Practice Book

3 Practice and Apply

Use Practice Book pp. 231–232

Assignment Guide	
Decelerated	1–9
Average	2–16 Even
Accelerated	7–18

■ Before assigning the exercises on Practice Book pages 231–232, work through the examples in the teaching display. Use the Think boxes to help students identify vertical and horizontal lines, as well as how to determine if it is necessary to use the Distance Formula, which is shown in the Remember box.

■ Remind students to substitute the x- and y-coordinates into the proper places when using the Distance Formula in exercises 1–12.

Errors Commonly Made

Some students may incorrectly place the x- and y-coordinates when substituting into the Distance Formula. Suggest that they plot and connect the points and then draw horizontal and vertical segments to form a right triangle. Then have them examine the relationship between the Distance Formula and the Pythagorean Theorem.

■ Encourage students to draw the figures for exercises 13–15.

Problem Solving

■ Note that both problems 16 and 17 require using the Pythagorean Theorem. For problem 17, students must remember that a rectangle can be divided into two right triangles.

WRITE ABOUT IT

■ Suggest that students approach exercise 18 by using the Distance Formula to write an expression for the distance between the two given points.

9-6 Distance in the Coordinate Plane

Name ______________________ Date __________

Find the distance between the points. Write the answer in simplest radical form.

$(5, 6)$ and point $(5, -3)$

Think
x-values are equal, but y-values are not. This is a vertical line; use $|y_2 - y_1|$.

$|-3 - 6|$ ← Substitute the given values into the formula.

$|-9|$ ← Simplify.

9 ← Find the absolute value.

$(-3, 2)$ and point $(2, 2)$

Think
y-values are equal, but x-values are not. This is a horizontal line; use $|x_2 - x_1|$.

$|2 - (-3)|$ ← Substitute the given values into the formula.

$|5|$ ← Simplify.

5 ← Find the absolute value.

$(2, 7)$ and point $(9, 8)$

Think
x-values are not equal; y-values are not equal. Use the distance formula.

$d = \sqrt{(9-2)^2 + (8-7)^2}$

$= \sqrt{(7)^2 + (1)^2}$ ← Simplify.

$= \sqrt{50}$ ← Simplify.

$= 5\sqrt{2}$ ← Simplify.

Remember: Distance Formula
The distance, d, between any two points, (x_1, y_1) and (x_2, y_2), can be found using the formula:
$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

Find the distance between the points. Write your answer in simplest radical form.

1. $(-5, 12)$ and $(-5, 15)$
x-values are equal
vertical line
$|15 - 12| = |3| = 3$
3

2. $(11, -7)$ and $(5, -7)$
y-values are equal
horizontal line
$|5 - 11| = |-6| = 6$
6

3. $(10, 2)$ and $(7, 5)$
$d = \sqrt{(7-10)^2 + (5-2)^2}$
$= \sqrt{(-3)^2 + 3^2}$
$= \sqrt{18}$
$3\sqrt{2}$

4. $(12, 4)$ and $(6, 8)$
$d = \sqrt{(6-12)^2 + (8-4)^2}$
$= \sqrt{(-6)^2 + (4)^2}$
$= \sqrt{52}$
$2\sqrt{13}$

5. $(-2, 1)$ and $(0, 3)$
$d = \sqrt{[0-(-2)]^2 + (3-1)^2}$
$= \sqrt{(2)^2 + (2)^2}$
$= \sqrt{8}$
$2\sqrt{2}$

6. $(-3, 2)$ and $(0, 7)$
$d = \sqrt{[0-(-3)]^2 + (7-2)^2}$
$= \sqrt{(3)^2 + (5)^2}$
$\sqrt{34}$

7. $(-1, -8)$ and $(-7, -3)$
$d = \sqrt{[-7-(-1)]^2 + [-3-(-8)]^2}$
$= \sqrt{(-6)^2 + (5)^2}$
$\sqrt{61}$

8. $(-2, -5)$ and $(-9, -2)$
$d = \sqrt{[-9-(-2)]^2 + [-2-(-5)]^2}$
$= \sqrt{(-7)^2 + (3)^2}$
$\sqrt{58}$

