

Homework Qs???

Selling

⑤ Revenue = $(0.65 + 0.05x)(50 - 2x)$
 $= 32.5 - 1.3x + 2.5x - 0.1x^2$
 $= -0.1x^2 + 1.2x + 32.5$
 $= -0.1(x^2 - 12x) + 32.5$
 $= -0.1(x^2 - 12x + 36) + 3.6 + 32.5$
 $= -0.1(x - 6)^2 + 36.1$
 \downarrow
 $x = 6$

Profit = $(40 + 2x)(1000 - 10x)$
 $= 40000 - 400x + 2000x - 20x^2$
 $= -20x^2 + 1600x + 40000$
 $= -20x(x - 80) + 40000$
 $\swarrow \quad \downarrow$
 $x = 0 \quad x = 80$
 Vertex $x = 40$

<u>Selling Price</u>	<u># Sold</u>
$\$50 + 2(40)$	$.1000 - 10(40)$
$= \$130$	$= 600$

⑧ let ' x ' be one # Product X

let ' $x - 12$ ' be the other #

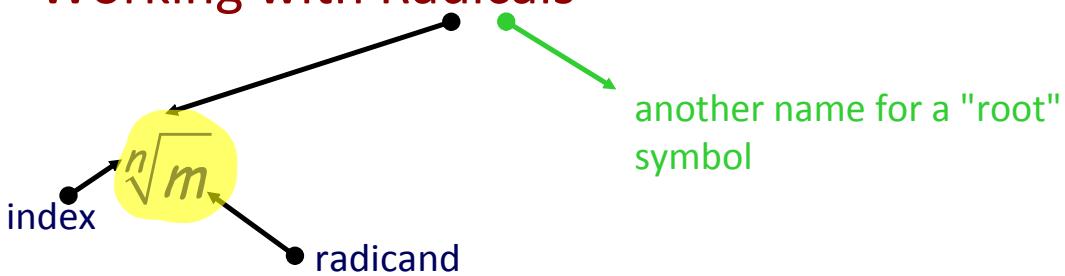
Product = $(x)(x - 12) + 0$ $\rightarrow x^2 - 12x$

$\swarrow \quad \downarrow$
 $x = 0 \quad x = 12$

Vertex: $X = 6$

one # is 6
 the other is -6

1.4A Working with Radicals



Entire Radical

$$\sqrt{49} \quad \sqrt{72}$$

Mixed Radical

$$2\sqrt{3} \quad 5\sqrt{7}$$

Think of:
perfect square factors
1, 4, 9, 16, 25, 36, 49, 64, ...

Ex. 1 Change Entire Radicals to Mixed Radicals

$$\begin{array}{llll} a) \sqrt{27} & b) \sqrt{48} & c) \sqrt{500} & d) \sqrt{180} \\ = \sqrt{9 \cdot 3} & = \sqrt{16 \cdot 3} & = \sqrt{100 \cdot 5} & = \sqrt{9 \cdot 20} \\ = 3\sqrt{3} & = 4\sqrt{3} & = 10\sqrt{5} & = 3\sqrt{20} \\ & & & = 3\sqrt{4 \cdot 5} \\ & & & = 3 \cdot 2\sqrt{5} \\ & & & = 6\sqrt{5} \end{array}$$

A radical is in simplest form if:

* the radical has no perfect square factors other than 1 in the radicand

* there are no fractions under a $\sqrt{}$

Ex. $\sqrt{\frac{1}{6}}$ ← needs to be simplified

* there are no $\sqrt{}$ in the denominator

Ex. $\frac{1}{\sqrt{2}}$ ←

* Always SIMPLIFY first

Perfect Squares & Square Roots

$1^2 = 1$	$\sqrt{1} = 1$
$2^2 = 4$	$\sqrt{4} = 2$
$3^2 = 9$	$\sqrt{9} = 3$
$4^2 = 16$	$\sqrt{16} = 4$
$5^2 = 25$	$\sqrt{25} = 5$
$6^2 = 36$	$\sqrt{36} = 6$
$7^2 = 49$	$\sqrt{49} = 7$
$8^2 = 64$	$\sqrt{64} = 8$
$9^2 = 81$	$\sqrt{81} = 9$
$10^2 = 100$	$\sqrt{100} = 10$
$11^2 = 121$	$\sqrt{121} = 11$
$12^2 = 144$	$\sqrt{144} = 12$
$13^2 = 169$	$\sqrt{169} = 13$
$14^2 = 196$	$\sqrt{196} = 14$
$15^2 = 225$	$\sqrt{225} = 15$

Operations with Radicals:

A. Adding and Subtracting

Algebra: Collect like terms.

Like Terms

Same variables, same exponents

Example: $2x, 4x$
 $-2xy^2, 8xy^2$

Counter-example:

Radicals: Collect like radicals.

