# Algebra Book Answers

## 17 simultaneous linear equations

1. a) $y = 5 \rightarrow (1)$

$y = 2x - 3 \rightarrow (2)$

substitube by (1) in (2):

$5 = 2x - 3$

$2x = 5 + 3 = 8$

$x = 4$

point p (4, 5)

b) $x + y = 7$

$x - y = -3$

by adding the 2 equations

$2x = 7 - 3$

$2x = 4 \quad \div 2$

$x = 2$

to get y-coordinate, put $x = 2$ in any equation

$x + y = 7$

$2 + y = 7 \rightarrow y = 5$

$x = 2$

$y = 5$

2. $x + y = 7$

$+ \; 2x - y = 2$

$3x = 9 \quad \div 3$

$x = 3$

by putting $x = 3$ in 1st equ.

$3 + y = 7$

$y = 4$

$x = 3$

$y = 4$

3. $4x + 5y = 13 \rightarrow (1)$

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

$-5x - 5y = -15 \rightarrow (3)$

adding equ. (1) and (3)

$-x = -2 \quad \div (-1)$

$x = 2$

to get y:

$x + y = 3$

$2 + y = 3$

$y = 3 - 2$

$y = 1$

$x = 2$

$y = 1$

4. $(4t - r) = 13$

$+ \; (2t + r) = 2$

5. $3x + 7y = 18 \rightarrow (1)$

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

$-3x - 6y = -15 \rightarrow (3)$

by adding (1) and (3)

$0 + 1y = 18 - 15$

$y = 3$

to get $x$, put $y = 3$ in any equation:

$x + 2(3) = 5$

$x + 6 = 5$

$x = 5 - 6$

$x = -1$

$x = -1$
$y = 3$

6. $4x + 3y = 21 \rightarrow (1)$

$2x + y = 8 \rightarrow (2) \times(2)$

$4x + 2y = 16 \rightarrow (3)$

by subtracting (3) from (1)

$$\begin{array}{r} 4x + 3y = 21 \\ -\ 4x + 2y = 16 \\ \hline 0 + y = 5 \end{array}$$

to get $x$:

$4x + 3(5) = 21$

$4x + 15 = 21$

$4x = 21 - 15$

$4x = 6 \quad \div 4$

$x = \frac{6}{4}$ or $1.5$

$x = 1.5$
$y = 5$

7. a) Length $= 6 - 2 = 4$

Width $= 4 - 3 = 1$

perimeter $= 2(4 + 1) = 10$

b) $$\begin{array}{r} y = 4x - 10 \\ +\ y = -4x + 18 \\ \hline 2y = 0 + 8 \quad \div 2 \end{array}$$

$y = 4$

to get $x$:

$4 = 4x - 10$

$4x = 10 + 4$

$4x = 14 \quad \div 4$

$x = \frac{14}{4}$ or $3.5$

They intersect at $(3.5, 4)$

8. $5x+3y=60 \rightarrow (1)$

$x+9y=60 \quad \times(5)$

$5x+45y=300 \rightarrow (3)$

by subtracting (3) from (1)

$$0-42y=240$$

$$-42y=240 \quad \div(-42)$$

$$y=\frac{40}{7} \simeq 5.7$$

to get $x$ : (subs. in equ. (1))

$$5x+3\left(\frac{40}{7}\right)=60$$

$$5x=60-3\left(\frac{40}{7}\right)$$

$$5x=\frac{300}{7} \quad \div 5$$

$$x=\frac{60}{7} \simeq 8.6$$

$x=\frac{60}{7} \simeq 8.6$ (rounded)

$y=\frac{40}{7} \simeq 5.7$ (rounded)

9. $y=3x \rightarrow (1)$

$y=x+4 \rightarrow (2)$

by substituting equ (1) in equ (2)

$$3x=x+4$$

$$3x-x=4$$

$$2x=4 \rightarrow x=2$$

to get $y$ :

$y=3x$ $\quad x=2$

$y=3(2)$ $\quad y=6$

$y=6$

10. $2x+y=28 \rightarrow (1)$

$-x+4y=22 \quad (\times 2)$

$-2x+8y=44 \rightarrow (3)$

by adding (1) and (3)

$$0+9y=28+44$$

$$9y=72 \quad \div 9$$

$$y=8$$

to get $x$, put $y=8$ in equation (1)

$$2x+8=28$$

$$2x=28-8$$

$$2x=20 \quad \div 2$$

$$x=10$$

$x=10$

$y=8$

11. $x+y=7 \rightarrow (1) \times (2)$

$-2x+y=-8 \rightarrow (2)$

$2x+2y=14 \rightarrow (3)$

by adding (2) and (3)

$0+3y=-8+14$

$3y=6 \div 3$

$y=2$

to get $x$, put $y=2$ in equ. (1)

$x+2=7$

$x=7-2=5$

$x=5$

$y=2$

12. $y=2 \rightarrow (1)$

$y=2x-3 \rightarrow (2)$

by substituting (1) in (2)

