SIMULTANEOUS EQUATIONS - Worksheet

Equations such as (1) $X + Y = 9$ or (2) $Y = 2X$ can be used to represent a relationship between two unknown quantities.

The first states that the 2 unknown amounts add together to give a total of 9. The second states that one number (amount) is double the other one.

Each equation by itself has insufficient information to determine their values. However if both equations are known to be true (simultaneously) then we CAN find both values (we need 2 clues to find 2 unknowns).

We could try to guess them by continuing to choose numbers which satisfy one of the equations, then see if they work in the other one. But this becomes more difficult when the equations become more complex.

The albegraic method involves basically finding a way to combine the two equations into one, in some way that will elliminate one of the two unknowns, leaving just ONE equation with just ONE unknown amount! - the type of equation we are used to solving.

Example1:-

If you were told $x=5$

& $Y=3X$

you would simply replace the "X" in the 2nd equation with "5"

Thus it becomes:-

$Y = 3 \times 5$

so $Y = 15$

and we knew $X = 5$ already.

Example2:-

For the example above: $X + Y = 9$

& $Y = 2X$

you would replace "Y" in the 1st equation with "2X"

Thus the 1st equation becomes:

$X + (2X) = 9$

ie. $3X = 9$

so $X = 3$

But we know that "Y" is twice "X"

so... $Y = 2 \times (3)$

ie $Y = 6$

Example 3:-

Given: $Y = (5X + 13)$

$\Downarrow$

and $2X + 3Y + 12 = 0$

then $2X + 3(5X+13) + 12 = 0$

ie. $2X + 15X + 39 + 12 = 0$

then $17X = -51$

so $X = -3$

Substitute $X=-3$ into 1st equ^{n}.

thus $Y = 5(-3) + 13$

so $Y = -2$

Example 4:-

Given: $4X - Y = 5$

and $X + 2Y = 8$

Re-arrange the 1st equation to:-

$Y = 4X - 5$

and substitute this into the 2nd.

Thus $X + 2(4X-5) = 8$

or $X + 8X - 10 = 8$

so $9X = 18$

ie. $X = 2$

Substitute $X=2$ into $Y = 4X - 5$

then $Y = 4(2) - 5$

so $Y = 3$

LESSON (18) — HW

(A) Solve simultaneously:- using "Substitution" method.

(i) $y = x$ —— (1)
$y = 3x - 4$ —— (2)

(ii) $y = 5x + 6$ —— (1)
$y = 2x$ —— (2)

(iii) $y = 2x + 1$ —— (1)
$x + 2y = 17$ —— (2)

** (iv) $y = \frac{x+1}{2}$ —— (1)
$2x - y = 7$ —— (2)

(B) Solve simultaneously — using "elimination" method

(i) $x + y = 3$ —(1)
$3x - y = 1$ —(2)

(ii) $5x - 2y = 11$ —(1)
$x + y = 5$ —(2)

(iii) $1.5x - 0.8y = 3$ —(1)
$0.5x + 1.6y = 2.4$ —(2)

(C) (i) Sketch the functions

$x^2 + y^2 = 25$
$y = x - 1$
on the same number plane,

Solve these 2 equations simultaneously to find their point(s) of intersection.