9. $(2, -13)$ and $(10, 8)$
$d = \sqrt{(10-2)^2 + [8-(-13)]^2}$
$= \sqrt{(8)^2 + (21)^2}$
$\sqrt{505}$

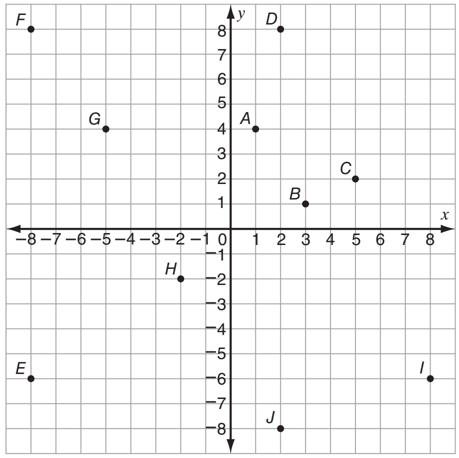
10. $(1, -15)$ and $(8, 2)$
$d = \sqrt{(8-1)^2 + [2-(-15)]^2}$
$= \sqrt{(7)^2 + (17)^2}$
$= \sqrt{338}$
$13\sqrt{2}$

11. $\left(\frac{2}{3}, \frac{1}{5}\right)$ and $\left(\frac{1}{3}, \frac{2}{5}\right)$
$d = \sqrt{\left(\frac{1}{3} - \frac{2}{3}\right)^2 + \left(\frac{2}{5} - \frac{1}{5}\right)^2}$
$= \sqrt{\frac{25 + 9}{9(25)}} = \sqrt{\frac{34}{9(25)}}$
$= \frac{\sqrt{34}}{3(5)}; \frac{\sqrt{34}}{15}$

12. $\left(\frac{1}{4}, \frac{2}{7}\right)$ and $\left(\frac{1}{2}, \frac{1}{7}\right)$
$d = \sqrt{\left(\frac{1}{2} - \frac{1}{4}\right)^2 + \left(\frac{1}{7} - \frac{2}{7}\right)^2}$
$= \sqrt{\frac{49 + 16}{49(16)}} = \frac{\sqrt{65}}{\sqrt{49(16)}}$
$= \frac{\sqrt{65}}{7(4)}; \frac{\sqrt{65}}{28}$

Use with SOURCEBOOK Lesson 9-6, pages 238–239.

Use the graph to solve each problem.



13. What is the perimeter of quadrilateral $EFGH$?

$EF = |8 - (-6)| = 14$

$FG = \sqrt{[-5-(-8)]^2 + (4-8)^2} = 5$

$GH = \sqrt{[-2-(-5)]^2 + (-2-4)^2} = 3\sqrt{5}$

$HE = \sqrt{[-8-(-2)]^2 + [-6-(-2)]^2} = 2\sqrt{13}$

perimeter: $19 + 3\sqrt{5} + 2\sqrt{13}$

14. What is the perimeter of triangle AIJ?

$AI = \sqrt{(8-1)^2 + (-6-4)^2} = \sqrt{149}$

$IJ = \sqrt{(2-8)^2 + [-8-(-6)]^2} = 2\sqrt{10}$

$JA = \sqrt{(1-2)^2 + [4-(-8)]^2} = \sqrt{145}$

perimeter: $\sqrt{149} + 2\sqrt{10} + \sqrt{145}$

15. What is the perimeter of quadrilateral $ABCD$?

$AB = \sqrt{(3-1)^2 + (1-4)^2} = \sqrt{13}$

$BC = \sqrt{(5-3)^2 + (2-1)^2} = \sqrt{5}$

$CD = \sqrt{(2-5)^2 + (8-2)^2} = 3\sqrt{5}$

$AD = \sqrt{(2-1)^2 + (8-4)^2} = \sqrt{17}$

perimeter: $\sqrt{13} + 4\sqrt{5} + \sqrt{17}$

Problem Solving

16. Prove that points $A(1, 1)$, $B(4, 2)$, and $C(0, 4)$ form a right triangle.

Adopt a different point of view:

$AB = \sqrt{(4-1)^2 + (2-1)^2} = \sqrt{10}$

$AC = \sqrt{(0-1)^2 + (4-1)^2} = \sqrt{10}$

$BC = \sqrt{(0-4)^2 + (4-2)^2} = \sqrt{20}$

$(\sqrt{10})^2 + (\sqrt{10})^2 \stackrel{?}{=} (\sqrt{20})^2$; $10 + 10 \stackrel{?}{=} 20$

$20 = 20$ True; The points form a right triangle.

