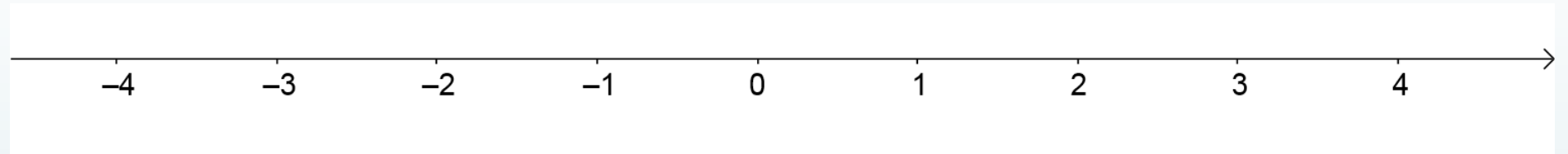


Coordinate Geometry – Outcomes

- ▶ Plot and read points on the coordinate plane.
- ▶ Solve problems about midpoints of line segments.
- ▶ Solve problems about slopes of lines.

Plot and Read Points

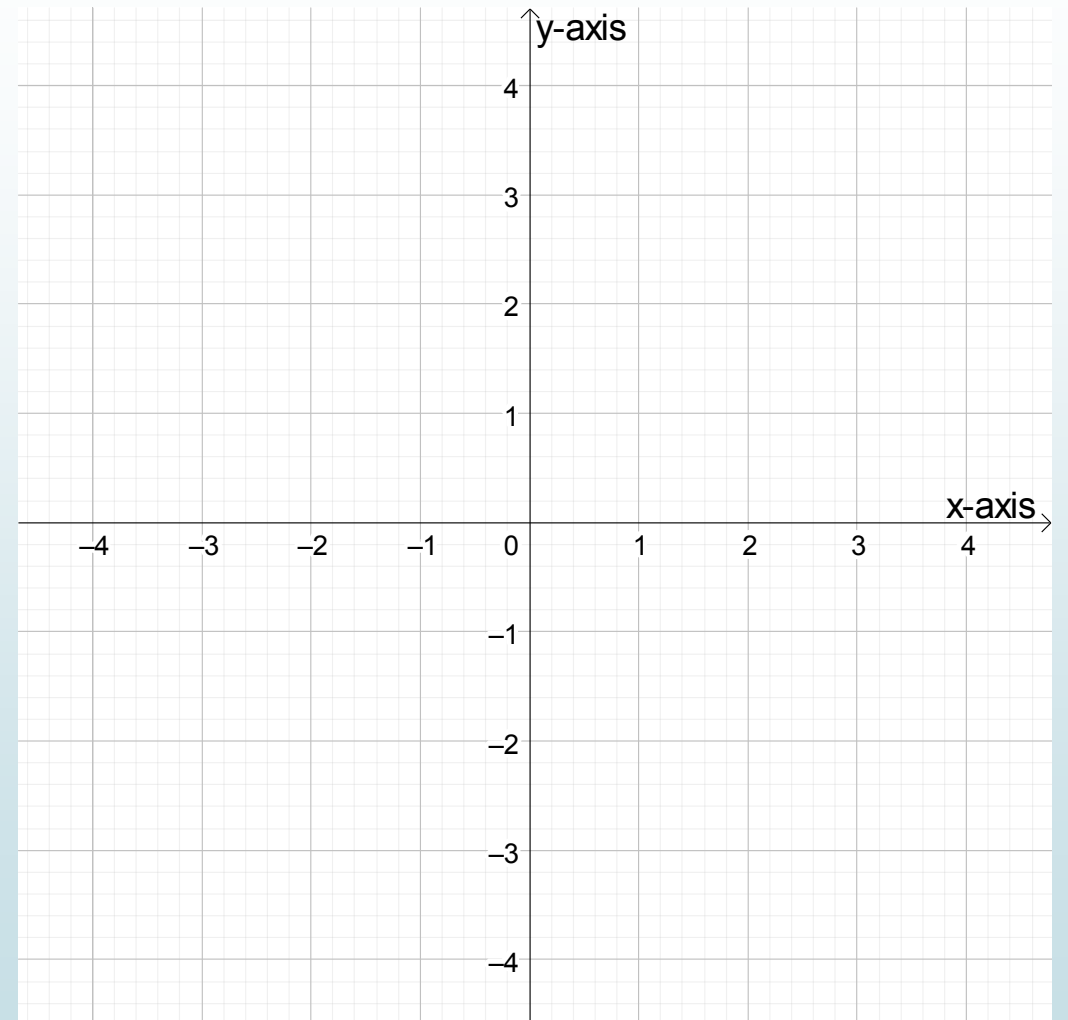
► Recall number lines:



