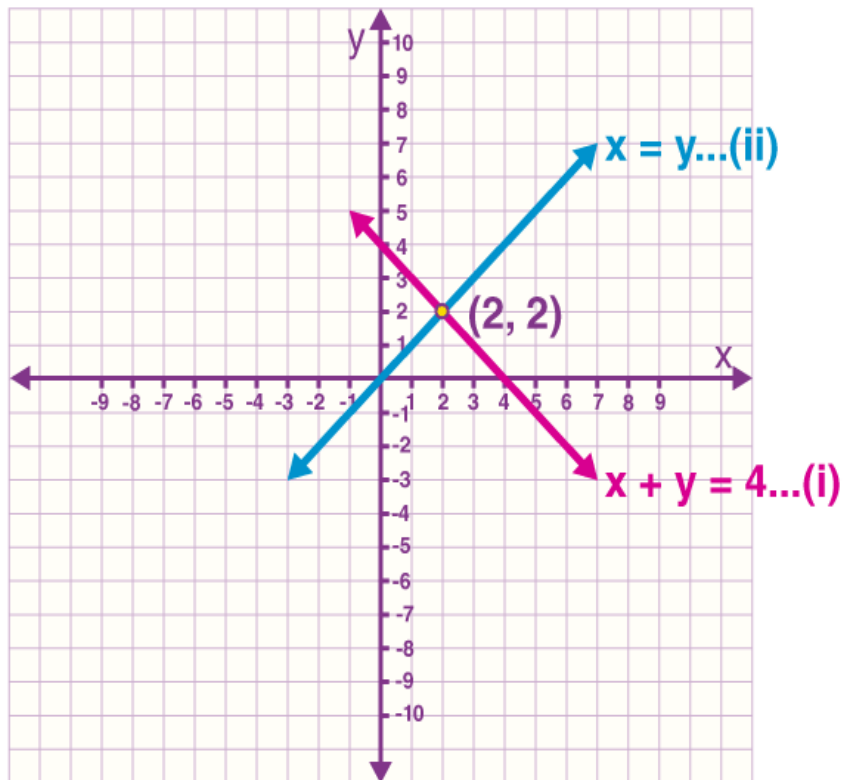


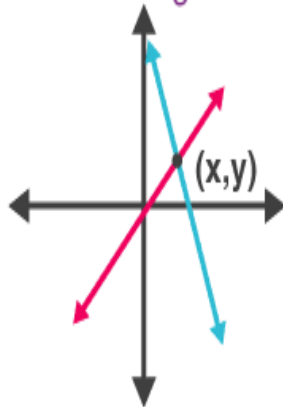


Parallel lines



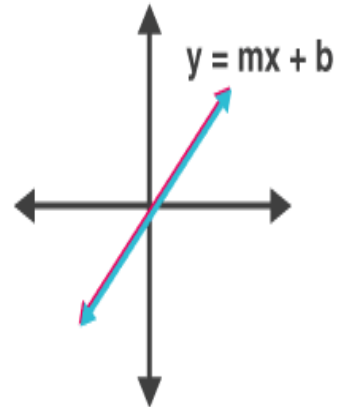
No points in common
Solution ; $\emptyset$

