Aksum Math

Pythagorean Theorem

Geometry · Grade 8

★ Hard · 13 Questions

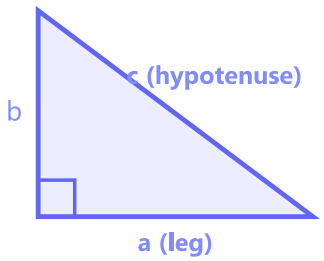
Name: _____

Date: _____

Score: _____ / 13

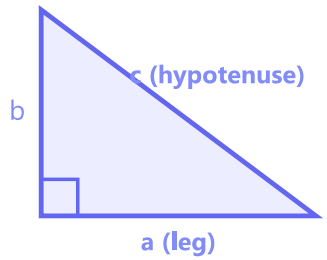
Solve each problem. Show your work in the space provided. Write your answer on the line.

1. A 26 m ladder reaches a window 24 m above the ground. How far is the base of the ladder from the wall?



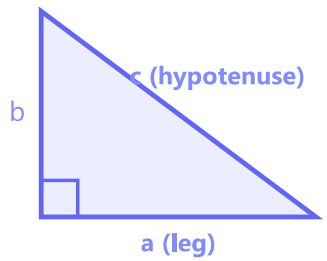
Answer: _____

2. Find the exact length of the diagonal of a rectangle with width 3 and height $4\sqrt{3}$.



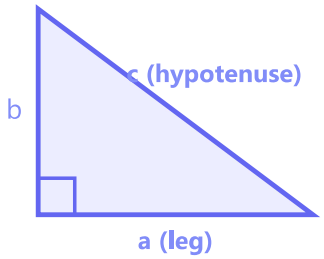
Answer: _____

3. A right triangle has legs in the ratio 3 : 4. The hypotenuse is 20. Find the legs.



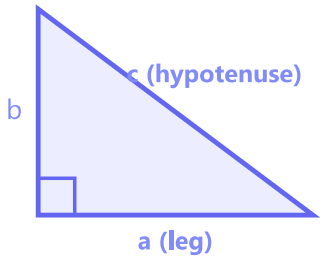
Answer: _____

4. Determine whether the triangle with sides $\sqrt{5}$, $\sqrt{12}$, $\sqrt{17}$ is a right triangle.



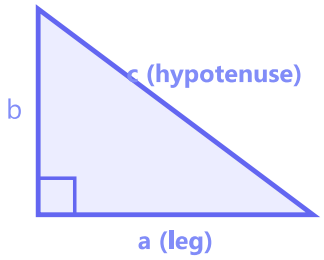
Answer: _____

5. A square has area 50 cm². Find the length of its diagonal.



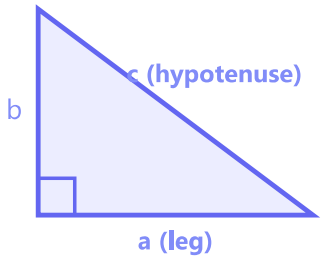
Answer: _____

6. A rectangle has a diagonal of 17 cm and one side of 8 cm. Find the perimeter.



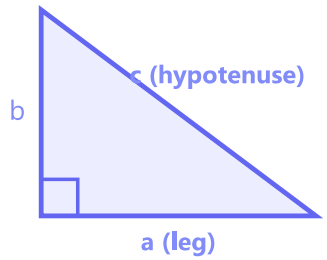
Answer: _____

7. An equilateral triangle has side length 6. Find the height. (Leave exact.)



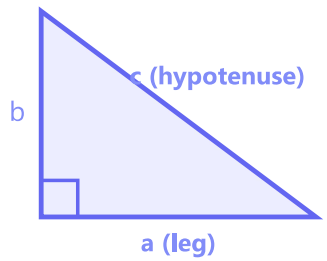
Answer: _____

8. Two poles of heights 8 m and 15 m stand 20 m apart on level ground. Find the distance between their tops.



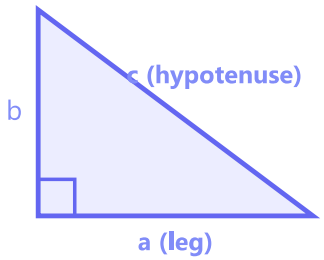
Answer: _____

9. A right triangle has perimeter 60 and hypotenuse 25. Find the two legs.



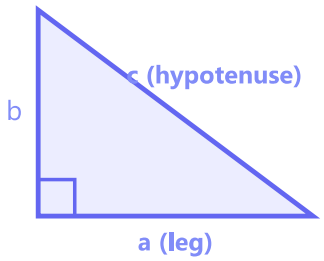
Answer: _____

10. Find the distance between points (1, 2) and (7, 10) using the distance formula (which is derived from the Pythagorean Theorem).



