4.01 Introduction to Coordinate Geometry

Equation of Lines Review Video [Click Here]

There are several ways to write the equation of a line. Here are the two most common ways:

Slope-intercept form: $y = mx + b$

where m is the ________________ and b is the _________________.

Point-slope form: $y - y1 = m(x - x1)$

where (x1, y1) is a ____________ on the line and m is the ______________.

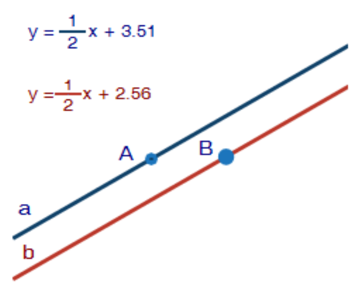
Parallel and Perpendicular Lines Video [Click Here]

Parallel Lines

The equations of parallel lines have slopes that are the
_________________________.

The slope of line a is _____________.
The slope of line b is _____________.

Therefore, the lines are _______________________.



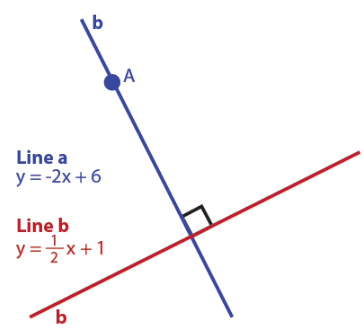
Perpendicular Lines

The equations of perpendicular lines have slopes that are
___________________ and ________________________ of each other.

Opposite : ______________
Reciprocal: ______________

The slope of line a = _________
The slope of line b = _________

Therefore, the lines are __________________.



Slope Video [Click Here]

The slope of a line is the ratio of the change in _______________________ over the change in _______________________ between any two points on a line.

Positive slope: slants _____ from left to right
Negative slope: slants _______ from left to right

m=_____________

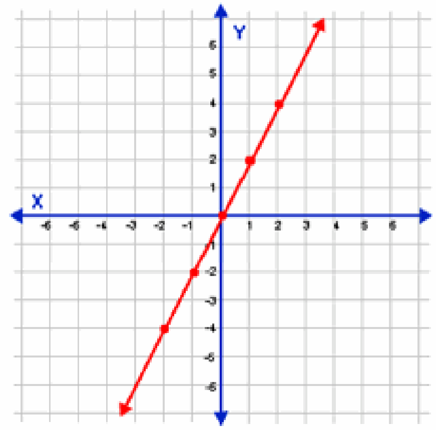
Given a Graph Video Click Here

1. Count how many units up. (rise)
2. Count how many units over. (run)
3. Put it together.

$$m = \frac{rise}{run}$$

Example:

1. ________
2. ________
3. ________



Given Coordinates Video Click Here

1. List coordinates and label (x_1, y_1) and (x_2, y_2).
2. Put them in the equation:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

3. Solve.

Example:

1. (2, −8) and (−3, 7)

2.

3.

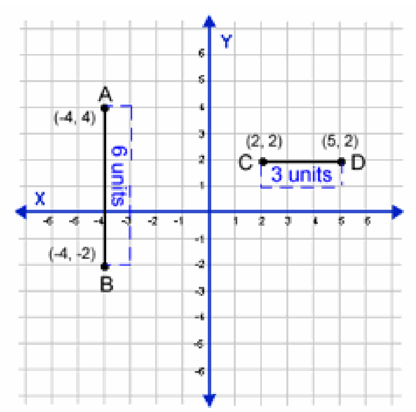
Distance Formula Video Click Here

We can find the length between two points on the graph several ways.

If the points are on the same vertical or horizontal line, we can count the units.

AB = __________________

CD = __________________

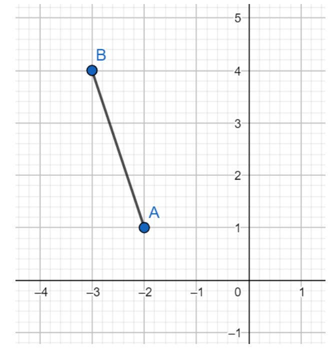


For lines that are diagonal, we will use the __________________ __________________ to determine the length:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Example:

The distance between A and B is ________________.



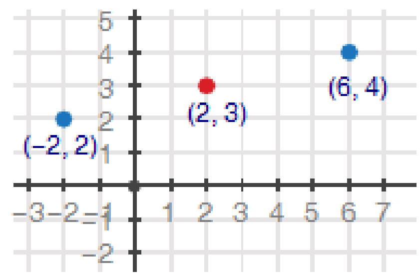
Midpoint Video [Click Here]

The midpoint formula allows us to find the midpoint between two _______________ on a line segment.

Midpoint formula: $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

Example
Find the midpoint between the points (−2, 2) and (6, 4).

The midpoint of (−2, 2) and (6, 4) is (_______, _______).



