# Geometry Unit 6: Analytic Geometry

## Bronx Early College Academy

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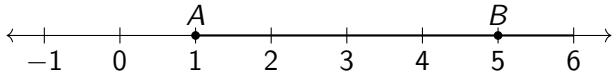
7 December 2022 - 13 January 2023

# Learning Target: I can plot a midpoint on the plane

HSG.CO.C.9 Prove theorems about lines and angles 6.1 Thursday 8 December

## Do Now

1. Review your Jumprope grades
2. Find the midpoint $M$ of $\overline{AB}$




Lesson: Midpoint and average, classwork practice

Homework: Deltamath midpoint practice (optional extension)

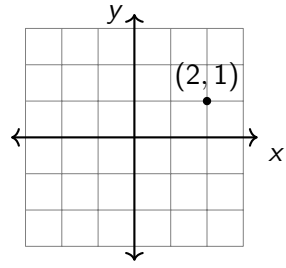
# What do you know about the coordinate plane?

**Coordinates** Values locating a point on a plane $(x, y)$

**Axis** The two number lines, $x$ and $y$-axis

**Origin** The center of the plane, $(0, 0)$

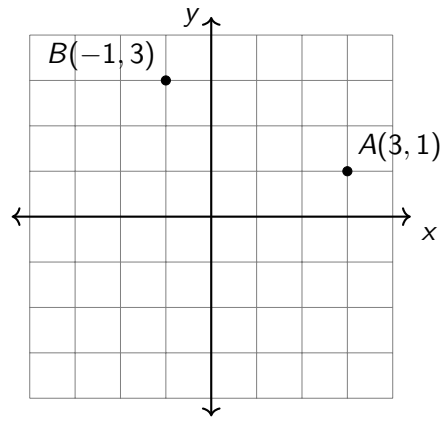
**Quadrant** The four quarters of the plane



# The midpoint formula

Given $A(x_A, y_A)$, $B(x_B, y_B)$, midpoint

$$M = \left(\frac{x_A + x_B}{2}, \frac{y_A + y_B}{2}\right)$$

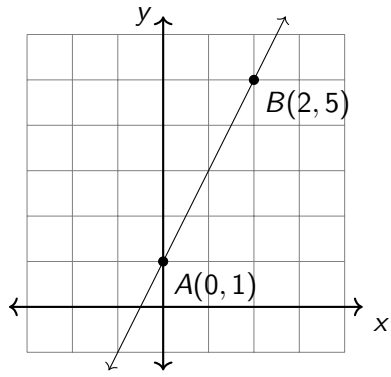


# Learning Target: I can use slope-intercept form of linear equations

8.F.A.3 Interpret $y = mx + b$ as a linear function, whose graph is a straight line 6.2 Friday 9 December

Do Now: Find the midpoint $M$ of $\overline{AB}$

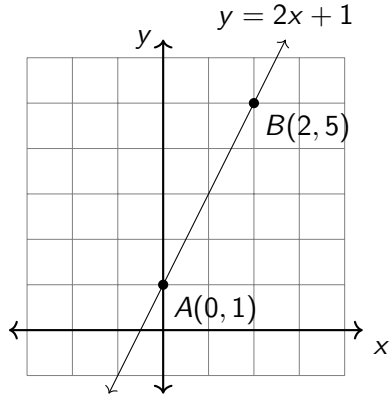
Lesson: Slope, $y$-intercept, linear equations
Homework: Deltamath graphing practice (optional extension)



