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?

Number of technicians $= x$

(a) 6 (correct)

(b) 10

(c) 5

(d) 8

(e) 7

$$7x + 2(34) = 110$$
$$7x = 110 - 68$$
$$x = \frac{42}{7} = 6$$
$$\boxed{x = 6}$$

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 (correct)

(b) \$ 300

(c) \$ 3000

(d) \$ 7000

(e) \$ 5000

Total Cost $= 12(10{,}000) + 92000$

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

Profit = Selling Price − Cost

$$88000 = 10{,}000x - 120{,}000 - 92000$$
$$10{,}000x = 300{,}000$$
$$x = \frac{300{,}000}{10{,}000} = 30$$
$$\boxed{x = 30}$$

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?

Number of unit Sold this month = x
" " " " next " = 4000 − x

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

revenue of this month = 10x
" " next " = 12(4000 − x)

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

$-2x \geq -3000$

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

$x \leq 1500$

4. A company manufacturers 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 (correct)
(b) 10000
(c) 8000
(d) 2000
(e) 25000

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

$5x > 50000$

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

$x > 10,000$

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 $q = 12$.

(20, 3) and (15, 5)

(12, P)

(a) \$ 6.2 (correct)

(b) \$ 3.2

(c) \$ 8

(d) \$ 5.5

(e) \$ 6

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.

(800, 10), (1000, 8)

(a) $p = -\frac{1}{100}q + 18$ (correct)

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

(c) $p = \frac{1}{100}q - 18$

(d) $p = \frac{-1}{100}q - 18$

(e) $p = q + 18$

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

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

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

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

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

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

vertex $= \left(\frac{-b}{2a}, r\left(\frac{-b}{2a}\right)\right)$ So $\frac{-b}{2a} = -\frac{(800)}{2(-2)} = 200$

$800(200) - 2(200)^2 = 80000$

10. The solution of following system:

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

is

$2(3x - 4y) = 2 \times 18$

$3(2x + 5y) = -11 \times 3$

(a) $x = 2,\ y = -3$ (correct)

(b) $x = 3,\ y = 2$

(c) $x = 2,\ y = 2$

(d) $x = -2,\ y = -2$

(e) $x = -3,\ y = 2$

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

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

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

$3x = 18 - 12 = 6$

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

$\boxed{x = 2}$

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

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

$12x - 6y = 7$ (i)
$18x - 9y = -3$ (ii)

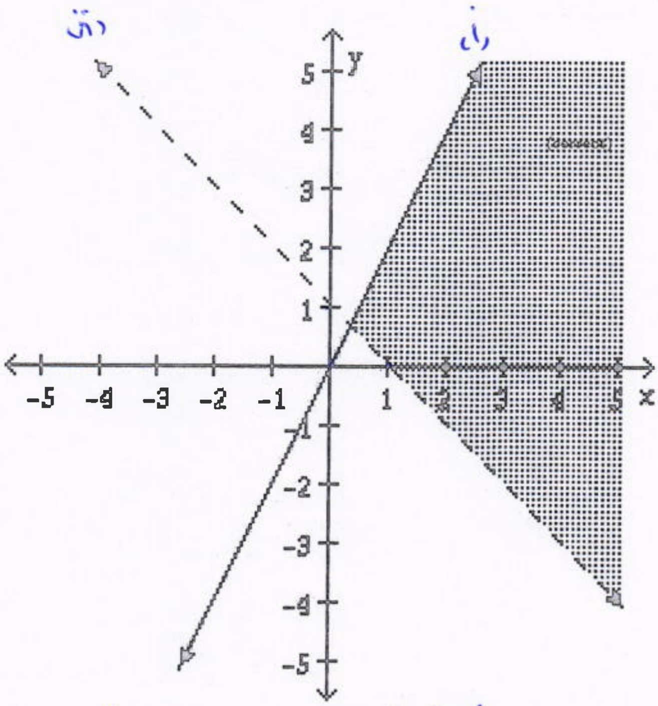
(i) $\Rightarrow y = \frac{1}{6}(12x - 7)$
$y = 2x - 7/2$

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

Both Equations have same Slop. So no Solution.

12. The region indicated in the diagram is described by

(a) $y \le 2x, \ x + y > 1$
(b) $y \ge 2x, \ x + y > 1$
(c) $y \le 2x, \ x + y \ge 1$
(d) $y \le 2x, \ x + y \le 1$
(e) $y < 2x, \ x + y > 1$



(i) $y = 2x$

Test point $(1,0)$ $0 < 2$

$y \le 2x$

(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

$0 < 1$

and region is Shaded on other side

So $x + y > 1$

13. One solution of the system

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

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

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

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

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

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

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

$x = y^2$

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

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

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

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

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

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

$= \frac{25}{9}$

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,

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

Befor tax demand function

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

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

$q = 140$

Then $p = \frac{3}{100}(140) + 7$

$= \frac{21}{5} + 7 = \frac{56}{5}$

$= 11.20$

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

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

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

$\begin{bmatrix} 2 & 2 & 4 \\ 1 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$ $\frac{1}{2}R_1$

$\begin{bmatrix} 1 & 1 & 2 \\ 1 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$ $R_2 - R_1$

$\begin{bmatrix} 1 & 1 & 2 \\ 0 & 0 & 0 \\ 0 & -1 & -1 \end{bmatrix}$ $R_3 - R_1$

$\begin{bmatrix} 1 & 1 & 2 \\ 0 & -1 & -1 \\ 0 & 0 & 0 \end{bmatrix}$ R_{23}

$\begin{pmatrix} 1 & 1 & 2 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{pmatrix}$ $-R_2$

Answer KEY

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