

# 9TH GRADE

# Notes & Activity

Topic :

ALGEBRA

Sub-Topic:

**SIMULTANEOUS LINEAR EQUATIONS -  
GRAPHICAL METHOD**

Consider the following two equations which contain the unknowns  $x$  and  $y$ .

$$x + y = 8 \quad \dots(1)$$

$$x - y = 2 \quad \dots(2)$$

If we determine the values of  $x$  and  $y$  such that equations (1) and (2) hold true, then the two equations are called simultaneous equations as they are considered together.

Simultaneous equations are solved approximately using the graphical method or exactly using an algebraic method.

## The Graphical Method

The graphical solution of linear simultaneous equations is the point of intersection found by drawing the two linear equations on the same axes.

### Example 1

Solve the following simultaneous equations graphically.

$$x + y = 8$$

$$x - y = 2$$

**Solution:**

The graphical solution of the simultaneous equations

$$x + y = 8 \text{ and } x - y = 2$$

is given by the point of intersection of the linear equations.

Consider  $x + y = 8$ .

x-intercept: When  $y = 0$ ,  $x = 8$

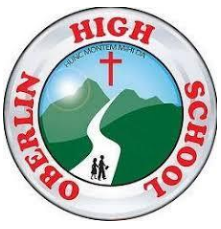
y-intercept: When  $x = 0$ ,  $y = 8$

Consider  $x - y = 2$ .

x-intercept: When  $y = 0$ ,  $x = 2$

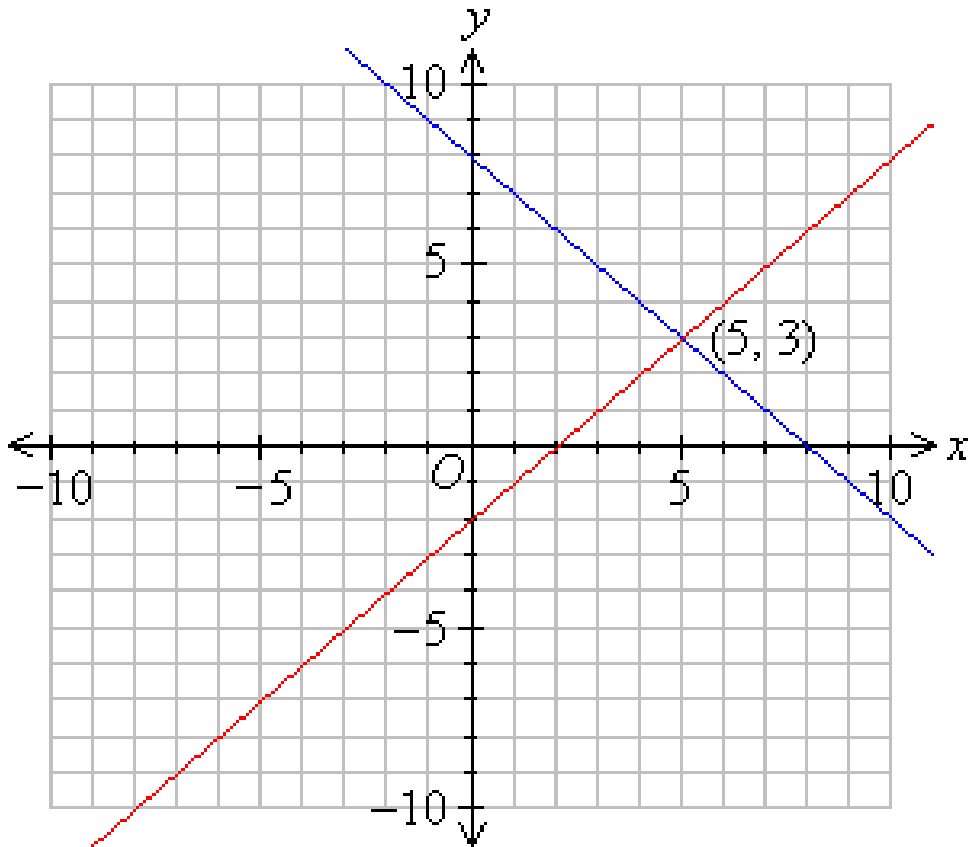
y-intercept:

$$\begin{aligned} \text{When } x = 0, -y &= 2 \\ \therefore y &= -2 \end{aligned}$$



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The diagram shows that the lines intersect at the point  $(5, 3)$ . So, the solution of the simultaneous equations is  $x = 5$  and  $y = 3$  or  $(5, 3)$

**Note:** Often the answer obtained with the graphical method is not exact.

## Example 2

The **graphical solution** of the simultaneous equations

$$y - 3x = 0 \text{ and } x + y = 8$$

is given by the point of intersection of the graphs.

