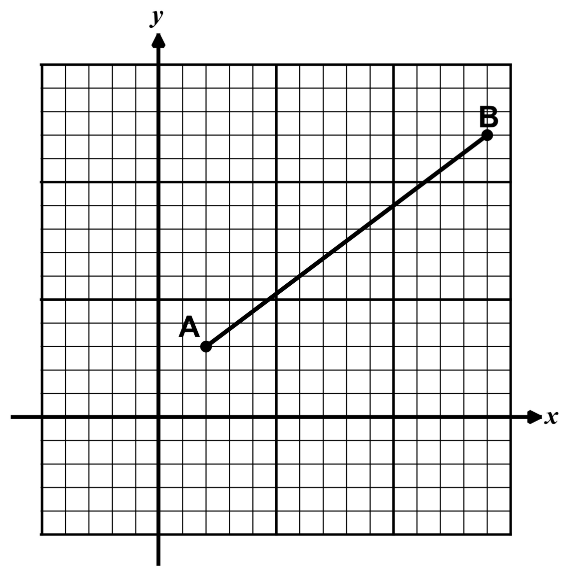
Name: ___________________________________ Date: _________________

THE DISTANCE FORMULA
COMMON CORE GEOMETRY

As we saw in the last lessons, the Pythagorean Theorem can be used to find the length of a line segment joining two points in the **coordinate plane**. This is the same as finding the **distance** between the points. We will review this in the first exercise.

***Exercise* #1:** We would like to find the distance between points A and B if they have coordinates $A(2,3)$ and $B(14,12)$.



(a) Sketch the right triangle below that could be used to calculate the length of $\overline{AB}$ and find its length using the Pythagorean Theorem.

(b) How could we calculate the lengths of the legs of the right triangle in (a) from the coordinates of points A and B.

***Exercise* #2:** Find the distance between the points $(1,5)$ and $(3,11)$ in simplest radical form. Draw a right triangle to support your work.

***Exercise* #3:** If there are two **arbitrary points** in the coordinate plane with coordinates (x_1, y_1) and (x_2, y_2), then use the approach you took in *Exercise* #2 to find the distance between them in the coordinate plane. Draw a right triangle to support your work.

THE DISTANCE FORMULA

If (x_1, y_1) and (x_2, y_2) are any two points in the plane, then the distance between them can be found by:

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

You will use the distance formula in this course and many others. Never forget, though, that it is simply the **Pythagorean Theorem** applied to the coordinate plane.

***Exercise* #4:** Find the distance between each set of points using the distance formula.

(a) $(3, 12)$ and $(15, 7)$

(b) $(-3, 1)$ and $(5, 7)$

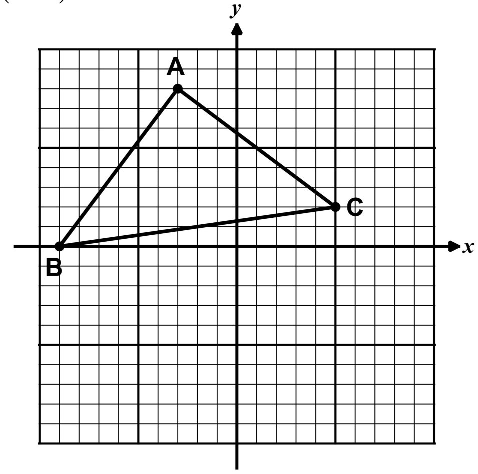
***Exercise* #5:** Find the distance between each set of points using the distance formula. Express your answers in simplest radical form.

(a) $(4, 1)$ and $(-2, 10)$

(b) $(-2, -5)$ and $(8, 0)$

The distance formula can be used to **prove** that certain figures have properties in the coordinate plane.

***Exercise* #6:** Given ΔABC with coordinates $A(-3, 8)$, $B(-9, 0)$ and $C(5, 2)$. We would like to prove that ΔABC is isosceles?



(a) Which two sides appear to have the same length?

(b) Show that these sides have equal lengths.

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THE DISTANCE FORMULA
COMMON CORE GEOMETRY HOMEWORK

PROBLEM SOLVING

1. For each set of points below, determine the distance between them using the distance formula. Each answer in this problem will be an integer.

(a) $(-2, 7)$ and $(10, 12)$

(b) $(10, -5)$ and $(-6, 7)$

2. For each set of points below, determine the distance between them using the distance formula. Express each answer in simplest radical form.

(a) $(2, -4)$ and $(6, 4)$

(b) $(5, 4)$ and $(-1, 14)$

3. If the endpoints of $\overline{MN}$ have coordinates of $M(2, 7)$ and $N(-3, 1)$, then the length of $\overline{MN}$ is closest to

(1) 6.1
(2) 6.7
(3) 7.5
(4) 7.8

____

4. A point A is translated in the coordinate plane three units to the left and nine units upward to produce its image point A'. Which of the following represents the length of segment $\overline{AA'}$?

(1) 12
(2) $2\sqrt{13}$
(3) $3\sqrt{10}$
(4) 18

____

5. Which of the following represents the distance between the y-intercept and x-intercept of the line whose equation is $y = 3x + 12$?

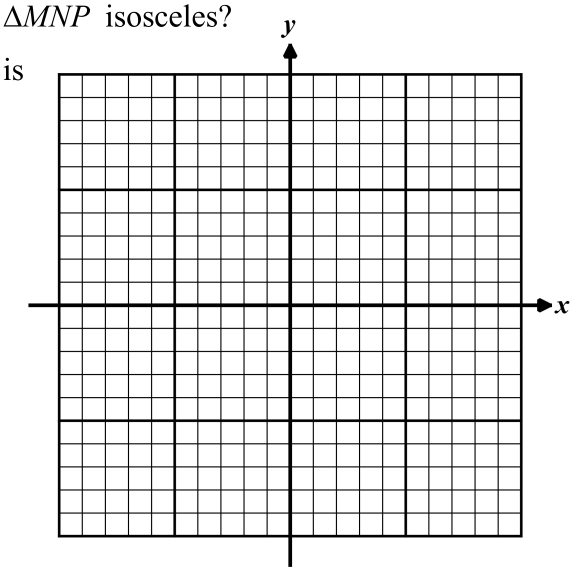
(1) $\sqrt{120}$ (3) $\sqrt{200}$

(2) $\sqrt{160}$ (4) $\sqrt{244}$

6. Two line segments, $\overline{AB}$ and $\overline{CD}$, have endpoints at $A(-5, 11)$, $B(3, 5)$, $C(9, 3)$, and $D(2, 10)$. Which of the two lines segments is longer? Show evidence to support your claim.

Reasoning

7. If ΔMNP has vertices at $M(-5, -7)$, $N(7, -2)$ and $P(2, 10)$ is ΔMNP isosceles? Provide evidence to support your claim. The use of the grid is optional.



8. A circle has a center located at $(-2, 4)$ and a radius of length 10. Does the point $(4, -4)$ lie on this circle? Explain how you arrived at your answer.