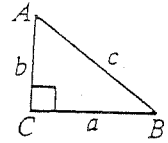


The Pythagorean Theorem

Objective: State and apply the Pythagorean Theorem.

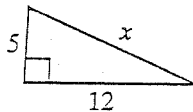
Pythagorean Theorem In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the legs.

If $\angle C$ in $\triangle ABC$ is a right angle, then $a^2 + b^2 = c^2$.

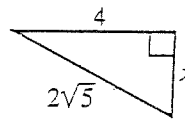


Example 1 Find the value of x . (Remember that the length must be a positive number, so you are only interested in positive roots.)

a.



b.



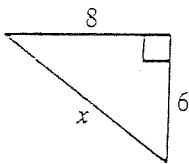
Solution

$$\begin{aligned} \text{a. } x^2 &= 5^2 + 12^2 \\ &= 25 + 144 = 169 \\ x &= \sqrt{169} = 13 \end{aligned}$$

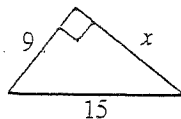
$$\begin{aligned} \text{b. } (2\sqrt{5})^2 &= x^2 + 4^2 \\ 20 &= x^2 + 16 \\ 4 &= x^2 \\ 2 &= x \end{aligned}$$

Find the value of x . Give exact answers.

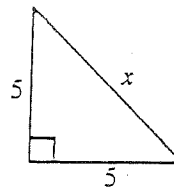
1.



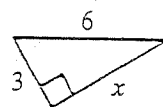
2.



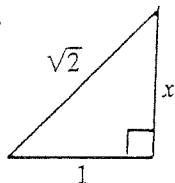
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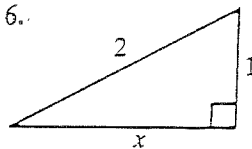
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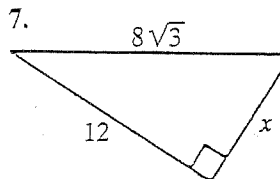
5.



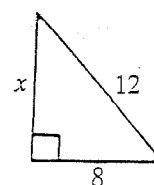
6.



7.

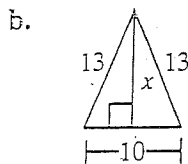
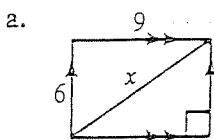


8.

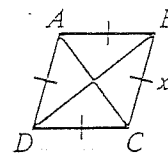


The Pythagorean Theorem (continued)

Example 2 Find the value of x .



c. $AC = 12$; $BD = 16$



Solution

a. The figure is a rectangle, so opposite angles are \cong .

$$\begin{aligned} x^2 &= 6^2 + 9^2 \\ &= 36 + 81 \\ &= 117 \\ x &= 3\sqrt{13} \end{aligned}$$

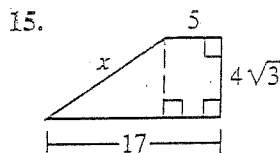
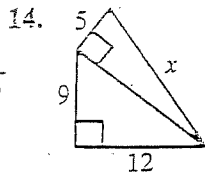
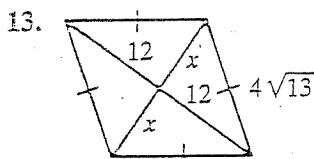
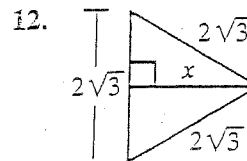
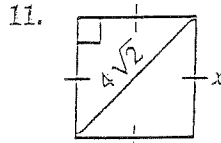
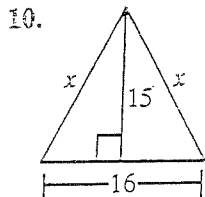
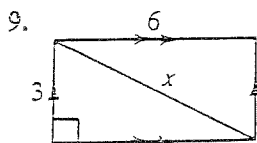
b. The altitude drawn to the base of an isosceles triangle is \perp to and bisects the base.

$$\begin{aligned} x^2 + 5^2 &= 13^2 \\ x^2 &= 144 \\ x &= 12 \end{aligned}$$

c. The diagonals of a rhombus are \perp bisectors of each other.

$$\begin{aligned} x^2 &= 6^2 + 8^2 \\ x^2 &= 100 \\ x &= 10 \end{aligned}$$

Find the value of x . Give exact answers.



17. Find the length of the diagonals of a square with perimeter 56.
18. The diagonals of a rhombus have lengths 18 and 24. Find the perimeter of the rhombus.
19. A rectangle has diagonals of 5 cm and its width is $\sqrt{3}$ cm. Find the length of the rectangle.