- Zero in the middle.
- Positive numbers increasing on the right.
- Negative numbers decreasing on the left.
- All real numbers exist somewhere on this line.

Plot and Read Points

- ▶ Two number lines make the **coordinate plane**:
- ▶ The **x -axis** is a horizontal number line with positive numbers to the right and negative numbers to the left.
- ▶ The **y -axis** is a vertical number line with positive numbers towards the top and negative numbers towards the bottom.



Plot and Read Points

- ▶ Points on the coordinate plane have two parts – an x -coordinate and a y -coordinate.
- ▶ The x -coordinate is how far left / right the point is.
- ▶ The y -coordinate is how far up / down the point is.
- ▶ Points are always written (x, y) .

Plot and Read Points

Write down the coordinates of each point shown in the diagram:

$A = (2, 3)$

$B = (-2, 3)$

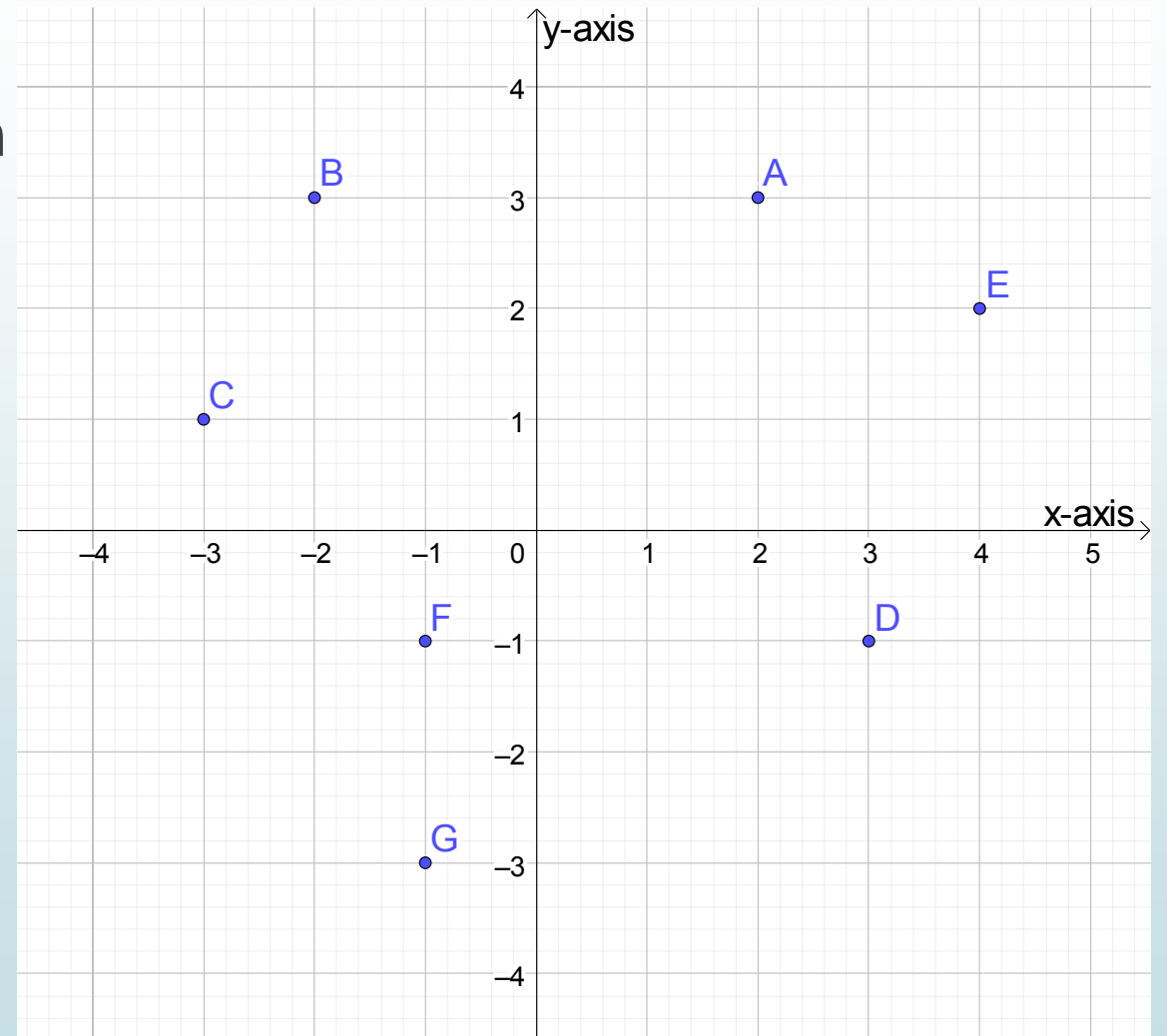
$C = (-3, 1)$

$D = (3, -1)$

$E = (4, 2)$

$F = (-1, -1)$

$G = (-1, -3)$



Plot and Read Points

➤ Draw a coordinate plane. Plot and label each of the following points on it:

➤ $A = (2, 5)$

➤ $B = (2, 0)$

➤ $C = (3, 1)$

➤ $D = (-3, 1)$

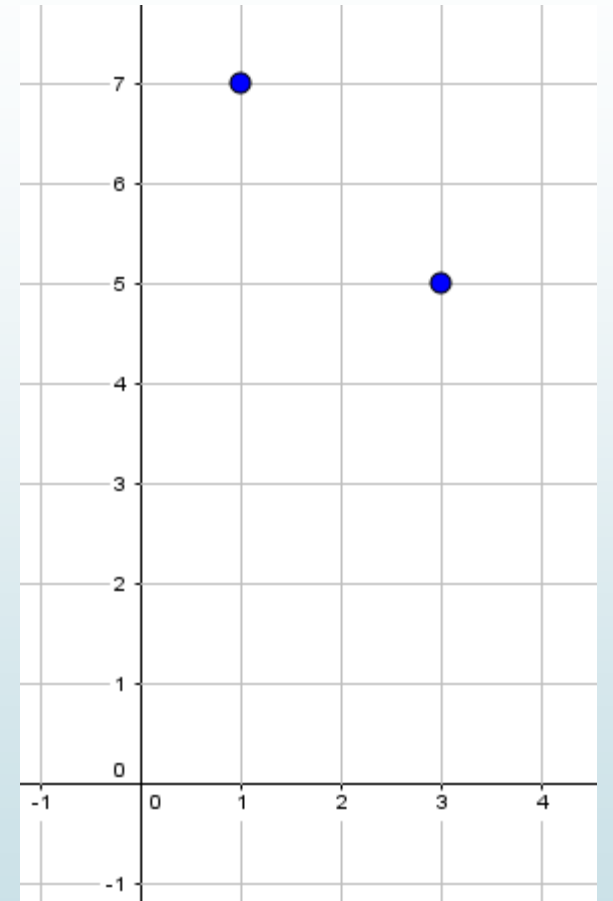
➤ $E = (-4, -2)$

➤ $F = (4, -2)$

➤ $F = (0, 2)$

Solve Problems about Midpoints

- ▶ A midpoint of a line segment is exactly halfway between its ends.
- ▶ Its coordinates are the average of the end coordinates.
- ▶ e.g. Find the midpoint of (3, 5) and (1, 7).
- ▶ Midpoint = $\left(\frac{3+1}{2}, \frac{5+7}{2}\right)$
- ▶ = $\left(\frac{4}{2}, \frac{12}{2}\right)$
- ▶ = (2, 6)



Solve Problems about Midpoints

► Plot the following pairs of points on their own coordinate diagrams. Find their midpoints and plot them on the coordinate diagrams.