$2=2x-3$

$2x=2+3$

$2x=5 \div 2$

$x=\frac{5}{2}$ or $2.5$

$p(2.5, 2)$

13. $y=3x+15 \rightarrow (1)$

$2x+y=0 \rightarrow (2)$

$-3x+y=15 \rightarrow (3)$

by subtracting (3) from (2)

$5x+0=-15$

$5x=-15 \div 5$

$x=-3$

to get $y$, put $x=-3$ in equation (1):

$y=3(-3)+15$

$y=-9+15$

$y=6$

$x=-3$

$y=6$

"Hana is correct"

14. $6(e-2) = f+7 \longrightarrow (1)$

$2a - b = 15 \longrightarrow (2)$

$3c + 2d = 32 \longrightarrow (3)$

$a = 3b \longrightarrow (4)$

$3c - d = 2 \longrightarrow (5)$

$3f - 6e = 3 \longrightarrow (6)$

solving (2) and (4)

$a = 3b$

$2a - b = 15$

$2(3b) - b = 15$

$6b - b = 15$

$5b = 15$

$\boxed{b = 3} \rightarrow \boxed{a = 3(3) = 9}$

solving (1) and (6)

$6e - 12 = f + 7$

$3f - 6e = 3$

$6e - f = 7 + 12$

$-6e + 3f = 3$

$(-1+3)f = 19 + 3$

$2f = 22$

$\boxed{f = 11}$ (get e)

solving (3) and (5)

$3c + 2d = 32$

$3c - d = 2$

$(2 - -1)d = 32 - 2$

$3d = 30$

$\boxed{d = 10} \longrightarrow$ get c

at $d = 10 \longrightarrow 3c + 2(10) = 32$

$3c = 32 - 20$

$3c = 12$

$\boxed{c = 4}$

$3(11) - 6e = 3$

$33 - 3 = 6e$

$6e = 30 \rightarrow \boxed{e = 5}$

a) mean $= \dfrac{a+b+c+d+e+f}{6}$

$= \dfrac{3+9+10+4+11+5}{6} = \underline{\underline{7}}$

b) Range $= f - b$

$= 11 - 3 = \underline{\underline{8}}$

(62)

15. $11 = 6 + a \longrightarrow \boxed{a = 11 - 6 = 5}$

$a + 7 = 10 + b$

- $(5) + 7 = 10 + b \longrightarrow 10 + b = 12 - 10$

$\boxed{b = 2}$

16. a) $x - y = 40$

$y = 2x$

$x - 2x = 40$

$-x = 40 \longrightarrow \boxed{x = -40}$ (refused) (-ve number)

at $x = -40 \longrightarrow 40 - y = 40$

$\boxed{y = 0}$

so,

$y - x = 40$

$y = 2x$

$2x - x = 40$

$\boxed{x = 40}$

at $x = 40 \longrightarrow \boxed{y = 2(40) = 80}$

b) $x + y = 30$

$y = x + 50\% x$

$= 1.5x$

- $x + 1.5x = 30$

$2.5x = 30\longrightarrow \boxed{x = 12}$ (GH)

$12 + y = 30$

$y = 30 - 12$

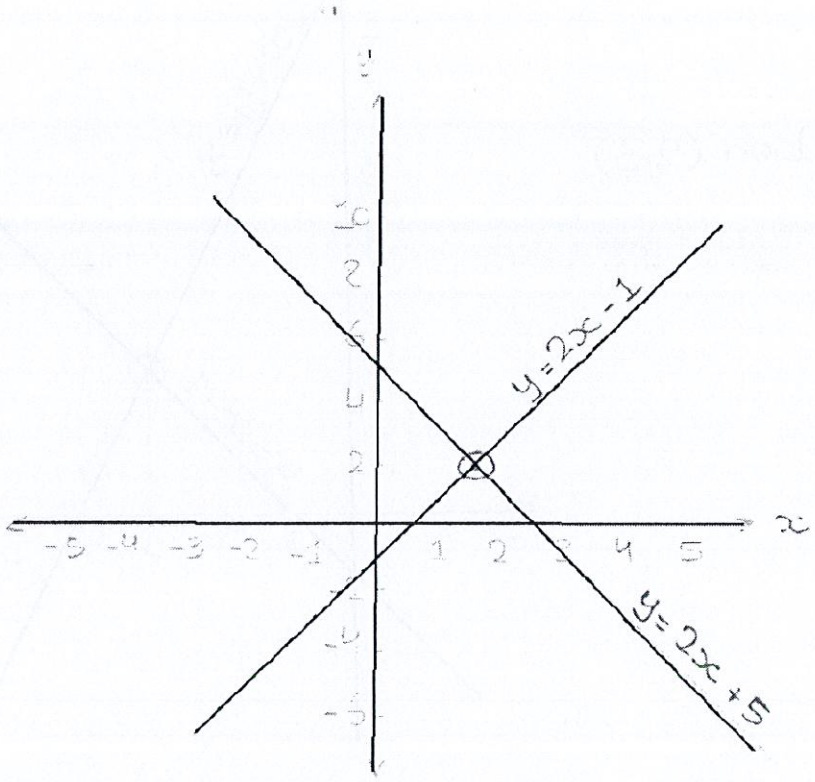
$\boxed{y = 18}$

## 18. Solving simultaneous equations graphically

1. $x = 4$
   $y = 3$

"The intersection point between the two lines is the solution of the two lines graphically"

