**?**

**W**

**2K**

D. the theorem stating that the sum of the squares of the lengths of the legs in a right triangle

is equal to the square of the length of the hypotenuse.

 distance formula

C. to build or form something by combining parts

 Pythagorean

theorem

B. a system for locating points in two dimensions that uses a horizontal axis and a vertical axis

 construct

A. the formula used to find the distance between two points in the coordinate plane

 coordinate plane

**Words to Know**

*Write the letter of the definition next to the matching word as you work through the lesson. You may use the glossary to help you.*

formula.

**Use** the Pythagorean

theorem.

triangle from two given

vertices.

**Use** the

**Create** a

**Determine** distances on the coordinate plane.

**Lesson Goals**

**Lesson Question**

### Finding the Missing Measure

The paths between the locations at the park create a right triangle. What is the distance between the playground and picnic area?

#### City Park

**Play ground**

**18 f**

**P**

**eet**

**et**

***x* fe**

**Picnic area**



**24 f**

**eet**

**ond**

*a*2 + *b*2 = *c*2

182 + = *c*2

+ 576 = *c*2

= *c*2

900  *c*

*c* = feet

**2**

**Constructing a Right Triangle**

Construct a right triangle from the two points and find the distance of the two legs.

AC is

BC is



|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | *y* |  |  |  |  |  |
|  |  |  |  |  | 4 |  |  | B |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 2 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | A |  |  |  |  |  | C |  |  | *x* |
|  | − | 4 | − | 2 |  |  |  | 2 |  | 4 |  |
|  |  |  |  |  | −2 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | −4 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |

**Slide**

**Plotting Points on the Coordinate Plane**

What is the distance between the points A(–3, 1) and B(2, 4) on the **coordinate plane**?

*Plot and label A and B on the graph and connect them.*

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | *y* |  |  |  |  |  |
|  |  |  |  |  | 4 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 2 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | *x* |
|  | − | 4 | − | 2 |  |  |  | 2 |  | 4 |  |
|  |  |  |  |  | −2 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | −4 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |

**5**

**8**

**Finding Lengths of the Legs**

* The lengths of the

of

the right triangle can also be found using the coordinates of the points.

Represent the distance using

value.



|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | *y* |  |  |  |  |  |  |  | B ( | *x* , | *y* ) |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | *y*  | − *y* |   |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | C |  |  |  |  |  |  | A |  |  |
|  | (*x* |  , *y* |  ) |  | *x*  | − *x*  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | *x* |
|  |  |  |  |  |  |  |  |  |  |  |  |

**Slide**

**Finding the Distance Between Two Points**

Calculate the distance using the **Pythagorean theorem**.

* *a*2 + *b*2 = *c*2

*a* = 5, *b* = 3

*a*2 + *b*2 = *c*2

52 + 32 = *c*2

+

= *c*2

= *c*2

34  *c*

*c* ≈



|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | *y* |  |  |  |  |  |
|  |  |  |  |  | 4 |  |  | B |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 2 |  |  | **3** |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | A |  |  | **5** |  |  | C |  |  | *x* |
|  | − | 4 | − | 2 |  |  |  | 2 |  | 4 |  |
|  |  |  |  |  | −2 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | −4 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |

**Slide**

### Generating a Formula for Distance

A formula can be developed by substituting the values into the Pythagorean theorem.

*a*2 + *b*2 = *c*2



|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | *y* |  |  |  |  |  |  |  | ( | *x* , | *y* ) |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | *y*  | − *y* |   |
|  |  |  |  |  |  |  |  |  |  | *b* |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  | (*x* |  , *y* |  ) |  | *x*  | − *x*  |  |  |  |  |  |
|  |  |  |  |  |  | *a* |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | *x* |
|  |  |  |  |  |  |  |  |  |  |  |  |

2

*x*2  *x*1 

2

*y*2  *y*1 

2

*x*2  *x*1 

2

*y*2  *y*1 

2 1

*x*  *x*

**8**

2 1

2   *y*

 *y* 2  *c*

**Slide**

−2

−4

4

2

−2

−4

*x*

2

(*x* , *y* )

**(**−**4, 1)**

3

4

4 

 4

3  4

7

(*x*2, *y*2)

**(3, 4)**

2 1

*y*  *y*

2 1

*y*

2

*x*  *x*

* *y* 

2 1



2



* *x*  *y*

2 1



*d*  *x*

**Finding Distance on the Coordinate Plane**

The **distance formula** is used to find the distance between two points in the coordinate plane.

**10**

−4

*d* 

−2

*d* 

4

2

−2

−4

*x*

**7**

*d* 

**3**

2

(*x* , *y* )

**(**−**4, 1)**

4

3  (4)2  4  12



 9

 *7.62*



(*x* , *y* )

**(3, 4)**

*y*

2



* *y*

2 1



2



2 1

*x*  *x*  *y*

*d* 

**Slide**

### Distance from the Origin

Find the distance between the origin and (3, −5) using the distance formula.

(*x*1, *y*1) = ( , 0)

(*x*2, *y*2) = (3, −5)

*d*  *x*  *x* 2   *y* 

2 1 2

1

*y* 2

*d*  

*d*  32  52

*d*  9 

 02

 –5  2

**12**

*d*   5.83

# Summary

**Lesson Question**

**??**

## Finding Distance in the Coordinate Plane

How can you find distance on the coordinate plane?

**Lesson Question**

**Answer**

*Use this space to write any questions or thoughts about this lesson.*