# Linear equations of the form $y = mx + b$

| | |
|---|---|
| Linear | Straight, constant rate of change |
| Intercept | Where the line crosses the axis |
| $b$ | $y$-intercept, point $(0, b)$ when $x = 0$ |
| Increasing | Going up. $y$ increases as $x$ increases |
| Decreasing | Going down. $y$ decreases as $x$ increases |
| $m$, slope | How steep the line is |

$$m = \frac{rise}{run} = \frac{y_B - y_A}{x_B - x_A}$$

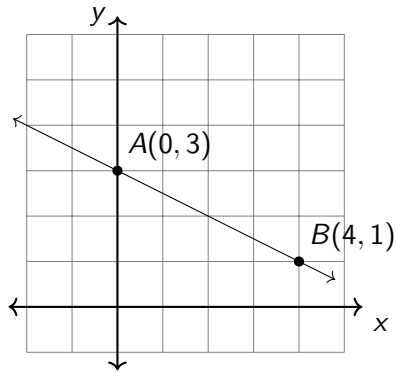


# Learning Target: I can use the standard form of linear equations

8.F.A.3 Interpret $y = mx + b$ as a linear function, whose graph is a straight line 6.3 Monday 12 December

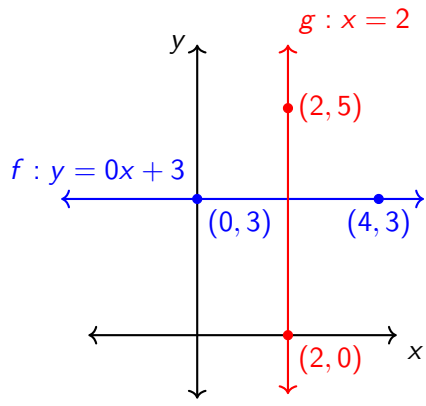
Do Now: Find the equation of $\overleftrightarrow{AB}$

Lesson: Function notation, vertical and horizontal slopes, the standard form of linear equations (GraspableMath practice)
Homework: Handout problem set



# Function notation, $f(x) = mx + b$

| | |
|---|---|
| Function | $(x, y)$ pairs that satisfy a rule, $f(x) = y$ |
| Horizontal | Slope is zero, $m = 0$ |
| Vertical | Slope is undefined, $m = \infty$ |
| Domain | The set of $x$ values that are allowed |
| Range | The set of $y$ values that are allowed |
| Real numbers | The set of all numbers, $\mathbb{R}$ |



# Linear equations of the form $ax + by = c$

Standard form A linear equation written in the form $ax + by = c$

Calculator form Casios and other calculators use the form $y = mx + b$

Convert from standard to $y$-intercept form. Example:

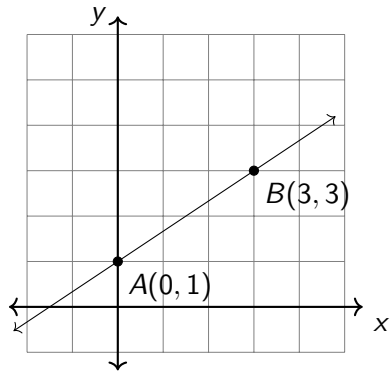
$$x + 2y = 6$$

# Learning Target: I can find parallel and perpendicular slopes

HSG.GPE.B.5 The slope criteria for parallel and perpendicular lines 6.4 Tuesday 13 December

Do Now: Find the equation of $\overleftrightarrow{AB}$
Challenge: find the $x$-intercept

Lesson: Parallel and perpendicular lines, negative reciprocals
Homework: Deltamath problem set

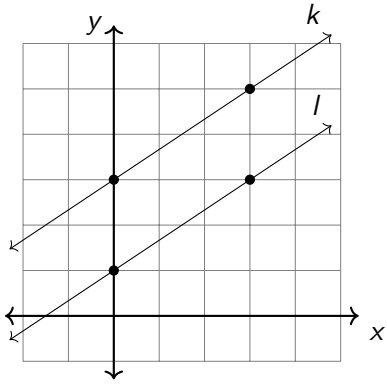


# Parallel lines have the same slope

**Parallel** Lines in the same plane that never intersect

**Skew** Lines that do not intersect and are not parallel

Lines $k$ and $l$ are parallel if and only if $m_k = m_l$, if their slopes are equal.