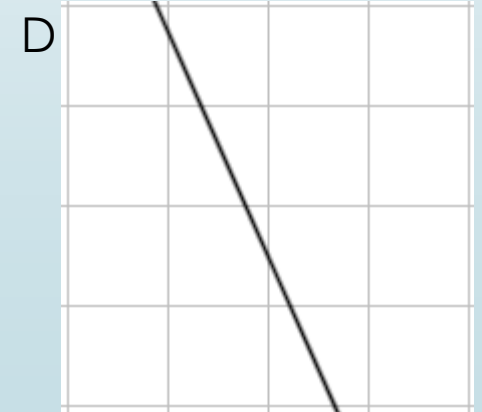
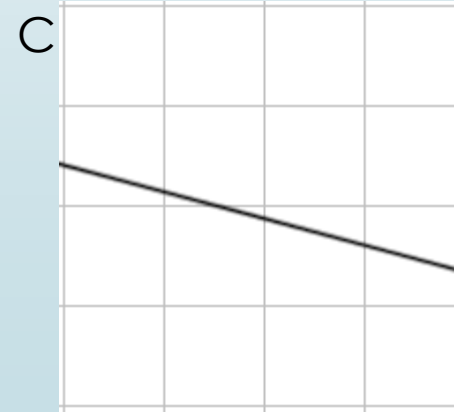
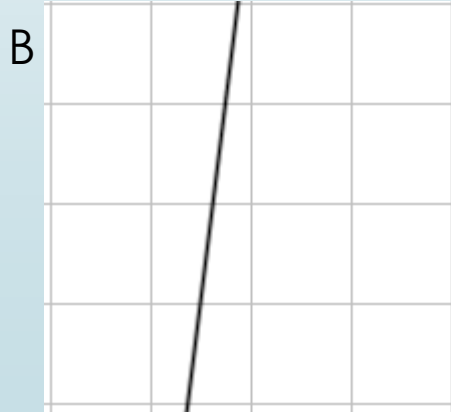
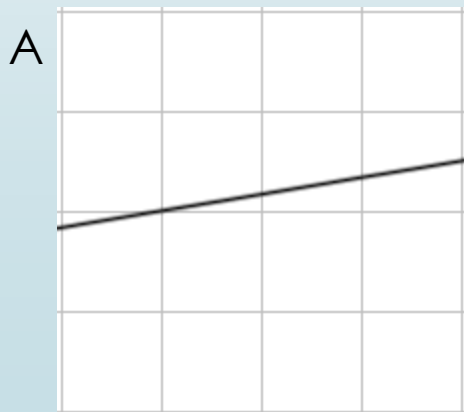
1. $A(5, 0)$, $B(1, 4)$
2. $C(4, 2)$, $D(7, 6)$
3. $E(-9, 3)$, $F(7, -7)$
4. $G(8, 1)$, $H(-2, -5)$
5. $I(4, -1)$, $J(-5, 9)$

Solve Problems about Midpoints

- ▶ Given one endpoint and the midpoint, find the other endpoint:
 1. Endpoint $(0, 0)$, midpoint $(2, 4)$
 2. Endpoint $(1, 3)$, midpoint $(3, 6)$
 3. Endpoint $(-6, 9)$, midpoint $(2, -4)$
 4. Endpoint $(6, -4)$, midpoint $(5, -1)$
 5. Endpoint $(3, -8)$, midpoint $(1, -6)$