Intersecting lines

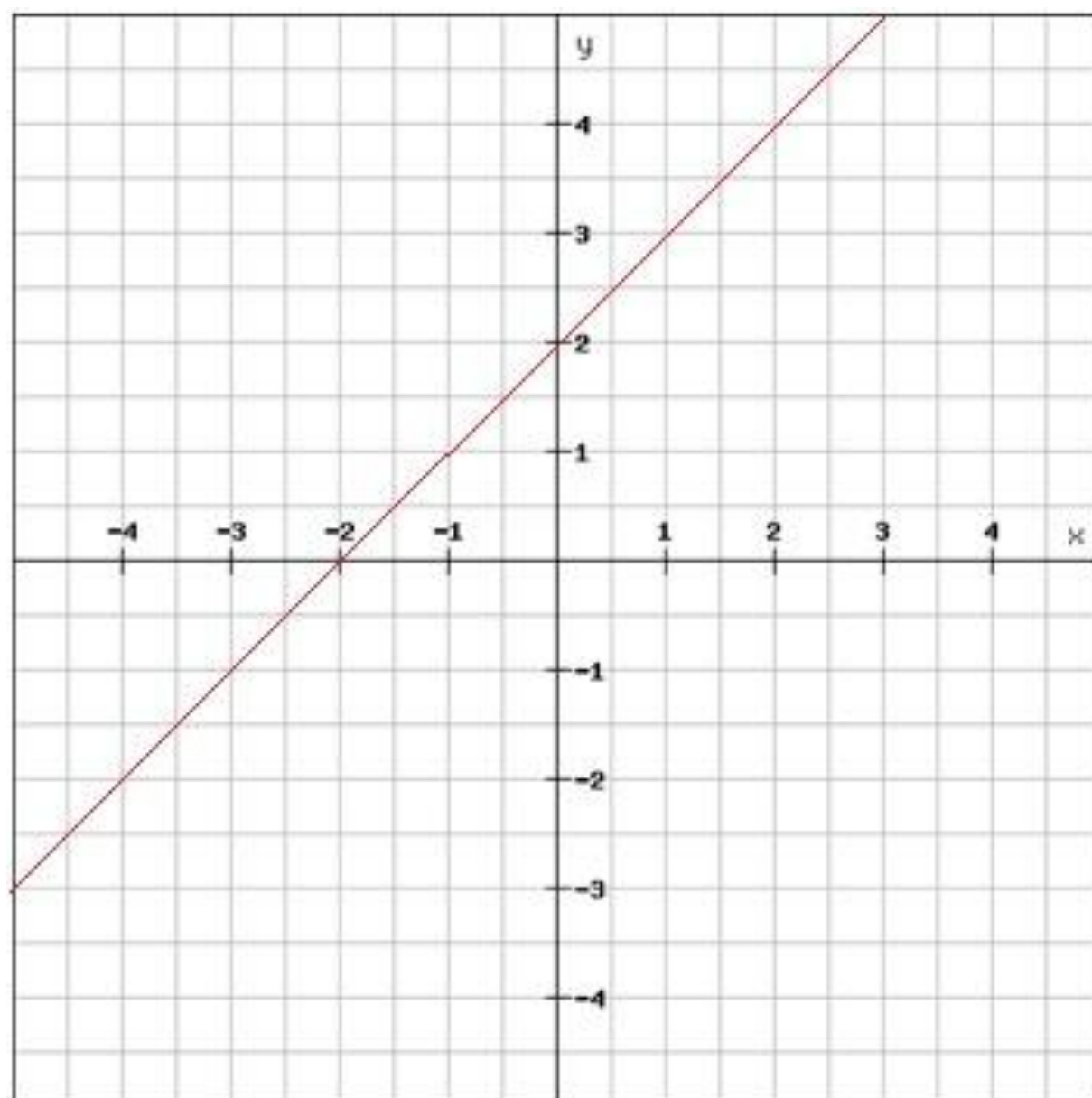


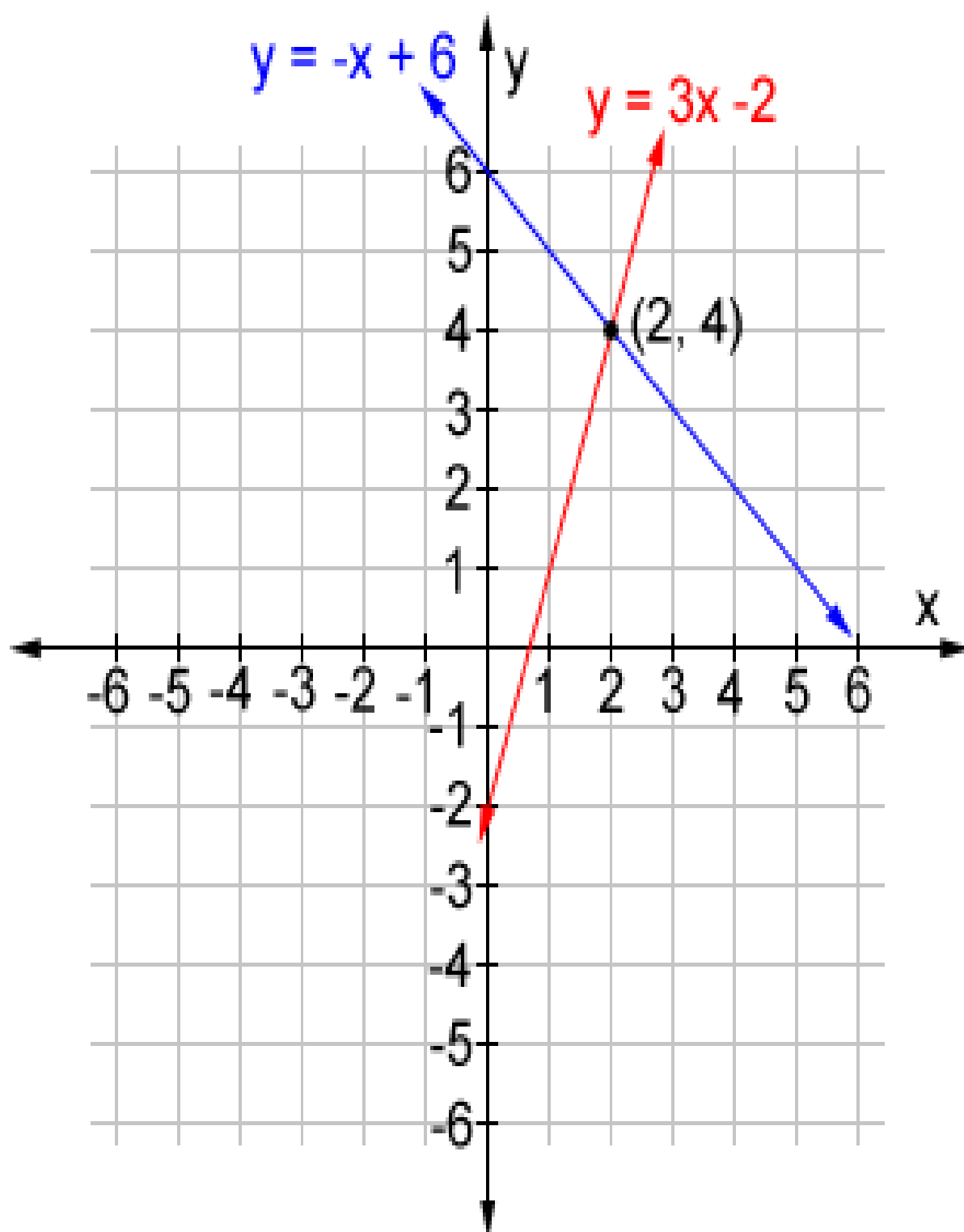
One point in common
Solution ; (x,y)

