Practice Book

3 Practice and Apply

Use Practice Book pp. 229–230

Assignment Guide	
Decelerated	1–3, 7–10, 19–20
Average	2–18 Even, 19–20
Accelerated	4–6, 11–20

■ Before assigning the exercises on Practice Book pages 229–230, work with students through the example in the teaching display. Discuss how the rectangular field is divided into two congruent right triangles.

■ Make sure students can identify whether they need to find the length of a leg, or of the hypotenuse, of each right triangle in exercises 1–6.

Errors Commonly Made

Some students may forget to take the square root to find the unknown side length when using the Pythagorean Theorem. Suggest that they try sketching a triangle with the given side lengths and the unknown length they arrived at to see if it is reasonable.

■ Before students begin exercises 7–14, discuss the fact that the Pythagorean Theorem is an "if and only if" statement. Hence, if three sides of a triangle have lengths with the relationship $a^2 + b^2 = c^2$, then the triangle is a right triangle.

Problem Solving

■ Encourage students to draw a diagram for problems 15–16 to help them understand the relationships. Note that problems 17–18, require more than one step.

MENTAL MATH

■ Suggest that students look for familiar patterns in exercises 19–20.

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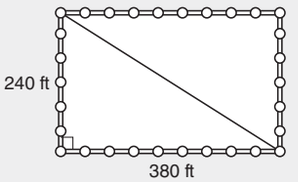
9-5 The Pythagorean Theorem

Name _____ Date _____

A diagonal fence creates two triangular fields. Each field has a height of 240 ft and a base of 380 ft. What is the length of the diagonal fence? Write the answer in simplest radical form.



$a^2 + b^2 = c^2$ ← Use the Pythagorean Theorem.

$240^2 + 380^2 = c^2$ ← Substitute values into the Pythagorean Theorem.

$57{,}600 + 144{,}400 = c^2$ ← Simplify.

$202{,}000 = c^2$ ← Simplify.

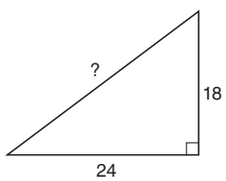
$\sqrt{202{,}000} = c$ ← Take the square root of both sides.

$20\sqrt{505} = c$ ← Write in simplest radical form: $\sqrt{202{,}000} = \sqrt{400 \cdot 505}$

The length of the diagonal fence is $20\sqrt{505}$ feet.

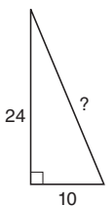
Find the length of the third side of each right triangle. Give your answer in simplest radical form.

1.



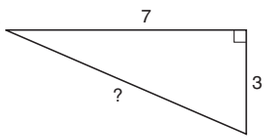
$a^2 + b^2 = c^2$
$24^2 + 18^2 = c^2$
$576 + 324 = c^2$
$900 = c^2$
$\sqrt{900} = c$
$c = 30$

2.



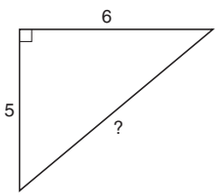
$24^2 + 10^2 = c^2$
$576 + 100 = c^2$
$676 = c^2$
$c = 26$

3.



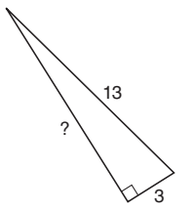
$3^2 + 7^2 = c^2$
$9 + 49 = c^2$
$58 = c^2$
$c = \sqrt{58}$

4.



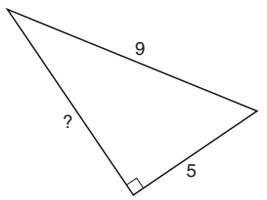
$5^2 + 6^2 = c^2$
$25 + 36 = c^2$
$61 = c^2$
$c = \sqrt{61}$

5.



$a^2 + 3^2 = 13^2$
$a^2 + 9 = 169$
$a^2 = 160$
$a = \sqrt{16 \cdot 10}$
$a = 4\sqrt{10}$

6.



$a^2 + 5^2 = 9^2$
$a^2 + 25 = 81$
$a^2 = 56$
$a = \sqrt{4 \cdot 14}$
$a = 2\sqrt{14}$

Use with SOURCEBOOK Lesson 9-5, pages 236–237.

Determine whether or not a right triangle can have sides of the given lengths.

7. 1, 1, 5

$a^2 + b^2 = c^2$
$1^2 + 1^2 \stackrel{?}{=} 5^2$
$1 + 1 \stackrel{?}{=} 25$
$2 = 25$ False
no

8. 5, 5, 7

$5^2 + 5^2 \stackrel{?}{=} 7^2$
$50 = 49$ False
no

9. 2, $4\sqrt{2}$, 6

$2^2 + (4\sqrt{2})^2 \stackrel{?}{=} 6^2$
$4 + 32 \stackrel{?}{=} 36$
$36 = 36$ True
yes

10. 3, $6\sqrt{2}$, 9

$3^2 + (6\sqrt{2})^2 \stackrel{?}{=} 9^2$
$9 + 72 \stackrel{?}{=} 81$
$81 = 81$ True
yes