Consider the graph of

$$y - 3x = 0$$

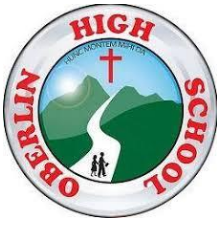
That is,  $y = 3x$

It passes through the origin  $(0, 0)$  and the point  $(1, 3)$ .

Consider the graph of  $x + y = 8$ .

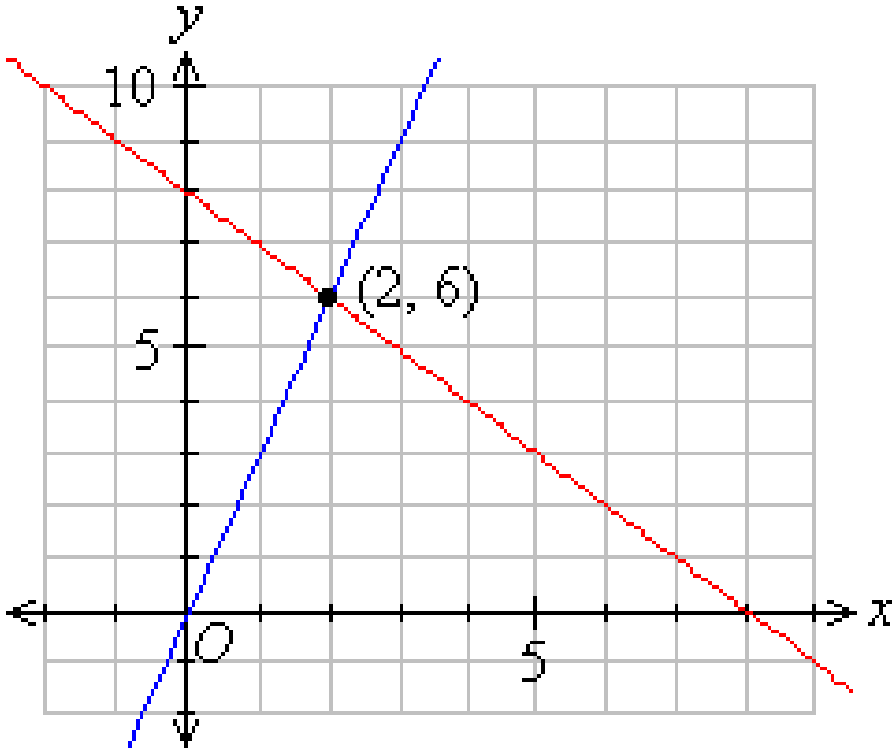
x-intercept: When  $y = 0$ ,  $x = 8$ .

y-intercept: When  $x = 0$ ,  $y = 8$ .



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The lines intersect at  $(2, 6)$ . So, the solution is  $(2, 6)$  as shown in the diagram.

## WORKSHEET

Practice the questions given in the activity on graphing simultaneous equations.

**1. Draw the graph of the following simultaneous linear equations and solve them graphically.**

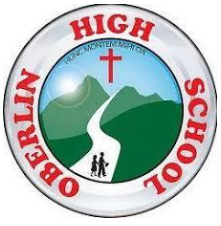
(i)  $x + y = 5$  and  $x - y = 1$

(ii)  $x + y = 0$  and  $2x - y = 9$

(iii)  $x = y + 6$  and  $y = 2x - 3$

**2. (a) Solve the following system of linear equations graphically  $2x + y - 5 = 0$  and  $x + y - 3 = 0$ .**

**(b) Also find the points where the graph lines meet the y-axis.**



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