Coincident lines



Infinitely many points in
common;
 $\{(x,y) : y = mx + b\}$





Chapter 1: Linear Simultaneous Equations

Introduction | ଅଧ୍ୟାୟ ପରିଚୟ

English:

Linear Simultaneous Equations form the foundation of coordinate geometry in Class 10 Mathematics.

ଓଡ଼ିଆ:

ରେଖୀୟ ସମକାଳୀନ ସମୀକରଣ ଦଶମ ଶ୍ରେଣୀ ଗଣିତର ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ଅଧ୍ୟାୟ ।
ଏଠାରେ ଦୁଇଟି ଚଳକ ଥିବା ସମୀକରଣ ଏବଂ ସେମାନଙ୍କର ଗ୍ରାଫିକାଲ ଉପସ୍ଥାପନ ବିଷୟରେ
ଶିଖାଯାଏ ।

ବୋର୍ଡ ପରୀକ୍ଷାରେ ଏହି ଅଧ୍ୟାୟ ଅଧିକ ମାର୍କ ଆଣିଦିଏ ।

Linear Equation in Two Variables

(ଦୁଇ ଚଳକ ଥିବା ରେଖୀୟ ସମୀକରଣ)

English:

A linear equation in two variables is expressed as:

$$ax+by+c=0 \quad ax + by + c = 0 \quad ax+by+c=0$$

where **a**, **b**, **c** are real numbers and **a** ≠ 0, **b** ≠ 0.

Each equation represents a **straight line** on the coordinate plane.

ଓଡ଼ିଆ:

ଦୁଇଟି ଚଳକ ଥିବା ରେଖୀୟ ସମୀକରଣର ସାଧାରଣ ରୂପ—

$$ax+by+c=0 \quad ax + by + c = 0 \quad ax+by+c=0$$

ଯେଉଁଠାରେ **a**, **b**, **c** ବାସ୍ତବ ସଂଖ୍ୟା ଓ **a** ≠ 0, **b** ≠ 0 ।

ଏହା ଗ୍ରାଫରେ ଏକ ସରଳ ରେଖା ଦର୍ଶାଏ ।

Graphical Solution Using Coordinate Geometry

(ସମନ୍ୱୟ ଜ୍ୟାମିତି ଦ୍ୱାରା ଗ୍ରାଫିକାଲ ସମାଧାନ)

English – Steps:

1. Convert equation into **y = mx + c** form
2. Find two solution points

3. Plot points on graph paper
4. Intersection point gives the solution

ଓଡ଼ିଆ – ପଦକ୍ରମ:

1. ସମୀକରଣକୁ $y = mx + c$ ରୂପରେ ପରିବର୍ତ୍ତନ କରନ୍ତୁ
2. ଦୁଇଟି ସମାଧାନ ବିନ୍ଦୁ ନିର୍ଣ୍ଣୟ କରନ୍ତୁ
3. ଗ୍ରାଫ ପେପରରେ ଅଙ୍କନ କରନ୍ତୁ
4. ଯେଉଁଠାରେ ଦୁଇ ରେଖା କଟେ, ସେଠାରେ ସମାଧାନ ମିଳେ

Conditions of Solutions

(ସମାଧାନର ଅବସ୍ଥା)

Lines	Condition	Result	ଓଡ଼ିଆ ଅର୍ଥ
Intersecting	$a_1/a_2 \neq b_1/b_2$	One solution	ଏକ ନିଶ୍ଚିତ ସମାଧାନ
Parallel	$a_1/a_2 = b_1/b_2 \neq c_1/c_2$	No solution	କୌଣସି ସମାଧାନ ନାହିଁ
Coincident	$a_1/a_2 = b_1/b_2 = c_1/c_2$	Infinite solutions	ଅସୀମ ସମାଧାନ

Key Learning Outcomes

English:

- Understand equations of the form $ax + by + c = 0$
- Solve equations graphically
- Identify **unique**, **no solution**, and **infinite solution** cases

ଓଡ଼ିଆ:

- $ax + by + c = 0$ ରୂପର ସମୀକରଣ ବୁଝିବା
- ଗ୍ରାଫ ମାଧ୍ୟମରେ ସମାଧାନ
- ସମାଧାନର ପ୍ରକାର ଚିହ୍ନଟ

Important MCQs (Board-Type)

MCQ-1:

If two lines intersect at one point, the system has:

- A) No solution
- B) Infinite solutions

- C) One solution
- D) Two solutions

Answer: C – One solution **ଉତ୍ତର:** ଏକ ନିଶ୍ଚିତ ସମାଧାନ

MCQ-2:

The graph of $ax + by + c = 0$ is always a:

- A) Curve
- B) Circle
- C) Straight line
- D) Triangle

Answer: C – Straight line **ଉତ୍ତର:** ସରଳ ରେଖା

MCQ-3:

Parallel lines represent:

- A) One solution
- B) No solution
- C) Infinite solutions
- D) Two solutions

Answer: B – No solution, **ଉତ୍ତର:** କୌଣସି ସମାଧାନ ନାହିଁ

Introduction to Linear Simultaneous Equations

A linear equation in two variables has the general form:

$$ax + by + c = 0 \quad (a \neq 0, b \neq 0)$$

$$ax + by + c = 0 \quad (a = 0, b = 0)$$

Where:

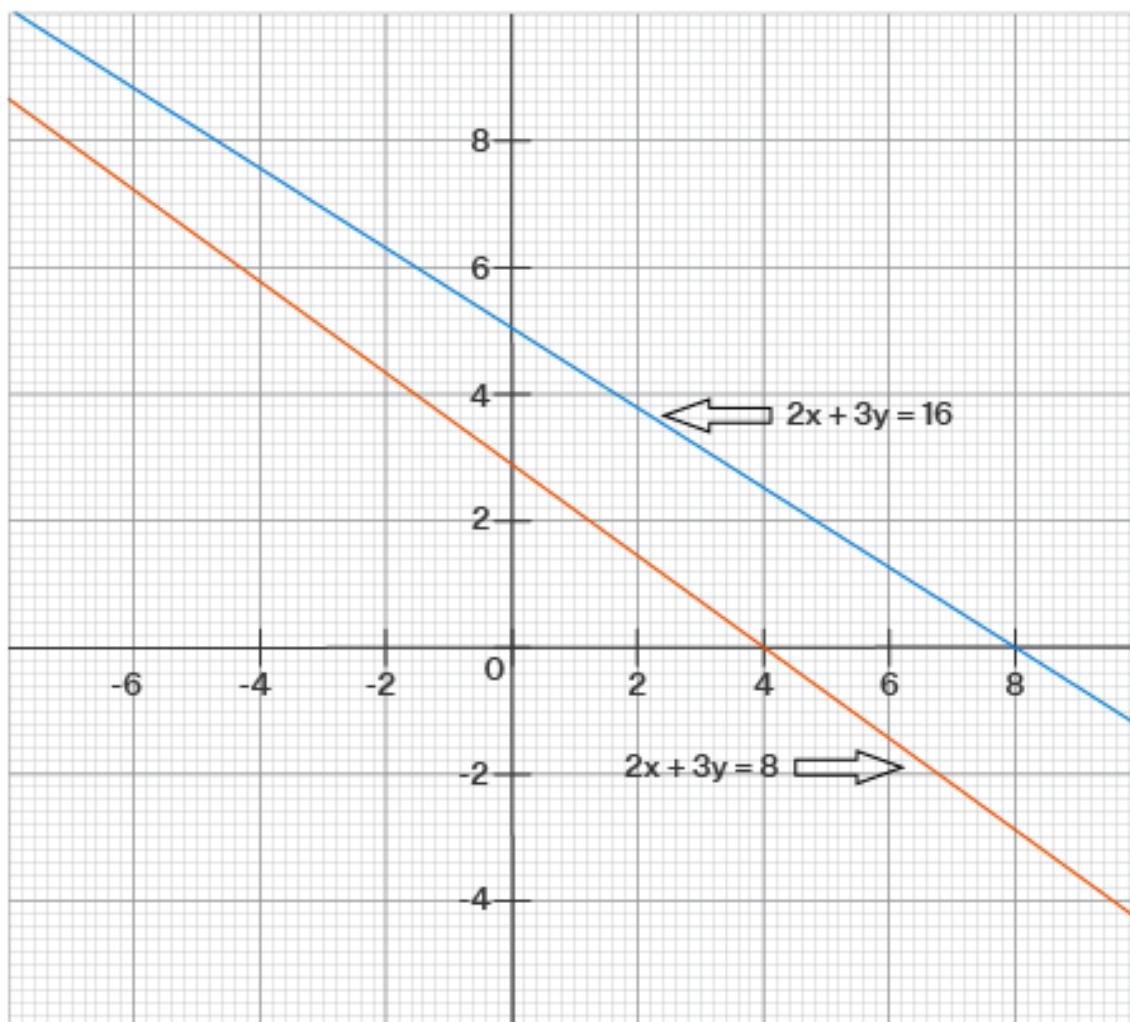
- $a, b \rightarrow$ coefficients
- $c \rightarrow$ constant
- $x, y \rightarrow$ variables

Two linear equations together form a pair of simultaneous equations:

$$\begin{cases} a_1x + b_1y + c_1 = 0 \\ a_2x + b_2y + c_2 = 0 \end{cases}$$

Geometrical Representation (Very Important for Board)

Each linear equation represents a **straight line** on the **XY-plane**.



