

Geometry: 9.6 - Pythagorean Families & The Reduced Triangle Principle

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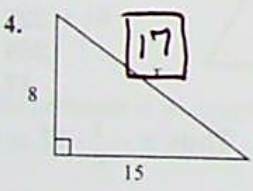
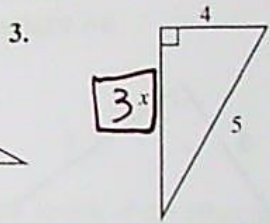
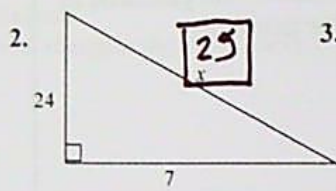
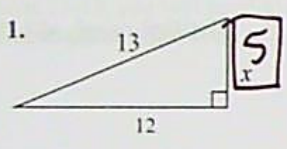
Families
It's time for some quality Family Time! Get to know your families; BOND with them!



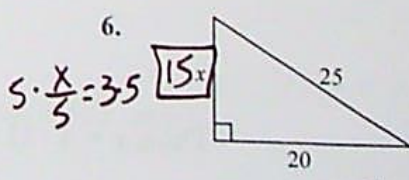
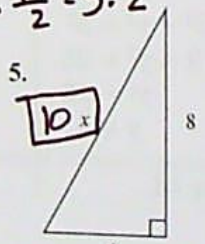
Pythagorean Families:
(or Pythagorean Triples)

1. * 3-4-5
2. * 5-12-13
3. * 7-24-25
4. * 8-15-17
5. * 9-40-41
6. 20-21-29

Examples: Try to find x without using the Pythagorean Theorem!



$2 \cdot \frac{x}{2} = 5 \cdot 2$

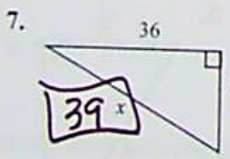


$5 \cdot \frac{x}{5} = 3 \cdot 5$

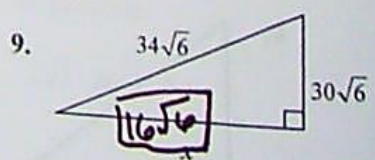
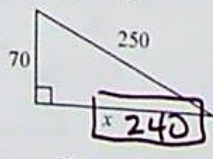
$\frac{4}{2} \cdot \frac{8}{2} = \frac{x}{2} \cdot \frac{x}{2}$
 $3 - 4 - 5$

$\frac{x}{5} \cdot \frac{20}{5} = \frac{25}{5}$
 $3 - 4 - 5$

$3 \cdot \frac{x}{3} = 13 \cdot 3$
 $x = 39$



$10 \cdot \frac{x}{10} = 24 \cdot 10$



$\frac{15}{3} \cdot \frac{36}{3} = \frac{x}{3}$
 $5 - 12 - 13$

$\frac{70}{10} \cdot \frac{x}{10} = \frac{250}{10}$
 $7 - 24 - 25$

$\frac{x}{2\sqrt{6}} \cdot \frac{30\sqrt{6}}{2\sqrt{6}} = \frac{34\sqrt{6}}{2\sqrt{6}}$

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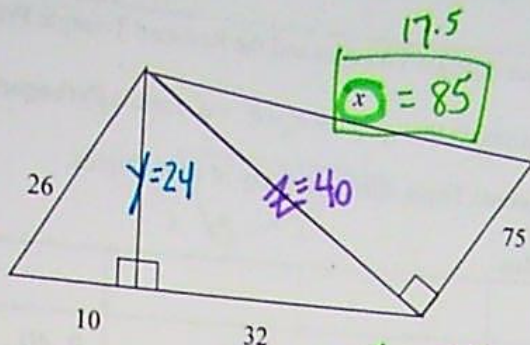
$8 - 15 - 17$
 $2\sqrt{6} \cdot \frac{x}{2\sqrt{6}} = 8 \cdot 2\sqrt{6}$
 $x = 16\sqrt{6}$