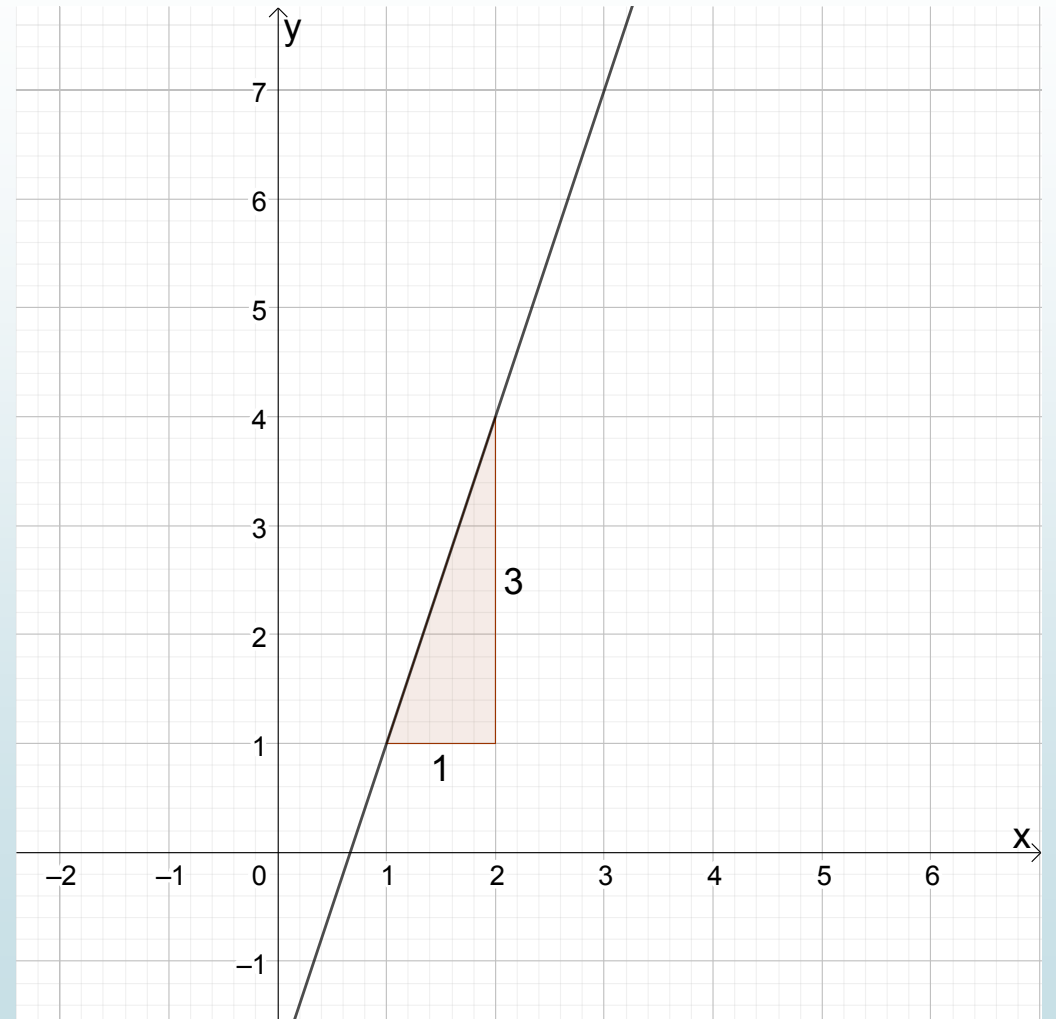
Solve Problems about Slopes

- The slope of a line is how steep it is.
- Bigger slopes are steeper.
- Positive slopes go up and right.
- Negative slopes go down and right.
- Describe each of these slopes as big or small, and positive or negative.