Graphical Problems – 4 to 5 Marks

Chapter 1: Linear Simultaneous Equations

Importance in Board Examination

(ବୋର୍ଡ ପରୀକ୍ଷାରେ ଗୁରୁତ୍ୱ)

English:

Graphical problems carry **4 to 5 marks** in the BSE Odisha Class 10 Mathematics examination. These questions test:

- Conceptual clarity
- Accuracy of graph drawing
- Proper labeling and scale
- Correct identification of solution

ଓଡ଼ିଆ:

ଗ୍ରାଫିକାଲ ପ୍ରଶ୍ନଗୁଡ଼ିକ **4-5 ମାର୍କ** ଆଣିଦିଏ।

ଏଥିରେ—

- ଧାରଣା ସ୍ପଷ୍ଟତା
- ଗ୍ରାଫ ଅଙ୍କନର ସଠିକତା
- ମାପ ଓ ଲେବେଲିଂ
- ସମାଧାନ ବିନ୍ଦୁର ଚିହ୍ନଟ
ମୂଲ୍ୟାୟନ କରାଯାଏ।

Standard Board Question Pattern

(ବୋର୍ଡ ପ୍ରଶ୍ନ ଢ଼ାଞ୍ଚା)

English:

Solve the following pair of linear equations **graphically** and find the solution.

ଓଡ଼ିଆ:

ନିମ୍ନଲିଖିତ ଦୁଇଟି ରେଖୀୟ ସମୀକରଣକୁ ଗ୍ରାଫ ମାଧ୍ୟମରେ ସମାଧାନ କରନ୍ତୁ।

Step-wise Graphical Method

(ଧାପ ଧାପରେ ଗ୍ରାଫିକାଲ ପଦ୍ଧତି)

✓ **Step 1: Convert into $y = mx + c$ form**

English:

Rewrite both equations in slope-intercept form.

ଓଡ଼ିଆ:

ସମୀକରଣଗୁଡ଼ିକୁ $y = mx + c$ ରୂପରେ ପରିବର୍ତ୍ତନ କରନ୍ତୁ।

Step 2: Find two solution points

English:

Substitute two values of x to get corresponding y values.

ଓଡ଼ିଆ:

x ର ଦୁଇଟି ମୂଲ୍ୟ ନେଇ y ର ମୂଲ୍ୟ ନିର୍ଣ୍ଣୟ କରନ୍ତୁ।

Step 3: Draw neat graph

English:

Plot the points accurately using proper scale.

ଓଡ଼ିଆ:

ଯଥାଯଥ ମାପ ବ୍ୟବହାର କରି ସଫା ଗ୍ରାଫ ଅଙ୍କନ କରନ୍ତୁ।

Step 4: Identify point of intersection

English:

The intersection point gives the required solution.

ଓଡ଼ିଆ:

ଦୁଇ ରେଖା ଯେଉଁଠାରେ କଟେ, ସେଇ ବିନ୍ଦୁ ହେଉଛି ସମାଧାନ ।

Board-Level Solved Graphical Problem (5 Marks)

Question:

Solve graphically:

$$x+y=4 \text{ and } x-y=2 \quad \text{or} \quad x+y=4 \text{ and } x-y=2$$

English Solution:

Convert into y-form:

$$y=4-x \text{ and } y=x-2 \quad \text{or} \quad y=4-x \text{ and } y=x-2$$

x y (Eqn 1) y (Eqn 2)

2	2	0
4	0	2

After plotting, both lines intersect at **(3, 1)**.

✓ Required Solution:

$$x=3, y=1 \quad \text{or} \quad x=3, y=1$$

ଓଡ଼ିଆ ସମାଧାନ:

ସମୀକରଣକୁ y ରୂପରେ ଲେଖିବା—

$$y=4-x \text{ ଓ } y=x-2 \quad \text{or} \quad y=4-x \text{ ଓ } y=x-2$$

ଗ୍ରାଫ ଅଙ୍କନ କଲେ ଦୁଇ ରେଖା **(3,1)** ବିନ୍ଦୁରେ କଟେ ।

✓ ସମାଧାନ:

$$x=3, y=1 \quad \text{or} \quad x=3, y=1$$

Types of Graphical Results (Very Important)