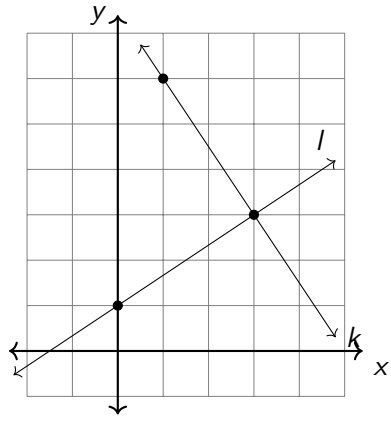
# Perpendicular lines slopes' are negative reciprocals

**Perpendicular** Lines that intersect at right angles

**Reciprocals** Two numbers whose product is 1

**Quarter turn** $90^\circ$ rotation, reversing the sign of the slope and the $x$ and $y$ coordinates

Lines $k$ and $l$ are perpendicular if and only if $m_k \times m_l = -1$, if their slopes are negative reciprocals.



# Learning Target: I can graph linear equations

8.F.A.3 Interpret $y = mx + b$ as a linear function, whose graph is a straight line 6.5 Wednesday 14 December

## Prequiz roundtable groupwork

Do Now: Organize and complete worksheets

6.5 Prequiz: Review slope-intercept form of linear equations

6.4 Classwork: Parallel and perpendicular slopes

6.3 Homework: Standard form

6.2 Classwork: Linear equations

6.1 Classwork: Midpoints

Lesson: Peer review of linear equations
Homework: Study for quiz on Thursday
Deltamath due Friday

# Quiz: Slope and linear equations

## 6.6 Friday 16 December

8.F.A.3 Interpret $y = mx + b$ as a linear function, whose graph is a straight line
HSG.GPE.B.5 The slope criteria for parallel and perpendicular lines

Do Now: Turn in worksheets (Deltamath due)

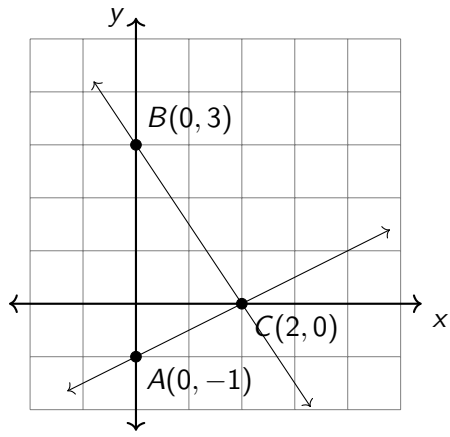
Open notebook, calculator allowed

# Learning Target: I can solve two equations in two variables

HSG.REI.C.6 Solve systems of linear equations 6.7 Tuesday 3 January

Do Now: Find the equations of $\overleftrightarrow{AC}$ and $\overleftrightarrow{BC}$
Are they perpendicular?

Lesson: Systems of equations, two intersecting lines
Homework: Deltamath problem set

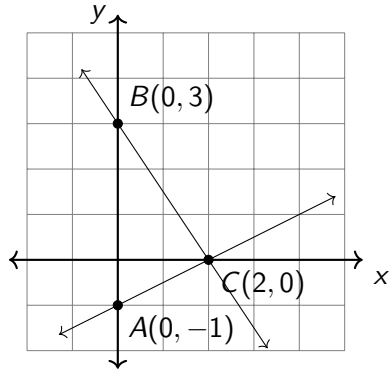


# Systems of equations

$$\overleftrightarrow{AC} : y = +\frac{1}{2}x - 1$$
$$\overleftrightarrow{BC} : y = -\frac{3}{2}x + 3$$

Lines are not perpendicular: $\frac{1}{2} \times -\frac{3}{2} \neq -1$ (slopes are not negative reciprocals)