Like Radicals

Same index, same radicand

Example: $\sqrt{3}, 8\sqrt{3}$
 $\sqrt[3]{5}, \sqrt[3]{5}$

Counter-example:
 $\sqrt{5}, \sqrt[3]{5}$

Ex. 1 Are the following radicals like or unlike?

a) $2\sqrt{3}, -3\sqrt{3}, 4\sqrt{3}$

like

b) $\sqrt{4}, \sqrt{2}, \sqrt{3}$

unlike

c) $\sqrt{8}, \sqrt{2}, \sqrt{32}$

\downarrow
 $2\sqrt{2}$

d) $\sqrt[3]{3}, \sqrt[3]{3}, \sqrt[4]{3}$

unlike

\downarrow
 $4\sqrt{2}$

like

Ex. 2 Add or Subtract

a) $\sqrt{27} + \sqrt{20} - \sqrt{12} + \sqrt{45}$

$$\begin{aligned} &= \sqrt{9 \cdot 3} + \sqrt{4 \cdot 5} - \sqrt{4 \cdot 3} + \sqrt{9 \cdot 5} \\ &\quad \swarrow \quad \searrow \\ &= \underline{3\sqrt{3}} + \underline{2\sqrt{5}} - \underline{2\sqrt{3}} + \underline{3\sqrt{5}} \end{aligned}$$

$$= \sqrt{3} + 5\sqrt{5}$$

b) $7\sqrt{2} - 6\sqrt{63} - \sqrt{28} + 5\sqrt{18}$

$$\begin{aligned} &= 7\sqrt{2} - 6\sqrt{9 \cdot 7} - \sqrt{4 \cdot 7} + 5\sqrt{9 \cdot 2} \\ &= 7\sqrt{2} - 6 \cdot 3\sqrt{7} - 2\sqrt{7} + 5 \cdot 3\sqrt{2} \\ &\quad \swarrow \quad \searrow \\ &= \underline{7\sqrt{2}} - \underline{18\sqrt{7}} - \underline{2\sqrt{7}} + \underline{15\sqrt{2}} \\ &= 22\sqrt{2} - 20\sqrt{7} \end{aligned}$$

B) Multiplication

$$\begin{array}{l|l} \sqrt{4 \cdot 25} & \sqrt{4} \cdot \sqrt{25} \\ = \sqrt{100} & = 2 \cdot 5 \\ = 10 & = 10 \end{array}$$

In general:

$$\boxed{\sqrt{b} \cdot \sqrt{d}} = \sqrt{b \cdot d}$$
$$a\sqrt{b} \cdot c\sqrt{d} = a \cdot c \sqrt{b \cdot d}$$

C) Division

$$\begin{array}{l|l} \sqrt{\frac{81}{9}} & \frac{\sqrt{81}}{\sqrt{9}} \\ = \sqrt{9} & = \frac{9}{3} \\ = 3 & = 3 \end{array}$$

In general:

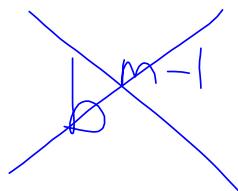
$$\boxed{\frac{\sqrt{b}}{\sqrt{d}}} = \sqrt{\frac{b}{d}}$$
$$\frac{a\sqrt{b}}{c\sqrt{d}} = \frac{a}{c} \sqrt{\frac{b}{d}}$$

D) Squaring

$$\begin{array}{l|l} (\sqrt{b})^2 & (a\sqrt{b})^2 \\ = b & = a^2 b \end{array}$$

In general:

$$(a\sqrt{b})^m = a^m (\sqrt{b})^m$$



Examples: Simplify.

a) $\sqrt{5} \cdot \sqrt{7}$
 $= \sqrt{35}$

b) $3\sqrt{6} \cdot \sqrt{2}$
 $= 3\sqrt{12}$
 $= 3\sqrt{4 \cdot 3}$
 $= 3 \cdot 2\sqrt{3}$
 $= 6\sqrt{3}$

c) $(5\sqrt{6})(2\sqrt{8})$
 $= 10\sqrt{48}$
 $= 10\sqrt{16 \cdot 3}$
 $= 10 \cdot 4\sqrt{3}$
 $= 40\sqrt{3}$

d) $(2\cancel{\sqrt{6}})(3\cancel{\sqrt{2}})(5\sqrt{6})$
 $= 30\sqrt{72} = 180\sqrt{2}$
 $= 30\sqrt{36 \cdot 2}$
 $= 30 \cdot 6\sqrt{2}$
 $= 180\sqrt{2}$

e) $\sqrt{3}(\sqrt{6} + 5)$
 $= \sqrt{18} + 5\sqrt{3}$
 $= 3\sqrt{2} + 5\sqrt{3}$

f) $\frac{\sqrt{18}}{\sqrt{3}}$
 $= \sqrt{6}$

g) $\frac{15\sqrt{7}}{3\sqrt{4}}$
 $= \frac{5\sqrt{7}}{2}$

h) $\frac{5\sqrt{12}}{\sqrt{8}}$
 $= 5\sqrt{\frac{12}{8}}$
 $= 5\sqrt{\frac{3}{2}}$
 $= 5\frac{\sqrt{3}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$
 $= \frac{5\sqrt{6}}{2}$

$\frac{5\sqrt{12}}{2\sqrt{2}}$
 $= \frac{5\sqrt{6}}{2}$

i) $\frac{12\sqrt{27}}{4\sqrt{45}} \div 9$

$\sqrt{\frac{27}{45}} = \sqrt{\frac{9}{5}}$

$\frac{3\sqrt{3}}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$
 $= \frac{3\sqrt{15}}{5}$

Rationalizing the Denominator

Multiply both the numerator and the denominator by the radical in the denominator.

Squaring the radical will eliminate it from the denominator.

Homework

p. 39 # 1-3, 4bdf, 5bdf, 6bcde, ~~7ab~~,
8ad, 9acd, 11, 13, 14, 16c



$$\sqrt[n]{a} \sqrt[n]{b} = \sqrt[n]{ab}$$

$$\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$$

You CANNOT split up the radical across a + or - sign.

$$\sqrt{x+y} \neq \sqrt{x} + \sqrt{y}$$

$$\sqrt{x-y} \neq \sqrt{x} - \sqrt{y}$$