Graph Type	Result	Marks Impact
Intersecting Lines	One solution	Full marks
Parallel Lines	No solution	Concept-based
Coincident Lines	Infinite solutions	High scorer

Common Mistakes to Avoid

(ସାଧାରଣ ଭୁଲ)

- Wrong scale
- Improper labeling of axes
- Incomplete graph
- No final answer written

- ପ୍ରତିକ ମାପ ବ୍ୟବହାର କରନ୍ତୁ
X ଓ Y ଧୁରା ଲେବେଲ କରନ୍ତୁ
ସମାଧାନ ବିନ୍ଦୁ ସ୍ପଷ୍ଟ ଦର୍ଶାନ୍ତୁ
-

Examiner's Tip (Marks Booster)

Neat graph = **+1 mark advantage**

Clear intersection point = **Full marks**

Box the final answer

ସଫା ଗ୍ରାଫ ଅଙ୍କନ କଲେ ଅଧିକ ମାର୍କ ମିଳେ

Question 1 (5 Marks) — Intersecting Lines

English:

Solve graphically:

$$x+y=4, x-y=2 \quad x+y=4, \quad x-y=2$$

Odia:

ନିମ୍ନଲିଖିତ ସମୀକରଣଗୁଡ଼ିକୁ ଗ୍ରାଫ ମାଧ୍ୟମରେ ସମାଧାନ କରନ୍ତୁ—

$$x+y=4, x-y=2 \quad x+y=4, \quad x-y=2$$

Solution:

Convert to yyy-form:

$$y=4-x, y=x-2 \quad y=4-x, \quad y=x-2$$

x y (Eqn 1) y (Eqn 2)

$$2 \quad 2 \quad 0$$

$$4 \quad 0 \quad 2$$

Intersection: (3,1)(3,1)(3,1)

Answer / ଉତ୍ତର: $x=3, y=1$

Board Tip: Clear intersection point = full marks.

Question 2 (4 Marks) — Parallel Lines (No Solution)

English:

Solve graphically:

$$2x+y=4, 4x+2y=10 \quad 2x+y=4, \quad 4x+2y=10$$

Odia:

ଗ୍ରାଫ ଦ୍ଵାରା ସମାଧାନ କରନ୍ତୁ—

$$2x+y=4, 4x+2y=10 \quad 2x+y=4, \quad 4x+2y=10$$

Solution:

Convert to yyy-form:

$$y=4-2x, y=5-2x \quad y=4-2x, y=5-2x$$

Both lines have **same slope** but **different intercepts** $\Rightarrow$ **Parallel**.

Answer / ଉତ୍ତର: No solution / କୌଣସି ସମାଧାନ ନାହିଁ

Board Tip: Write the conclusion explicitly.

Question 3 (4 Marks) — Coincident Lines (Infinite Solutions)

English:

Solve graphically:

$$x+2y=6, 2x+4y=12 \quad x+2y=6, \quad 2x+4y=12$$

Odia:

ଗ୍ରାଫ ମାଧ୍ୟମରେ ସମାଧାନ କରନ୍ତୁ—

$$x+2y=6, 2x+4y=12 \quad x+2y=6, \quad 2x+4y=12$$

Solution:

Both equations reduce to the **same line**.

Graph Result: Lines coincide.

Answer / ଉତ୍ତର: Infinite solutions / ଅସଂଖ୍ୟ ସମାଧାନ

Board Tip: Mention “coincident lines” to secure marks.

Question 4 (5 Marks) — Standard Board Pattern

English:

Solve graphically:

$$3x-y=1, x+y=5 \quad 3x-y=1, \quad x+y=5$$

Odia:

ଗ୍ରାଫ ଦ୍ୱାରା ସମାଧାନ କରନ୍ତୁ—

$$3x-y=1, x+y=5 \quad 3x-y=1, \quad x+y=5$$

Solution:

Convert to yyy-form:

$$y=3x-1, y=5-x \quad y=3x-1, y=5-x$$

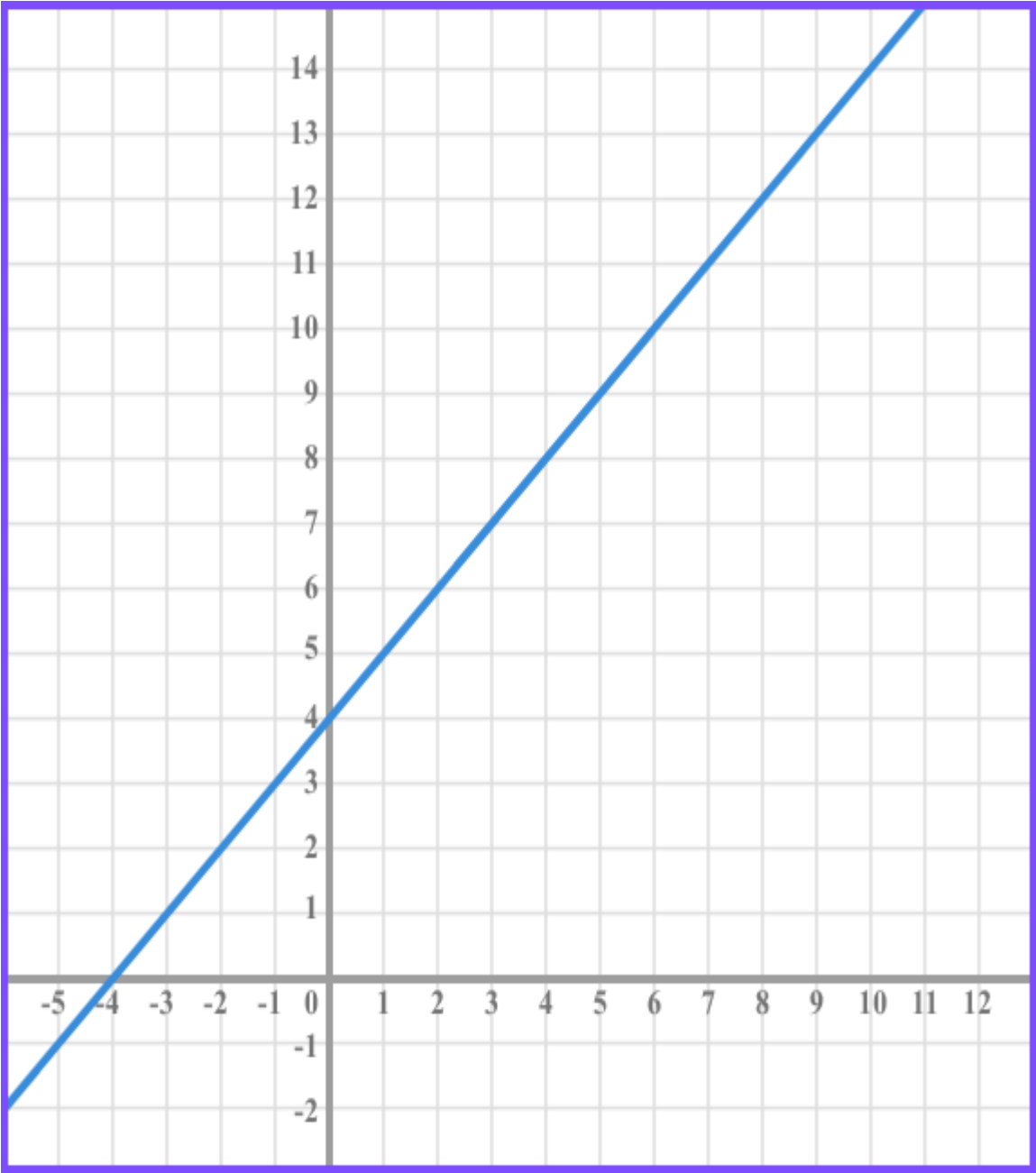
x y (Eqn 1) y (Eqn 2)

$$\begin{matrix} 2 & 5 \\ 1 & 2 \end{matrix}$$

$$\begin{matrix} 3 \\ 4 \end{matrix}$$

Intersection: $(\frac{3}{2}, \frac{7}{2})$ $(23, 27)$

Answer / ଉତ୍ତର: $x=32, y=72$ $x=\frac{3}{2}, y=\frac{7}{2}$ $x=23, y=27$





Chapter 1: Linear Simultaneous Equations

BSE Odisha Class 10 Mathematics | Board Exam Focus (4–5 Marks)

This **practice worksheet** is designed **exactly as per BSE Odisha Board pattern** to help students score **full marks** in **graphical questions**.

Instructions | ନିର୍ଦ୍ଦେଶ

English:

- Use **graph paper**
- Take **proper scale**
- Label **X-axis & Y-axis**
- Show **intersection point clearly**

ଓଡ଼ିଆ:

- ଗ୍ରାଫ ପେପର ବ୍ୟବହାର କରନ୍ତୁ
- ଯଥାଯଥ ମାପ ନିଅନ୍ତୁ
- X ଓ Y ଧୁରା ଲେବେଲ କରନ୍ତୁ
- କଟିବା ବିନ୍ଦୁ ସ୍ପଷ୍ଟ ଦର୍ଶାନ୍ତୁ

PRACTICE SET – A (5 Marks Each)

Q1.

English: Solve graphically:

$$x+y=5, x-y=1 \quad x + y = 5, \quad x - y = 1$$

ଓଡ଼ିଆ:

ଗ୍ରାଫ ମାଧ୍ୟମରେ ସମାଧାନ କରନ୍ତୁ—

$$x+y=5, x-y=1 \quad x + y = 5, \quad x - y = 1$$

Q2.