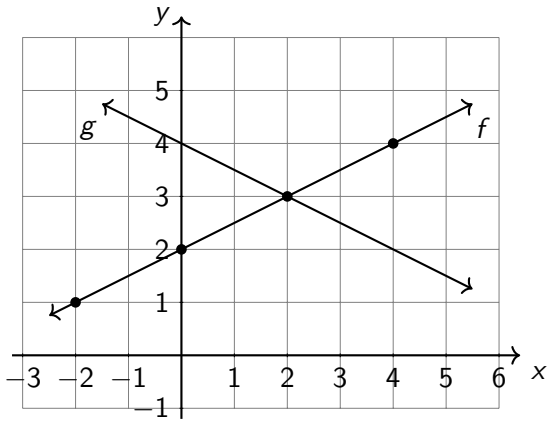
| | |
|---|---|
| Systems | Multiple equations with the same variables |
| Intersection | Point that satisfies both equations |
| Solution | Values $(x, y)$ that satisfy both equations |



# *T-chart* list of $(x, y)$ pairs satisfying a equation

$f(x)$

| $x$ | $y$ |
|---|---|
| $-2$ | |
| $0$ | |
| $2$ | |
| | $4$ |




$g(x)$

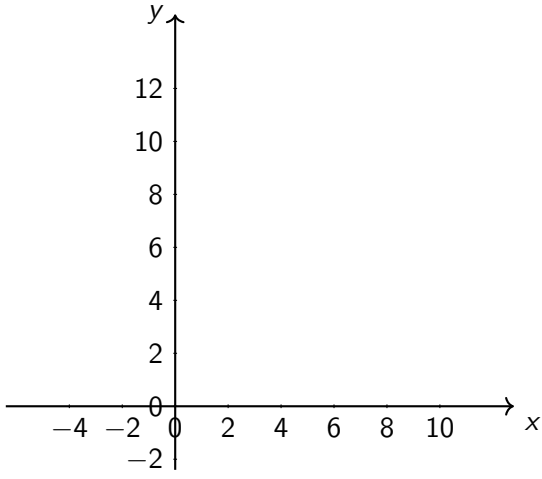
| $x$ | $y$ |
|---|---|
| | |

# Solve the system for its solution, the intersection

link to Graspable Math calculator

$f(x) = \frac{2}{3}x + 4$

| $x$ | $y$ |
|---|---|



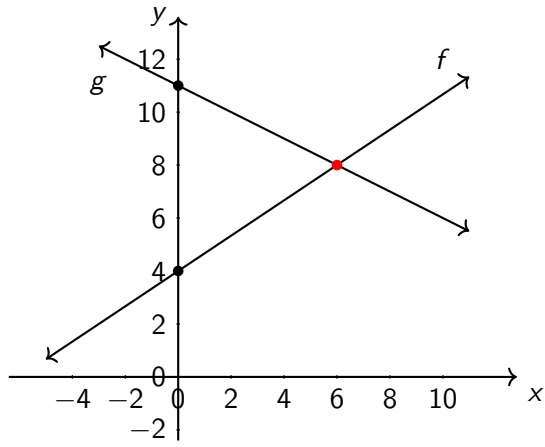

$g(x) = -\frac{1}{2}x + 11$

| $x$ | $y$ |
|---|---|

# Solution: the intersection is $(6, 8)$

$f(x) = \frac{2}{3}x + 4$

| $x$ | $y$ |
|---|---|
| 0 | 4 |
| 6 | 8 |




$g(x) = -\frac{1}{2}x + 11$

| $x$ | $y$ |
|---|---|
| 0 | 11 |
| 6 | 8 |

# Learning Target: I can solve linear equations in context

HSG.REI.C.6 Solve systems of linear equations

6.8 Wednesday 4 January

Do Now: Find the equations of $\overleftrightarrow{AC}$ and $\overleftrightarrow{BC}$
Are they perpendicular?

Lesson: Systems of equations, two intersecting lines
Homework: Deltamath problem set