11. 3.6, 4.8, 6

$3.6^2 + 4.8^2 \stackrel{?}{=} 6^2$
$12.96 + 23.04 \stackrel{?}{=} 36$
$36 = 36$ True
yes

12. 4.5, 6, 7.5

$4.5^2 + 6^2 \stackrel{?}{=} 7.5^2$
$20.25 + 36 \stackrel{?}{=} 56.25$
$56.25 = 56.25$ True
yes

13. $\frac{3}{4}, \frac{1}{4}, 1$

$\frac{9}{16} + \frac{1}{16} \stackrel{?}{=} 1$
$\frac{10}{16} = 1$ False
no

14. $\frac{5}{3}, \frac{1}{3}, 2$

$\frac{25}{9} + \frac{1}{9} \stackrel{?}{=} 4$
$\frac{26}{9} = 4$ False
no

Problem Solving

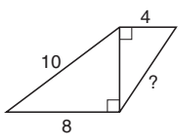
15. Bill traveled due north for 5 miles, then 7 miles due west, and then $\sqrt{74}$ miles southeast towards his starting point. Did Bill arrive at his starting point? Explain how you know.

Make a drawing; $5^2 + 7^2 \stackrel{?}{=} (\sqrt{74})^2$; $25 + 49 \stackrel{?}{=} 74$
$74 = 74$ True. Bill traveled following the shape of a right triangle. To arrive at his starting point, $5^2 + 7^2$ would have to equal 74. Because it does, Bill arrived at the same place where he began.

16. The side of a square is 9 inches. What is the length of each diagonal?

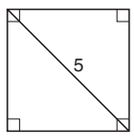
Make a drawing of a square with sides of 9 in. Then draw a diagonal with length of c; $9^2 + 9^2 = c^2$
$81 + 81 = c^2$; $162 = c^2$; $\sqrt{162} = c$; $9\sqrt{2} = c$
The length of each diagonal is $9\sqrt{2}$ in.

17. What is the length of the unknown side of the figure?



Reason logically using the Pythagorean Theorem twice: $8^2 + a^2 = 10^2$
$64 + a^2 = 100$; $a^2 = 36$; $a = 6$
$6^2 + 4^2 = c^2$; $36 + 16 = c^2$; $52 = c^2$; $2\sqrt{13} = c$
The length of the unknown side of the figure is $2\sqrt{13}$.

18. What is the perimeter of the square?



Reason logically using the Pythagorean Theorem.
$a^2 + a^2 = 5^2$; $2a^2 = 25$
$a^2 = \frac{25}{2}$; $a = \sqrt{\frac{25}{2}}$; $a = \frac{5\sqrt{2}}{2}$
$P = 4 \cdot \frac{5\sqrt{2}}{2} = 10\sqrt{2}$
The perimeter of the square is $10\sqrt{2}$ units.

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19. $(\sqrt{15} + 12)(\sqrt{15} - 12)$

$15 - 144$
-129

20. $(\sqrt{21} + 16)(\sqrt{17} - \sqrt{17})$

0

Additional Resources

ONLINE www.progressinmathematics.com

- Meeting Individual Needs Activities
- Alternative Teaching Models
- Vocabulary Activities
- Audio Glossary
- Virtual Manipulatives

Meeting Individual Needs
See page 225F.

4 Summarize/Assess

Conceptual Thinking

■ To assess whether students have conceptualized the lesson concepts, have them explain how to use the Pythagorean Theorem to find unknown side lengths of right triangles. Use examples such as a right triangle with legs of lengths 4 ft and 6 ft, and a right triangle with a hypotenuse of length 15 cm and one leg of length 5 cm. $2\sqrt{13}$ ft; $10\sqrt{2}$ cm

■ Have students determine if a triangle is a right triangle by giving side lengths, such as 4 yd, 6 yd, and 8 yd, or 7.5 ft, 10 ft, and 12.5 ft. no; yes

MATH JOURNAL In their *Math Journals*, have students explain the Pythagorean Theorem and give examples of finding an unknown side length of a right triangle. Then have them determine if the triangles with the given side lengths are right triangles.
$\sqrt{3}$ in., $\sqrt{5}$ in., $\sqrt{8}$ in. yes
1 m, $\sqrt{2}$ m, 3 m no

5 Follow-Up

Reteaching

ONLINE **Virtual Manipulatives: Pythagorean Theorem**

■ Have students use the Pythagorean Theorem Virtual Manipulative to explore the derivation of the formula.

■ Provide students with centimeter grid paper and rulers. Have them draw a right triangle with legs of 3 cm and 4 cm and then measure the hypotenuse, which should be 5 cm. They should then use the Pythagorean Theorem to verify their answers. Have students draw other right triangles with whole number side lengths and measure the hypotenuses. Have them use the Pythagorean Theorem to find the actual lengths and compare to them to their measured estimates. Remind students that measurements are always estimates, so they should not be concerned if they don't obtain the exact same answer as long as it is reasonable.

ONLINE **See Chapter 9 Alternative Teaching Models.**

End of Lesson

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