Review of Simplifying Square Roots and Pythagorean Theorem

Review of Simplifying Radicals: Square Roots

- **square root (radical)**→ expression that contain a $\sqrt[2]{\ }$ or $\sqrt{\ }$ symbol where the index # is 2 (understood)
  - GOAL to simplifying radicals – take out perfect square factors

    where the easiest way to do this is by breaking apart the radicand using a factor tree

Example 1: Simplify each square root completely.
Left side – Show factor tree and Right side – Show work to simplify square root.

a.) Simplify: $\sqrt{64}$

64 → 8, 8 → 4, 2, 4, 2 → 2, 2, 2, 2

$= 2^6$

$\sqrt{2^6}$

$= \sqrt{2^2 2^2 2^2}$

$= 2 \cdot 2 \cdot 2$

$= \boxed{8}$

b.) Simplify: $\sqrt{27}$

27 → 3, 9 → 3, 3

$= 3^3$

$\sqrt{3^3}$

$= \sqrt{3^2 \cdot 3}$

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

c.) Simplify: $\sqrt{180}$

180 → 10, 18 → 5, 2, 9, 2 → 3, 3

$= 3^2 \cdot 2^2 \cdot 5$

$\sqrt{3^2 \cdot 2^2 \cdot 5}$

$= 3 \cdot 2\sqrt{5}$

$= \boxed{6\sqrt{5}}$

d.) Simplify: $5\sqrt{28}$

28 → 4, 7 → 2, 2

$= 2^2 \cdot 7$

$= 5\sqrt{2^2 \cdot 7}$

$= 5 \cdot 2\sqrt{7}$

$= \boxed{10\sqrt{7}}$

e.) Simplify: $2\sqrt{24}$

24 → 6, 4 → 3, 2, 2, 2

$= 2^3 \cdot 3$

$2\sqrt{2^3 \cdot 3}$

$= 2\sqrt{2^2 \cdot 2 \cdot 3}$

$= 2 \cdot 2\sqrt{6}$

$= \boxed{4\sqrt{6}}$

f.) Simplify: $3\sqrt{8} \cdot 2\sqrt{5}$ $= 6\sqrt{40}$

40 → 5, 8 → 4, 2 → 2, 2

$= 2^3 \cdot 5$

$6\sqrt{2^3 \cdot 5}$

$= 6\sqrt{2^2 \cdot 2 \cdot 5}$

$= 6 \cdot 2\sqrt{10}$

$= \boxed{12\sqrt{10}}$

g.) Simplify: $\dfrac{2\sqrt{3}}{\sqrt{16}}$

16 → 4, 4 → 2, 2, 2, 2

$= 2^4$

$\dfrac{2\sqrt{3}}{\sqrt{2^2 2^2}}$

$= \dfrac{\cancel{2}^{1}\sqrt{3}}{\cancel{4}_{2}}$

$= \boxed{\dfrac{\sqrt{3}}{2}}$

h.) Simplify: $\dfrac{\sqrt{2}}{3\sqrt{72}}$

72 → 8, 9 → 4, 2, 3, 3 → 2, 2

$= 2^3 \cdot 3^2$

$\dfrac{\sqrt{2}}{3\sqrt{2^2 \, 2 \, 3^2}}$

$= \dfrac{\cancel{\sqrt{2}}}{3 \cdot 6\cancel{\sqrt{2}}}$

$= \boxed{\dfrac{1}{18}}$

or... $\dfrac{1}{3} \cdot \sqrt{\dfrac{2}{72}}$

$= \dfrac{1}{3}\sqrt{\dfrac{1}{36}} = \dfrac{1}{3} \cdot \dfrac{1}{6} = \dfrac{1}{18}$

i.) Simplify: $\dfrac{12\sqrt{50}}{4\sqrt{2}}$

50 → 25, 2 → 5, 5

$= 5^2 \cdot 2$

$\dfrac{12\sqrt{5^2 \cdot 2}}{4\sqrt{2}}$

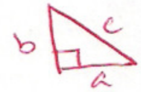
$= \dfrac{60\cancel{\sqrt{2}}}{4\cancel{\sqrt{2}}}$

$= \boxed{15}$

or... $\dfrac{12}{4}\sqrt{25}$

$= 3\sqrt{5^2} = 3 \cdot 5 = 15$

Review of the Pythagorean Theorem



Pythagorean Theorem → leg² + other leg² = hyp² => $a^2 + b^2 = c^2$

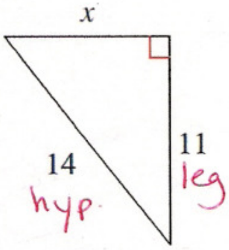
Remember → leg represents a side of a right triangle that forms the right angle

hypotenuse represents the side across from the right angle and is the longest side

When finding missing sides → answers must be in Simplified radical form

Example 2: Find the length of the missing side of each given right triangle. Must show EACH step!

a.)