Types of Triangles Video [Click Here]

Equilateral triangles have _______________ congruent sides.	**Isosceles** triangles have at least _____________ congruent sides.	**Right** triangles have one __________________ angle.	**Scalene** triangles do not have any congruent sides or angles.

Classifying Triangles Video [Click Here]

Angle Classification We use the ____________ formula to classify a triangle as a ___________ triangle or not.	**Side Classification** We use the ______________ formula to classify a triangle as _____________, _______________, or _____________.

Example

Example:
Use the distance formula to show the triangle below is an isosceles triangle.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

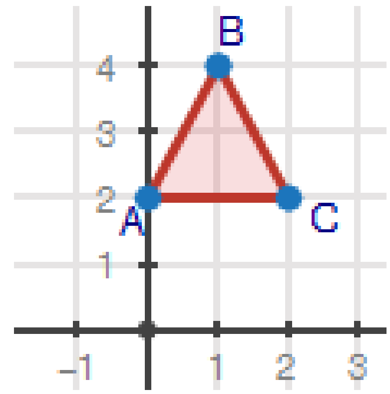
AB = __________

BC = ___________

AC = ___________

Therefore, triangle ABC is an _______________ triangle.

*Note: We had to check the length of AC as well to make sure that this is not an ________________ triangle.



Prove Right Triangle with Slope Video [Click Here]

We can prove the triangle ABC is a right triangle by using the _____________ formula. This can be used to show if two lines are perpendicular to each other. Perpendicular lines form a ______________ angle.

Use the slope formula to determine the slopes of each side:

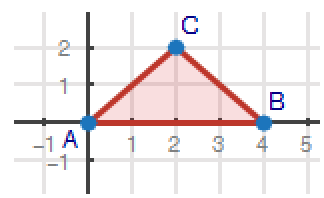
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

The slope of AC is ______.

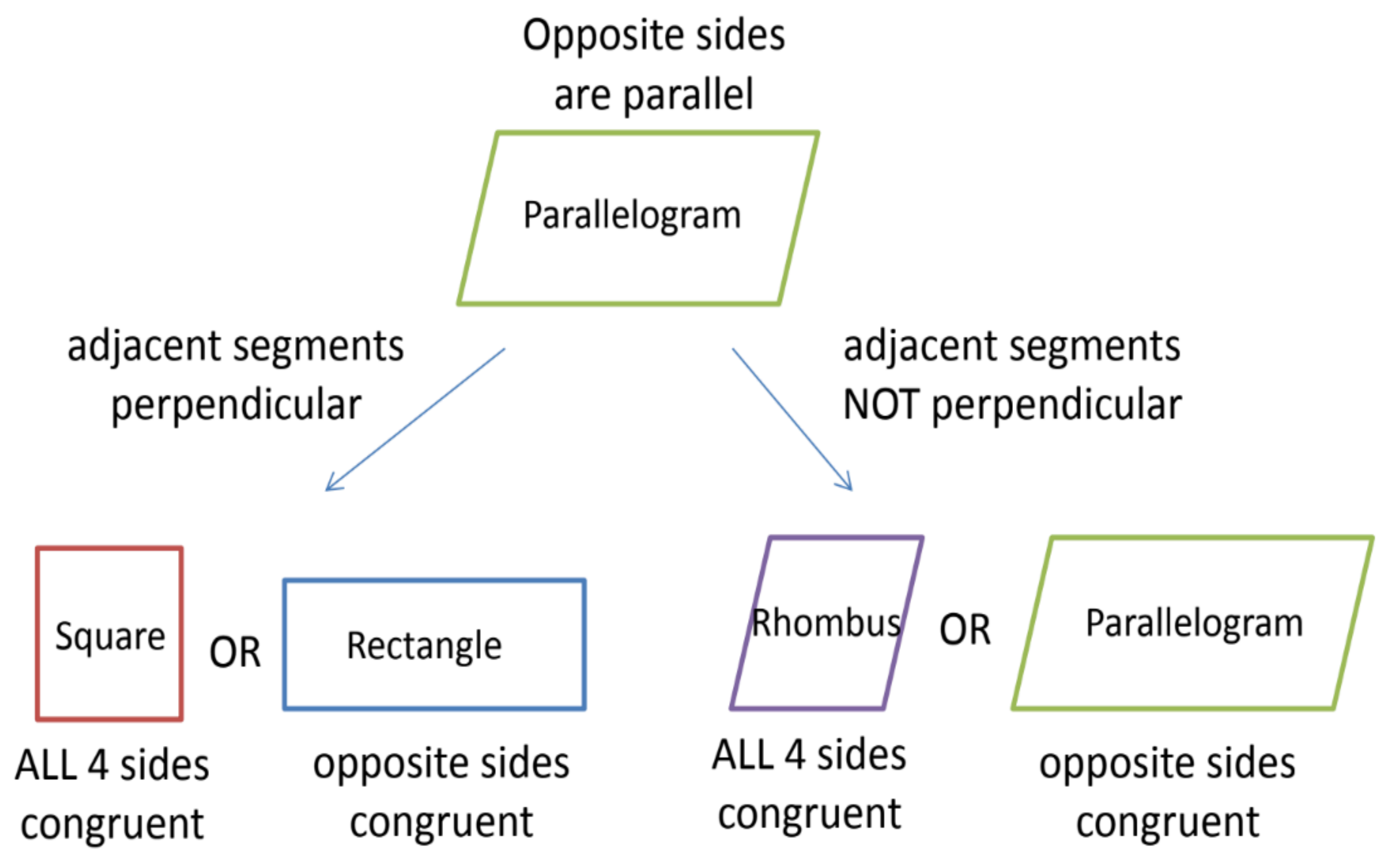
The slope of BC is ______.