10. Find x.

$$\frac{10}{2} \frac{y}{2} \frac{26}{2}$$

$$\boxed{5-12-13 \text{ Family}}$$

$$\frac{y}{2} = 12 \quad \boxed{y=24}$$



$$\frac{24}{8} \quad \frac{32}{8} \quad \frac{7}{8}$$

3-4-5 Family

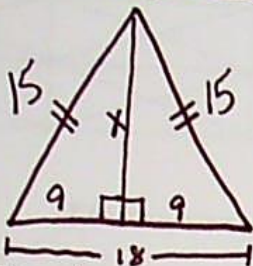
$$\frac{7}{8} = 5 \quad \boxed{z=40}$$

$$\frac{40}{5} \quad \frac{75}{5} \quad \frac{x}{5}$$

8-15-17 Family

$$5 \cdot \frac{x}{5} = 17.5$$

11. Find the altitude to the base of an isosceles triangle with a leg of 15 and a perimeter of 48.



P = 48

$$48 - (2 \cdot 15) = 48 - 30 = 18$$

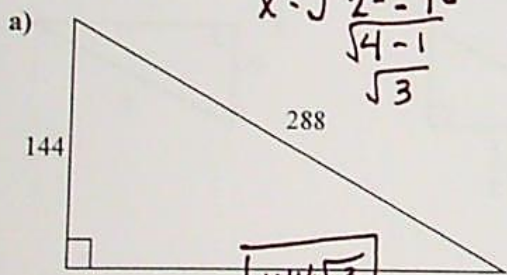
$$\frac{9}{3} \quad \frac{x}{3} \quad \frac{15}{3}$$

3-4-5

$$\frac{x}{3} = 4$$

$$\boxed{x=12} \text{ altitude length}$$

12. The reduced triangle principle can be used on any right triangle - even non-families! It is occasionally useful for solving a triangle with "messy" sides. Examples: Find x.



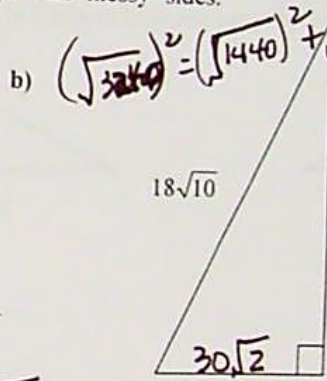
$$x = \sqrt{\frac{2^2 - 1^2}{4 - 1} \cdot 3}$$

$$\frac{144}{144} \quad \frac{x}{144} \quad \frac{288}{144}$$

$$1 - \sqrt{3} = 2$$

$$\frac{x}{144} = \sqrt{3}$$

$$\boxed{x = 144\sqrt{3}}$$



$$\frac{x}{6\sqrt{10}} \quad \frac{12\sqrt{10}}{6\sqrt{10}} \quad \frac{18\sqrt{10}}{6\sqrt{10}}$$

$$\boxed{\sqrt{5}} \quad 2 \quad 3$$

$$x = \sqrt{3^2 - 2^2}$$

$$= \sqrt{9 - 4}$$

$$= \sqrt{5}$$

13. Quick - find x!

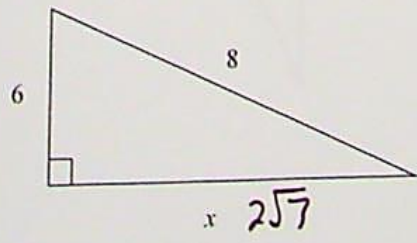
$$\frac{6}{3} \quad \frac{x}{2} \quad \frac{8}{2}$$

$$3 \quad \boxed{\sqrt{7}} \quad 4$$

$$\sqrt{4^2 - 3^2}$$

$$\sqrt{6-9}$$

$$\sqrt{7}$$



$$6\sqrt{10} \cdot \frac{x}{6\sqrt{10}} = \sqrt{5} \cdot 6\sqrt{10}$$

$$x = 6\sqrt{50}$$

$$\boxed{x = 30\sqrt{2}}$$

$$\boxed{39}$$