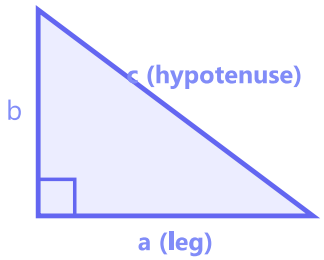
Answer: _____

11. In a right triangle, the hypotenuse is 3 more than the longer leg, and the shorter leg is 9. Find all sides.



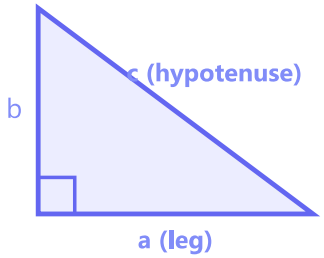
Answer: _____

12. A point P is 5 units from A(0,0) and lies on the line y = x. Find the coordinates of P (in the first quadrant).



Answer: _____

13. A rhombus has diagonals of length 24 cm and 10 cm. Find the side length.



Answer: _____

Answer Key Pythagorean Theorem — Hard

1. **10 m**

$d^2 = 26^2 - 24^2 = 676 - 576 = 100$. $d = 10$ m.

2. **$\sqrt{(9 + 48)} = \sqrt{57}$**

$d^2 = 3^2 + (4\sqrt{3})^2 = 9 + 48 = 57$. $d = \sqrt{57}$.

3. **12 and 16**

Legs = 3k and 4k. $(3k)^2 + (4k)^2 = 25k^2 = 400$. $k = 4$. Legs = 12 and 16.

4. **Yes: $(\sqrt{5})^2 + (\sqrt{12})^2 = 5 + 12 = 17 = (\sqrt{17})^2$**

Check: 5 + 12 = 17 ✓ It's a right triangle.

5. **10 cm**

Side = $\sqrt{50} = 5\sqrt{2}$. $d = s\sqrt{2} = 5\sqrt{2} \cdot \sqrt{2} = 10$ cm.

6. **46 cm**

Other side: $\sqrt{(289 - 64)} = \sqrt{225} = 15$. Perimeter = $2(8 + 15) = 46$ cm.

7. **$3\sqrt{3}$**

Height bisects the base. $h^2 = 6^2 - 3^2 = 36 - 9 = 27$. $h = 3\sqrt{3}$.

8. **$\sqrt{(449)} \approx 21.2$ m**

The vertical difference is 15−8=7 m. $d^2 = 20^2 + 7^2 = 400 + 49 = 449$. $d = \sqrt{449} \approx 21.2$.

9. **Legs = 20 and 15**

$a + b = 60 - 25 = 35$ and $a^2 + b^2 = 625$. $(a+b)^2 = a^2+2ab+b^2=1225$, so $2ab=600$, $ab=300$. Solve: 20+15=35, 20×15=300. Legs are 15 and 20.

10. **10**

$d = \sqrt{((7-1)^2 + (10-2)^2)} = \sqrt{(36+64)} = \sqrt{100} = 10$.

11. **9, 12, 15 (Pythagorean triple × 3)**

Let longer leg = x, hypotenuse = x+3. $9^2 + x^2 = (x+3)^2$. 81 = 6x+9. x=12. Hyp=15.

12. **$(5/\sqrt{2}, 5/\sqrt{2}) = (5\sqrt{2}/2, 5\sqrt{2}/2)$**

$x^2 + x^2 = 25$. $2x^2 = 25$. $x = 5/\sqrt{2} = 5\sqrt{2}/2$.

13. **13 cm**

Half-diagonals: 12 and 5. $\text{Side}^2 = 12^2 + 5^2 = 144 + 25 = 169$. Side = 13.