English: Solve graphically and find the nature of solution:

$$2x+y=6, 4x+2y=12 \quad 2x + y = 6, \quad 4x + 2y = 12$$

ଓଡ଼ିଆ:

ଗ୍ରାଫ ଦ୍ଵାରା ସମାଧାନ କରି ସମାଧାନର ପ୍ରକାର ଲେଖନ୍ତୁ—

$$2x+y=6, 4x+2y=12 \quad 2x + y = 6, \quad 4x + 2y = 12$$

PRACTICE SET – B (4 Marks Each)

Q3.

$$3x-y=3, x+y=5 \quad 3x - y = 3, \quad x + y = 5$$

Q4.

$$x+2y=4, x+2y=8 \quad x + 2y = 4, \quad x + 2y = 8$$

PRACTICE SET – C (Identify Nature Only)

Q5.

Without solving, identify the nature of solution:

$$x-y=2, 2x-2y=6 \quad x - y = 2, \quad 2x - 2y = 6$$

Answer space:

One solution ☐ No solution ☐ Infinite solutions

EXAMINER'S MARKING SCHEME (For Self-Check)

Criteria	Marks
Correct table of values	1
Neat graph with scale & labels	2
Correct conclusion	1–2

Q1.

Solve graphically

$$x+y=5, x-y=1 \quad x + y = 5, \quad x - y = 1$$

✓ **English Solution:**

Convert into y-form:

- $y=5-x$
- $y=x-1$

x y (Eq-1) y (Eq-2)

2 3	1
3 2	2

The two lines intersect at **(3, 2)**.

Final Answer:

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

ଓଡ଼ିଆ ସମାଧାନ:

- $y=5-x$ $y = 5 - x$
- $y=x-1$ $y = x - 1$

ଗ୍ରାଫ ଅଙ୍କନ କଲେ ଦୁଇ ରେଖା **(3, 2)** ବିନ୍ଦୁରେ କଟେ ।

ଉତ୍ତର:

$$x=3, y=2x = 3, \therefore y = 2x=3, y=2$$

Q2.

Solve graphically & find nature of solution

$$2x+y=6, 4x+2y=12 \quad 2x + y = 6, \quad 4x + 2y = 12$$

✓ **English Solution:**

Convert into y-form:

- $y=6-2x$ $y = 6 - 2x$
- $y=6-2x$ $y = 6 - 2x$

Both equations represent the **same straight line**.

Nature: Infinite solutions
(Coincident Lines)

ଓଡ଼ିଆ ସମାଧାନ:

ଦୁଇଟି ସମୀକରଣ ଏକେ ରେଖାକୁ ଦର୍ଶାଏ ।

ଫଳାଫଳ:

ଅସୀମ ସମାଧାନ (Coincident Lines)

Q3.

Solve graphically

$$3x-y=3, x+y=5 \quad 3x - y = 3, \quad x + y = 5$$

✓ **English Solution:**

Convert into y-form:

- $y=3x-3$ $y = 3x - 3$
- $y=5-x$ $y = 5 - x$

x y (Eq-1) y (Eq-2)

$$\begin{array}{cc} 2 & 3 \\ 1 & 0 \end{array} \quad \begin{array}{c} 3 \\ 4 \end{array}$$

Lines intersect at **(2, 3)**.

Final Answer:

$$x=2, y=3x = 2, \therefore y = 3x=2, y=3$$

ଓଡ଼ିଆ ସମାଧାନ:

ଗ୍ରାଫ ଅଙ୍କନ କଲେ ରେଖାଦୁଇଟି **(2, 3)** ବିନ୍ଦୁରେ କଟେ ।

ଉତ୍ତର:

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

Q4.

Solve graphically

$$x+2y=4, x+2y=8 \quad x+2y=4, x+2y=8$$

✓ **English Solution:**

Convert into y-form:

- $y=2-x \quad y=2-\frac{x}{2}$
- $y=4-x \quad y=4-\frac{x}{2}$

Both lines have:

- Same slope
- Different intercepts

Nature: No solution
(Parallel Lines)

ଓଡ଼ିଆ ସମାଧାନ:

ଦୁଇ ରେଖା ସମାନ୍ତର ହେଉଥିବାରୁ—

ଫଳାଫଳ:

କୌଣସି ସମାଧାନ ନାହିଁ

Q5.

Identify nature without solving

$$x-y=2, 2x-2y=6 \quad x-y=2, 2x-2y=6$$

✓ **English Solution:**

Compare coefficients:

$$\frac{a_1}{a_2} = \frac{1}{2}, \frac{b_1}{b_2} = \frac{-1}{-2}, \frac{c_1}{c_2} = \frac{2}{6} \quad \frac{a_1}{a_2} = \frac{1}{2}, \frac{b_1}{b_2} = \frac{-1}{-2}, \frac{c_1}{c_2} = \frac{2}{6}$$

Nature: No solution
(Parallel Lines)

ଓଡ଼ିଆ ସମାଧାନ:

ସମୀକରଣ ଅନୁପାତ ସମାନ ହେଲେ ମଧ୍ୟ ଧ୍ରୁବକ ଅସମାନ ।

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କୌଣସି ସମାଧାନ ନାହିଁ

JAI HIND! - BINAYA