$x^2 + 11^2 = 14^2$

$x^2 + 121 = 196$

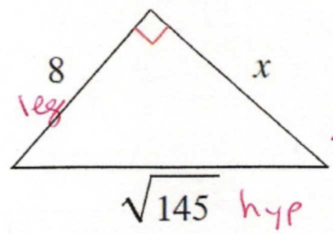
$-121 \quad -121$

$\sqrt{x^2} = \sqrt{75}$

$x = \sqrt{5^2 \cdot 3}$

$\boxed{x = 5\sqrt{3}}$

b.)



$x^2 + 8^2 = (\sqrt{145})^2$

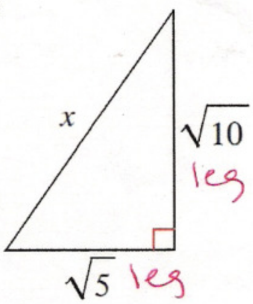
$x^2 + 64 = 145$

$-64 \quad -64$

$\sqrt{x^2} = \sqrt{81}$

$\boxed{x = 9}$

c.)



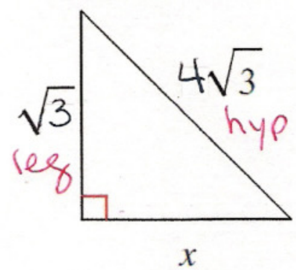
$(\sqrt{5})^2 + (\sqrt{10})^2 = x^2$

$5 + 10 = x^2$

$\sqrt{15} = \sqrt{x}$

$\boxed{x = \sqrt{15}}$

d.)



$x^2 + (\sqrt{3})^2 = (4\sqrt{3})^2$

$x^2 + 3 = 48$

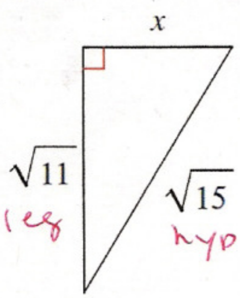
$-3 \quad -3$

$\sqrt{x^2} = \sqrt{45}$

$x = \sqrt{3^2 \cdot 5}$

$\boxed{x = 3\sqrt{5}}$

e.)



$x^2 + (\sqrt{11})^2 = (\sqrt{15})^2$

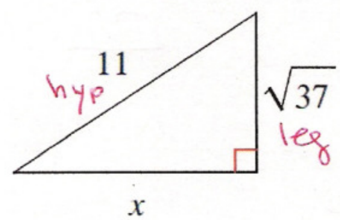
$x^2 + 11 = 15$

$-11 \quad -11$

$\sqrt{x^2} = \sqrt{4}$

$\boxed{x = 2}$

f.)



$x^2 + (\sqrt{37})^2 = 11^2$

$x^2 + 37 = 121$

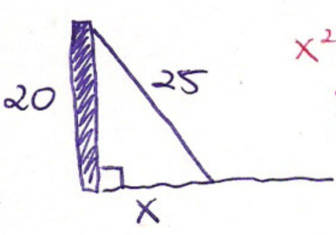
$-37 \quad -37$

$\sqrt{x^2} = \sqrt{84}$

$x = \sqrt{2^2 \cdot 3 \cdot 7}$

$\boxed{x = 2\sqrt{21}}$

g.) A telephone support cable attaches to the pole 20 feet high. If the cable is 25 feet long, how far from the bottom of the pole does the cable attach to the ground?



$x^2 + 20^2 = 25^2$

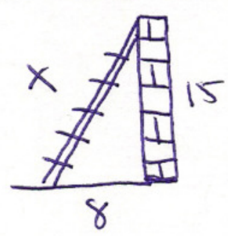
$x^2 + 400 = 625$

$-400 \quad -400$

$x^2 = 225$

$\boxed{x = 15 \text{ ft}}$

h.) Tara leaned a ladder against her house. The bottom of the ladder is 8 feet from the house and the top of the ladder is 15 feet above the ground. How long is the ladder?



$8^2 + 15^2 = x^2$

$64 + 225 = x^2$

$289 = x^2$

$\boxed{x = 17 \text{ ft}}$