Example 5 Solve the simultaneous equations:

$$\begin{cases} 2x + 3y = 3 & \ldots\ldots\ldots\ldots\ldots \text{(i)} \\ x - 2y = 12 & \ldots\ldots\ldots\ldots\ldots \text{(ii)} \end{cases}$$

Solution [If we multiply equation **(ii)** by 2 (i.e. each term on both sides of equation **(ii)** is multiplied by 2) and subtract the result from equation **(i)**, the term in x will be eliminated.]

In order to eliminate one of the unknowns by addition or subtraction we must make the coefficients of the unknown in the two equations equal in magnitude. Note that the solution is not affected by multiplying the equation by a non-zero constant.

(i)	$2x + 3y = 3$	
(ii) $\times 2$	$2x - 4y = 24$	$\ldots\ldots\ldots$ **(iii)**
(i) – (iii)	$7y = -21$	
	$y = -3$	

Substitute $y = -3$ into **(i)**, we have

$$\begin{aligned} 2x + 3(-3) &= 3 \\ 2x &= 12 \\ x &= 6 \end{aligned}$$

$\therefore$ The solution is $x = 6$, $y = -3$.

The check is left to the students.

Note : If you start solving the simultaneous equations by eliminating y first, then you may multiply equation **(i)** by 2 and equation **(ii)** by 3 and add the two equations together.

i.e.

(i) $\times 2$	$4x + 6y = 6$	$\ldots\ldots$ **(iii)**
(ii) $\times 3$	$3x - 6y = 36$	$\ldots\ldots$ **(iv)**
(iii) + (iv)	$7x = 42$	
	$x = 6$	

The value of y can then be easily obtained.