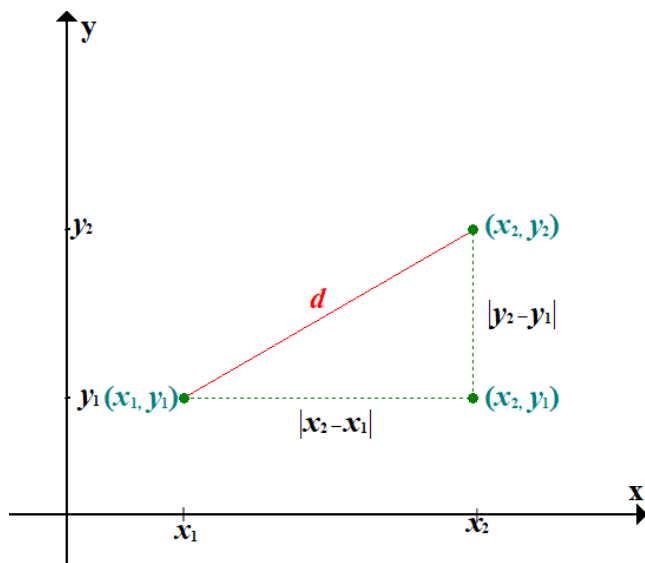


Distance and Intervals

Objective 1: Distance Formula

Distance between x and y on a number line is $|x - y| = |y - x|$



Let (x_1, y_1) and (x_2, y_2) be any two points on the plane. Then by the *Pythagorean Theorem*,

$$d^2 = (|x_2 - x_1|)^2 + (|y_2 - y_1|)^2$$

$$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$

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

Distance Formula

The distance between two points (x_1, y_1) and (x_2, y_2) is

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

Example: Find the distance between the points $(4, -5)$ and $(-2, 3)$.

Example: Prove that the three points $(0,0)$, $(3,3)$, and $(-1,1)$ form a right triangle.

Pause the video to try this one on your own, then restart when you are ready to check your answer.

Extra Practice

1. Find the distance between the points $(1,-2)$ and $(4,2)$.

2. Prove that the three points $(0,0)$, $(-2,-2)$, and $(1,-1)$ form a right triangle.

Restart when you are ready to check your answers.

Objective 2: Interval Notation and Set Builder Notation

Inequality	Graph	Set Builder Notation	Interval Notation

Example: Graph the solution to the compound inequality. Write the solution in set builder notation and in interval notation. $x \leq -3$ or $-1 < x < 5$ or $x > 11$

Pause the video to try this one on your own, then restart when you are ready to check your answer.

Extra Practice

Graph the solution to the inequality. Write the solution to the inequality both in set builder notation and interval notation.

1. $-3 \leq x \leq 4$

2. $x > 9$

3. $x < -8$ or $x \geq 2$

Restart when you are ready to check your answers.

Objective 3: Intervals represented by Absolute Value Inequalities

Distance between x and y on a number line is $|x - y| = |y - x|$

Distance between x and 4 could be written as $|x - 4|$

Consider the interval $(1,7)$.

What is the center of this interval?

How far is it from the center out to the ends of the interval?

Distance between x and 4 is less than 3

$$|x - 4| < 3$$

Example: Write an absolute value inequality to represent the interval $(3,15)$.

Example: Write an absolute value inequality to represent the interval $[2,7]$.

Example: Express the fact that x differs from 3 by less than 7 as an inequality involving an absolute value.

Example: Express the fact that x differs from -2 by more than 5 as an inequality involving an absolute value.

Example: Express the fact that x is within 4 units of 9 as an inequality involving an absolute value.

Example: Express the fact that x is within 5 units of 3 as an inequality involving an absolute value.

Example: Express the fact that the distance between x and 1 is more than 0 as an inequality involving an absolute value.

Pause the video to try this one on your own, then restart when you are ready to check your answer.

Extra Practice

1. Write an absolute value inequality to represent the interval $(3,11)$.
2. Write an absolute value inequality to represent the interval $[1,15]$.
3. Express the fact that x differs from 2 by less than 9 as an inequality involving an absolute value.
4. Express the fact that x differs from -8 by more than 2 as an inequality involving an absolute value.

5. Express the fact that x is within 8 units of 10 as an inequality involving an absolute value.

6. Express the fact that x is within 5 units of 1 as an inequality involving an absolute value.

7. Express the fact that the distance between x and 3 is more than 0 as an inequality involving an absolute value.

Restart when you are ready to check your answers.

Objective 4: Solve Absolute Value Inequalities

Example: Solve $|x| < 5$. Write your answer in interval notation.

Example: Solve $|x - 3| \leq 4$. Write your answer in interval notation.

Example: Solve $|x + 5| < 2$. Write your answer in set builder notation.

Example: Solve $|x - a| < b$. Write your answer in interval notation.

Example: Solve $|x| > 6$. Write your answer in interval notation.

Example: Solve $|3x - 1| > 5$. Write your answer in set builder notation.

Example: Solve $|x + 7| \geq 3$. Write your answer in interval notation.

Example: Solve $|2 - 4x| \geq 8$. Write your answer in set builder notation.

Example: Solve $|5 - x| \geq 0$. Write your answer in interval notation.

Pause the video to try this one on your own, then restart when you are ready to check your answer.

Extra Practice

1. Solve $|x - 2| \leq 6$. Write your answer in interval notation.

2. Solve $|x + 7| < 9$. Write your answer in set builder notation.

3. Solve $|4x - 3| > 7$. Write your answer in interval notation.

4. Solve $|3 - x| \geq 5$. Write your answer in set builder notation.

Restart when you are ready to check your answers.