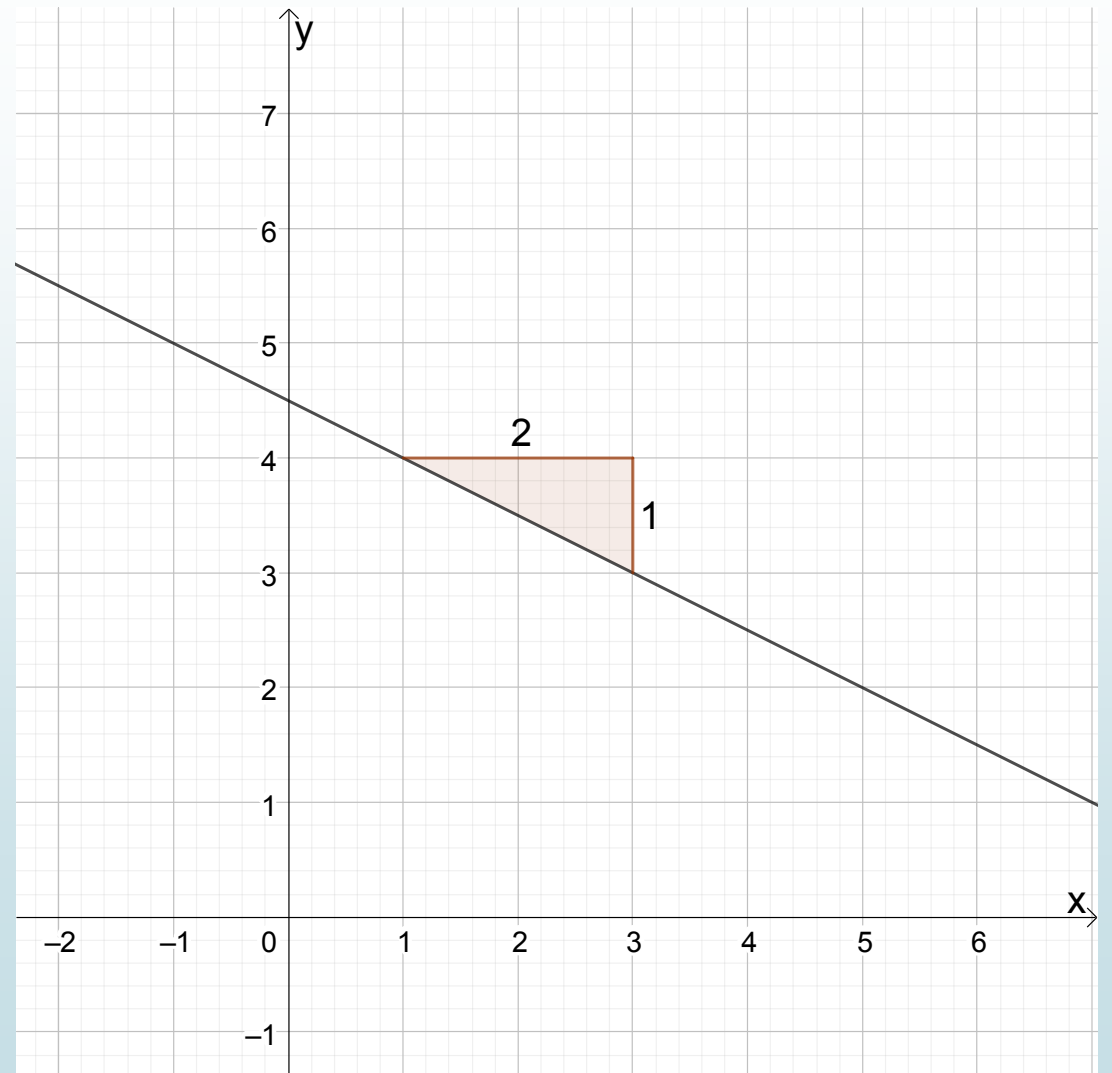
Solve Problems about Slopes

- ▶ The slope of a line is the ratio of its vertical change to its horizontal change, aka $\frac{\text{rise}}{\text{run}}$
- ▶ e.g. the line shown increases vertically by 3 when it increases horizontally by 1, so its slope is $\frac{3}{1} = 3$



Solve Problems about Slopes

- ▶ e.g. the line opposite decreases vertically by 1 when it increases horizontally by 2, so its slope is $-\frac{1}{2}$



Solve Problems about Slopes

► Using the previously drawn coordinate diagrams for the points below, calculate the slope of each of the lines joining the pairs of points.

1. $A(5, 0)$, $B(1, 4)$
2. $C(4, 2)$, $D(7, 6)$
3. $E(-9, 3)$, $F(7, -7)$
4. $G(8, 1)$, $H(-2, -5)$
5. $I(4, -1)$, $J(-5, 9)$