17. A quadrilateral is formed by points $A(-1, 1)$, $B(2, 2)$, $C(3, 0)$, and $D(0, -1)$. Prove that $ABCD$ is not a rectangle.

Reason logically: Points *A*, *B*, and *D* form a triangle. If the triangle is a not a right triangle, then *ABCD* is not a rectangle.

$AB = \sqrt{[2-(-1)]^2 + (2-1)^2} = \sqrt{10}$

$AD = \sqrt{[0-(-1)]^2 + (-1-1)^2} = \sqrt{5}$

$BD = \sqrt{(0-2)^2 + (-1-2)^2} = \sqrt{13}$

$(\sqrt{10})^2 + (\sqrt{5})^2 \stackrel{?}{=} (\sqrt{13})^2$; $10 + 5 \stackrel{?}{=} 13$; $15 = 13$ False

Quadrilateral *ABCD* is not a rectangle.

WRITE ABOUT IT

18. What possible values of a will make the distance between points $(a, 2)$ and $(0, 0)$ $\sqrt{29}$ units? Explain your steps. (*Hint:* a can be positive *or* negative.)

To find possible values for a, let $x_2 = a$, $x_1 = 0$, $y_2 = 2$, $y_1 = 0$, and $d = \sqrt{29}$.

Then substitute the values into the distance formula and solve for a: $\sqrt{(a-0)^2 + (2-0)^2} = \sqrt{29}$

$\sqrt{a^2 + 2^2} = \sqrt{29}$; $a^2 + 4 = 29$; $a^2 = 25$; $a = \pm 5$; So a can be either 5 or −5.

Additional Resources

ONLINE www.progressinmathematics.com

- Meeting Individual Needs Activities
- Alternative Teaching Models
- Vocabulary Activities
- Audio Glossary
- Virtual Manipulatives
- Check Your Progress III
- Practice Activities (Lessons 5–6)

Meeting Individual Needs

See page 225F.

4 Summarize/Assess

Conceptual Thinking

- To assess whether students have conceptualized the lesson concepts, lead a discussion about how to find the length of line segments on the coordinate plane. Talk about how to find the length of horizontal, vertical, and oblique line segments. Use examples, such as the distance between points (2, 5) and (−4, 5), the distance between points (−3, 6) and (−3, 15), and the distance between points (−2, 7) and (1, 12). 6; 9; $\sqrt{34}$

In their *Math Journals*, have students explain how to determine which segment is longer.

$\overline{AB}$: endpoints (4, 2) and (−3, 1)
$\overline{CD}$: endpoints (5, 4) and (2, −1). $\overline{AB}$

ONLINE Check Your Progress III

Administer Check Your Progress III to assess understanding of Lessons 5–6. For additional practice, assign the online Practice Activities.

5 Follow-Up

Reteaching

- Have students plot the points $A(2, 3)$, $B(2, 8)$, and $C(5, 3)$ on grid paper. Have students count the units to measure $\overline{AB}$ and $\overline{AC}$. 5 units; 3 units Then discuss how they can use the difference of the y-coordinates to find the length of $\overline{AB}$, and the difference of the x-coordinates to find the length of $\overline{AC}$. Elicit that $\overline{BC}$ is the hypotenuse of the right triangle ABC and that they can use the Pythagorean Theorem to find its length. Ask, "What is the length of $\overline{BC}$?" $\sqrt{34}$ units

ONLINE See Chapter 9 Alternative Teaching Models.

End of Lesson