C3 - Entire and Mixed Radicals

1. Interesting Problems
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4. Entire and Mixed Radicals

Interesting Problems

Text pg. 64: 20, 18, 24

#20) $y = x^2 - 4$ Solve for x when y = 32.

$32 = x^2 - 4$

$\sqrt{36} = \sqrt{x^2}$

$\pm 6 = x$

Interesting Problems

Text pg. 64: 20, 18, 24

#18) $SA = 4\pi r^2$ Determine radius when SA is 803.84 cm^2.

$$\frac{803.84}{4\pi} = \frac{\cancel{4\pi} r^2}{\cancel{4\pi}}$$

$$\sqrt{64} = \sqrt{r^2}$$

Context Matters

$$\pm 8 = r$$ ignore -ve ∵ radius

$r = 8$ cm

Interesting Problems

Text pg. 64: 20, 18, 24

#24) $\sqrt{-25} =$ Not Possible

$\sqrt{\ }$ → two equal factors

$5 \cdot 5 = +25$

$-5 \cdot -5 = +25$

$\sqrt[3]{-27} = -3$

$\sqrt[3]{\ }$ → three equal factors

$(-3)(-3)(-3) = -27$

Radical Notation

Radical: consists of a root symbol, an index, and a radicand.

index radical index radical

eg. $\sqrt[3]{27}$ $\sqrt{64}$

radicand radicand

Radical Notation & Rational Exponents

For each radical, circle the index and radicand.

$\sqrt[4]{\left(\frac{2}{3}\right)^3}$ $\sqrt[5]{32^2}$ $\sqrt[2]{16}$

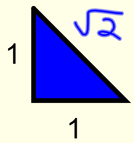
$\sqrt[3]{125^2}$ $\sqrt[2]{\left(\frac{16}{9}\right)^3}$ $\sqrt[3]{27^4}$

Activity: Intro to Entire & Mixed Radicals

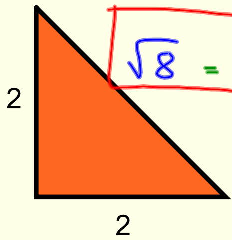
Determine the value of each hypotenuse as an exact value. (Hint: Pythagorean Theorem)

$\times 2$ $\times 3$

$\sqrt{32} = 4\sqrt{2}$
$\sqrt{50} = 5\sqrt{2}$

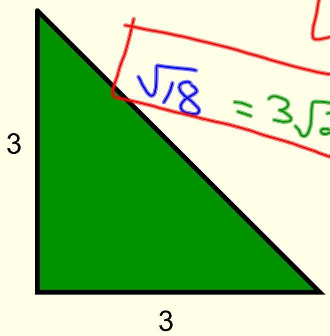


$a^2+b^2=c^2$
$1^2+1^2=c^2$
$\sqrt{2}=\sqrt{c^2}$
$\sqrt{2}=c$



$\boxed{\sqrt{8} = 2\sqrt{2}}$

$2^2+2^2=c^2$
$4+4=c^2$
$\sqrt{8}=\sqrt{c^2}$
$c=\sqrt{8}$



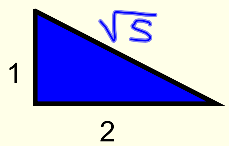
$\boxed{\sqrt{18} = 3\sqrt{2}}$

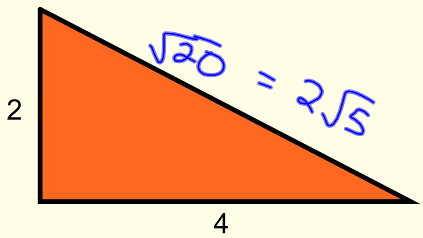
$3^2+3^2=c^2$
$9+9=c^2$
$\sqrt{18}=\sqrt{c^2}$
$\sqrt{18}=c$

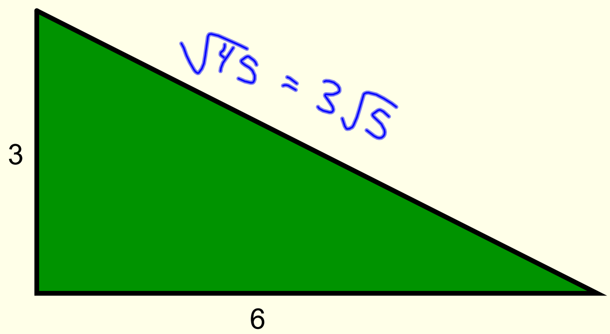
Now try to find the hypotenuse of the second and third triangles in a different form.
(Hint: Similar Triangles & Scale Factor)
Show algebraically that the different forms of the hypotenuse are equivalent.

Extension: Intro to Entire & Mixed Radicals

Determine the hypotenuse of the second and third triangles in two different forms.







$$\sqrt{20} = \sqrt{4}\cdot\sqrt{5}$$
$$= 2\sqrt{5}$$

$$\sqrt{45} = \sqrt{9}\cdot\sqrt{5}$$
$$= 3\sqrt{5}$$

Simplify Radicals

Entire Radical: $\sqrt{50}$ Mixed Radical: $4\sqrt{3}$

Change an entire radical to a mixed radical by finding factors of the radicand that are perfect squares or perfect cubes.

e.g. Write the following radicals as equivalent mixed radicals in simplest form.

$\sqrt{12} = \sqrt{4}\cdot\sqrt{3}$
$= \boxed{2\sqrt{3}}$

$2\sqrt{27} = 2\sqrt{9}\cdot\sqrt{3}$
$= 2\cdot 3\cdot\sqrt{3}$
$= 6\sqrt{3}$

(Board Work)

$\sqrt{48} = \sqrt{16}\cdot\sqrt{3}$
$= 4\sqrt{3}$

$\sqrt[3]{24} = \sqrt[3]{8}\cdot\sqrt[3]{3}$
$= \boxed{2\sqrt[3]{3}}$

$4\sqrt[3]{54} = 4\sqrt[3]{27}\cdot\sqrt[3]{2}$
$= 4\cdot 3\sqrt[3]{2}$
$= \boxed{12\sqrt[3]{2}}$

Simplifying Radicals

$\sqrt[3]{375} = \sqrt[3]{125}\cdot\sqrt[3]{3}$
$= 5\sqrt[3]{3}$

5 | 375
5 | 75
5 | 15
3 | 3
1

$5\overline{)375}$ = 75
-35
25

$5\cdot 5\cdot 5\cdot 3 = 375$
$125\cdot 3$

Practice: pg. 76: 6, 7

Mixed Radicals to Entire Radicals

Entire Radical: $\sqrt{50}$ Mixed Radical: $4\sqrt{3}$

Change a mixed radical to an entire radical by writing the numerical coefficient as a radical and then multiply the radicals.

e.g. Write the following mixed radicals as equivalent entire radicals.

$3\sqrt{11} = \sqrt{9}\sqrt{11}$
$= \sqrt{99}$

$7\sqrt{2} = \sqrt{49} \cdot \sqrt{2}$
$= \sqrt{98}$

$10\sqrt{6} = \sqrt{100}\sqrt{6}$
$= \sqrt{600}$

$2\sqrt[3]{7} = \sqrt[3]{8}\sqrt[3]{7}$
$= \sqrt[3]{56}$

$4\sqrt[3]{2} = \sqrt[3]{64}\sqrt[3]{2}$
$= \sqrt[3]{128}$

$2\sqrt[4]{5} = \sqrt[4]{16} \cdot \sqrt[4]{5}$
$= \sqrt[4]{80}$

Practice: pg. 76: 4abc, 5abcd