatrix}$$

$$R_3 - R_1$$

$$\begin{bmatrix} 1 & 1 & 2 \\ 0 & -1 & -1 \\ 0 & 0 & 0 \end{bmatrix}$$

$$R_{23}$$

$$\begin{bmatrix} 1 & 1 & 2 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{bmatrix}$$

$$-R_2$$

Q	MASTER	CODE01	CODE02	CODE03	CODE04
1	A	D	D	C	A
2	A	A	D	D	E
3	A	E	B	B	E
4	A	E	B	C	C
5	A	E	C	B	D
6	A	C	D	A	B
7	A	D	D	C	E
8	A	D	E	C	C
9	A	B	B	D	B
10	A	E	C	A	D
11	A	A	A	C	D
12	A	E	A	B	D
13	A	B	B	E	E
14	A	A	E	E	E
15	A	A	E	A	D