2.




| $x$ | -1 | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| $y$ | -3 | -1 | 1 | 3 | 5 | 7 |

c) $x = 1.5$
$y = 2$

$y = 2x - 1$

at $x = -1$, $y = (-1) \times 2 - 1 = -3$

$x = 1$, $y = 2(1) - 1 = 1$

$x = 4$, $y = 2(4) - 1 = 7$

(05)

3. Point of intersection is the solution of the 2 equations simultaneously which is (2,3)

$x = 2$
$y = 3$

4. $x = 3$
$y = 3$

5. Point of intersection (2,3)

$by = \frac{1}{2}x + 2$

$b(3) = \frac{1}{2}(2) + 2$

$3b = 1 + 2$

$3b = 3 \quad \div 3$

$b = 1 \longrightarrow (1)$

$ay + 3x = 12$

$a(3) + 3(2) = 12$

$3a + 6 = 12$

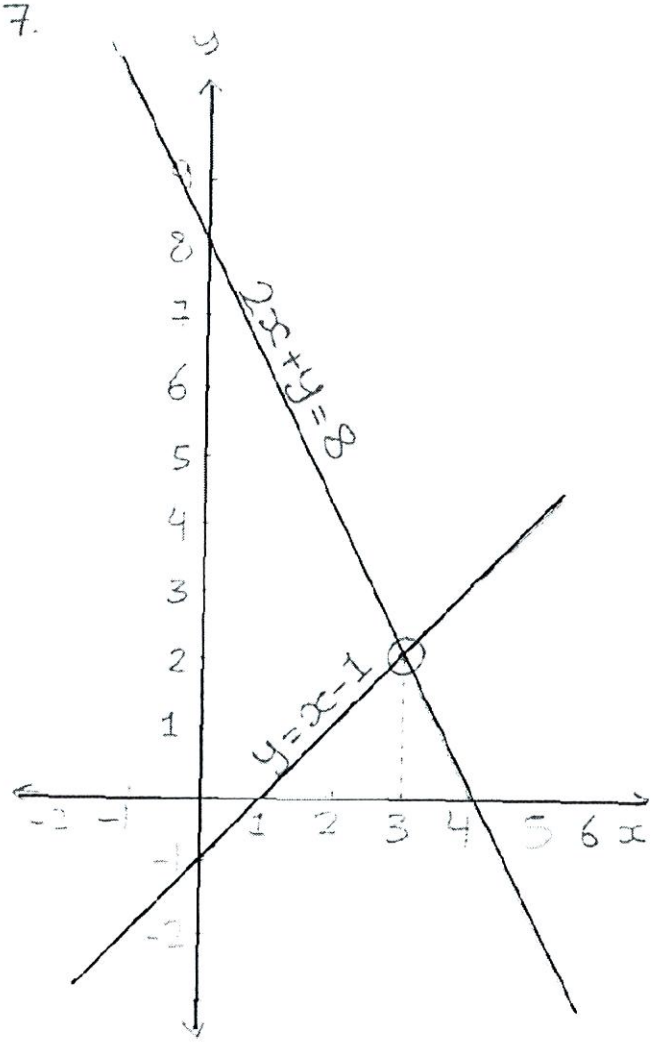
$3a = 12 - 6$

$3a = 6 \quad \div 3$

$a = 2 \longrightarrow (2)$

6. $x = 2$
$y = 5$

7.




$x = 3$
$y = 2$

8. $x = 2.7$
$y = 16.7$
"Approximate Values"

or

$x = 3$
$y = 17$

9. A, B | B, C
A, C | C, D
A, D

• 5 pairs of simultaneous equations can be solved

10. $y = 2x + 1 \longrightarrow A$

$x + y = 4 \longrightarrow B$

$2y = x - 1 \longrightarrow C$

$x + y + 2 = 0 \longrightarrow D$

A, B | B, C
A, C | C, D
A, D

• 5 pairs

11. a) 10 dollars

b) 5 dollars

c) 30 minutes

d) 5 dollars

e) 20 minutes

f) (20, 15)

g) T → (0 to 20 minutes)
best value

S → (20 to 40 minutes)
best value

• It depends on how much time I will spend on my calls if my calls are less than 20 minutes, I will use company T. If my calls are more than 20 minutes, I will use company S