The slope of AB is ______.

Since ______ and __________ are opposites and reciprocals of each other, segments __________ and ___________ are perpendicular to each other, so triangle ABC is a right triangle.



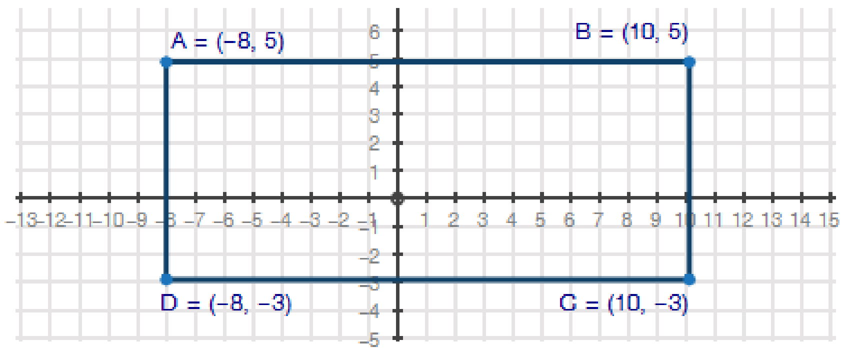
Properties of Quadrilaterals Review Video [Click Here]



Parallelogram • Opposite sides are congruent and parallel. • The diagonals bisect each other. • Opposite angles are congruent. • Consecutive angles are supplementary.	Rectangle • Opposite sides are congruent and parallel. • The diagonals bisect each other. • Opposite angles are congruent. • Consecutive angles are supplementary. • Each angle is a right angle. • The diagonals are congruent.
Rhombus • Opposite sides are congruent and parallel. • The diagonals bisect each other. • Opposite angles are congruent. • Consecutive angles are supplementary. • All four sides are congruent. • The diagonals are perpendicular. • The diagonals are angle bisectors.	Square • Opposite sides are congruent and parallel. • The diagonals bisect each other. • Opposite angles are congruent. • Consecutive angles are supplementary. • Each angle is a right angle. • The diagonals are congruent. • All four sides are congruent. • The diagonals are perpendicular. • The diagonals are angle bisectors.

Classifying Quadrilaterals Video [Click Here]

We can use coordinate geometry to classify our quadrilateral types. The _______________ _______________ will give us the side lengths of the quadrilateral, while the _______________ will tell us if there are any ______________ _______________ or _______________ _________________.



Example: Classify the given quadrilateral.
1. We use the ___________ formula to check for opposite sides ___________ and adjacent sides ____________.

The slope of AB is ______.

The slope of BC is ______.

The slope of CD is ______.

The slope of DA is ______.

AB and CD have the ______________ slope and BC and DA have the ____________slope. This means the opposite sides are ________________.

Therefore, quadrilateral ABCD is a parallelogram. But what type of parallelogram?

The slope of both AB and CD is ______________ and the slope of both BC and DA is ________________. This means they are opposite reciprocals.

Therefore, quadrilateral ABCD is either a rectangle or a square.

Example: Classify the given quadrilateral.
2. We use the ___________ formula to check for congruent sides.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

AB = _____________

CD = _____________

BC = _____________

DA = _____________

The opposite sides of this quadrilateral are ____________. This makes quadrilateral ABCD a ____________________.

Question 1 Video Click Here	**Question 2** Video Click Here
Triangle DEF has vertices located at D (0, 3), E (3, 3), and F (5, -1). Part A: Find the length of each side. Part B: Find the slope of each side. Part C: Classify the triangle and explain.	Determine what type of quadrilateral QRST is with coordinates Q(−5, 6), R(−1, 8), S(3, 6), and T(−1, 4).
Question 3 Video Click Here	**Question 4** Video Click Here
Determine what type of triangle ABC is with coordinates A(0, 2), B(2, 5), and C(−1, 7).	How do you determine if Quadrilateral ABCD is a square? A. Use the distance formula to show the sides are parallel B. Use the slope formula to show the sides are congruent C. Use the midpoint formula to show the angles are right angles D. Use the distance formula to show the sides are congruent

EXTRA PRACTICE for 4.01